

MINISTRY OF WATER RESOURCES
AND METEOROLOGY,
THE KINGDOM OF CAMBODIA

PREPARATORY SURVEY
FOR
IRRIGATION AND DRAINAGE SYSTEM
REHABILITATION AND IMPROVEMENT PROJECT
IN
THE KINGDOM OF CAMBODIA

FINAL REPORT

VOLUME - IV
ANNEXES (3/3)

SEPTEMBER 2012

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
NIPPON KOEI CO., LTD.

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ANNEX E

INSTITUTIONS

CHAPTER AE-1 INTRODUCTION (REGULATORY FRAMEWORK AND INSTRUMENTS RELEVANT TO INSTITUTION AND O&M FOR IRRIGATION SECTOR)

AE-1.1 General

Investment in facilities is a great impetus to development and irrigation sector in Cambodia is not left out. In order to effectively utilize available water resources, MOWRAM together with various development partners, as financial and technical resources, have been developing irrigation and drainage facilities through the projects such as Prey Nup Polder Rehabilitation Project, Stung Chinit Irrigation & Rural Infrastructure Project and Northwest Irrigation Sector Project and Water Resources Management Sector Development Program. Similar concept was applied for such major projects, activities of which consisted of both hardware component (rehabilitation and/or construction of irrigation facilities) and software component (institutional development such as establishment of joint operation and maintenance (O&M) system among the government and farmers by capacity development program) since improved irrigation and drainage infrastructure would benefit target communities from the view point of the cost and reliability of services, which are supported by enhanced O&M set-up so as to ensure overall sustainability.

Annex E Institutions explains regulatory framework for institutions and O&M for irrigation systems in Cambodia and proposed software component in the Project to establish organizational set-up in order for sustainable irrigation management. Chapter AE-1 to Chapter AE-3 are general information common to irrigation institution and O&M. Chapter AE-1, introduction, regulatory framework for institution and O&M for irrigation sector, shows information on relevant regulation and sub-decree on irrigation sector. Chapter AE-2 describes review on major irrigation projects previously implemented under the responsibility of MOWRAM with international development partners. In particular, focus in this chapter is given to the sub-component of institutional development and O&M improvement of those projects in order to derive lessons to be learnt for the planning of software component under the proposed Project. Chapter AE-3 expounds organizational framework concerned for the Project at the national and rural levels including legal status of Farmer Water Users' Community (FWUC).

On the basis of such present conditions, Chapter AE-4 elaborates proposed software component program consisting of present conditions of the area under Southwest Phnom Penh Irrigation and Drainage Rehabilitation and Improvement Project (SPPIDRIP) related with institution and O&M plan, proposed software component activities to enhance the system of sustainable management of rehabilitated infrastructures and cost estimate for the software component.

AE-1.2 Circular No. 1 on the Implementation Policy for Sustainable Irrigation Systems

Circular No. 1 on the Implementation Policy for Sustainable Irrigation Systems was issued in 2000 particularly referring two documents consisting of (i) Policy for Sustainability of Operation and Maintenance Irrigation Systems and (ii) Steps in the Formation of Farmer Water Users Community.

In the Circular No. 1, the Statute of the Farmer Water User Community (FWUC) is stipulated in 8 chapters as prototype as follows:

Table AE-1.2.1 Statute of the Farmer Water User Community (FWUC) in Circular No. 1 on the Implementation Policy for Sustainable Irrigation Systems

Chapter	Contents	
Chapter I	Name and Objective	Article 1 to Article 4 - Definition of organization - Registration at MOWRAM
Chapter II	Membership Criteria	Article 5 to Article 8 - Qualification to be a member - Cancellation of membership - Duties by FWUC member - Right of FWUC member
Chapter III	Organizational Structure	Article 9 to Article 17 - Members of FWUC committee - Roles and duties of FWUC committee (entire organization) - Role and duties of FWUC committee member, respectively - Roles and duties of FWUG
Chapter IV	Mandate and Procedures of the Community	Article 18 to Article 21 - Term of period for committee - Procedure of elevation - Meeting (normal meeting and special meeting)
Chapter V	The Revenue, Expense and Audit of the FWUC	Article 22 to Article 25 - Source of revenue - Item of expense - Water fee calculation formula - Audit of FWUC account
Chapter VI	Rules and Regulations	Article 26 to Article 36 - Regulations of FWUC members (water distribution, gate control, structure maintenance etc.)
Chapter VII	Punishment	Article 37 - Penalty including warning, fine, water cut off and legal action at communal authority
Chapter VIII	Other Issues	Article 38 to Article 40 - Miscellaneous
Attachment: Application Form for Membership of Farmer Water User Community		

Source: Circular No.1 on the Implementation Policy for Sustainable Irrigation Systems, 2000, MOWRAM

The purpose of Circular No.1 is to promote Irrigation Management Transfer (IMT) and Participatory Irrigation Management and Development (PIMD). By the establishment and strengthening of FWUC in each irrigation system, MOWRAM accelerates to consolidate the system of joint operation and management of irrigation and drainage infrastructures with FWUC. Steps in the Formation of a Farmer Water Users Community attached in the Circular No.1, in particular, explains FWUC formation procedure consisting of 8 steps as shown in the right figure. Such proposed process definitely needs to be customized based on the conditions of each irrigation system and organizational capability of FWUC, however, it can be utilized as basic procedure of FWUC formation approach. Newly established FWUCs need to be registered with MOWRAM, or practically with PDOWRAM at the field level. In the Circular No.1, additionally, gradual transfer of O&M responsibility from the Government to FWUC is explained by applying a declining share of O&M subsidies from the

Government over 5 years after completion of facilities' construction.¹

Using this approach, Action Plan on Water Resources and Meteorology Management and Development (2009-2013) reveals that 350 FWUCs in number has been established in the country with the support of MOWRAM which involves 305,550 family members in 245,122 ha of rainy season and 105,157 ha of dry season paddy cultivation in 5 years (2004-2008).

AE-1.3 Training Modules for Participatory Irrigation Management and Development (PIMD)

In order to effectively accelerate IMT and PIMD on the basis of abovementioned Circular No.1, MOWRAM prepared and issued six training modules in October 2003 as follows, which can be basic and practical guidelines for institutional development and O&M improvement in irrigation systems by facilitating IMT and PIMD:

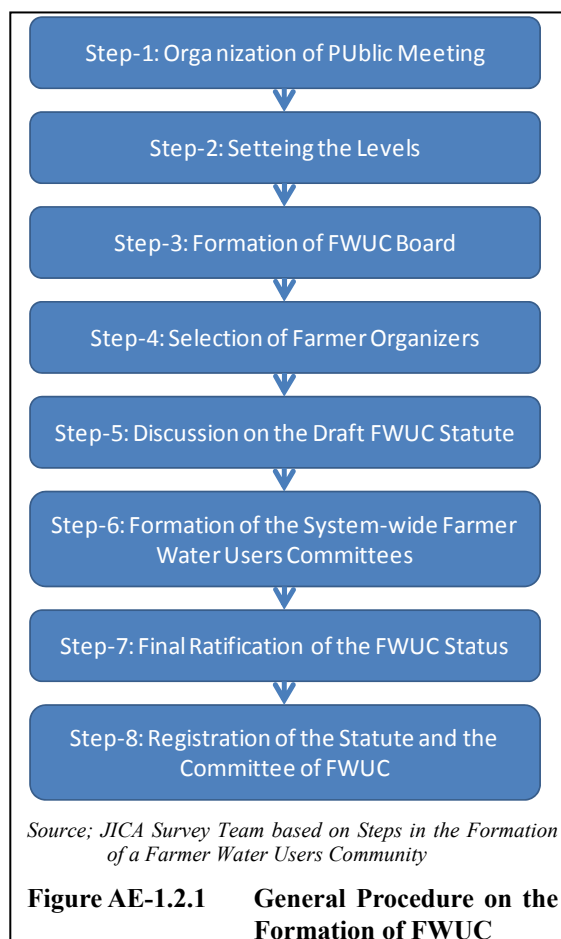


Table AE-1.3.1 Training Modules issued by MOWRAM for Promoting IMT and PIMD

Title	Contents
Module 1: Introduction to Participatory Irrigation Management and Development (PIMD)	<ul style="list-style-type: none"> - Purpose and overview of PIMD - Special characteristics of irrigation agriculture in Cambodia - Definition of PIMD - Four essential principles of PIMD - International experiences with PIMD strategies and results
Module 2: Participatory Irrigation Management and Development; Policy, Legal and Institutional Framework	<ul style="list-style-type: none"> - Current status of PIMD policy and strategy in Cambodia - Establishment of national secretariat for PIMD - Legal framework - Establishment of FWUC support teams
Module 3: Planning and Implementing PIMD at the National Level	<ul style="list-style-type: none"> - Context of PIMD in Cambodia - Strategic planning for PIMD
Module 4: Implementation of PIMD at Provincial and Irrigation System Levels	<ul style="list-style-type: none"> - Problems with irrigation system management - Participatory rural appraisal - Irrigation service plan - Water delivery and drainage - Maintenance - Rehabilitation, upgrading and extension - Financial management - Irrigation management audit
Module 5: Establishing and Developing the FWUC	<ul style="list-style-type: none"> - Incentives for farmers to support PIMD

¹ According to the Circular No.1, O&M subsidy during transfer period is stipulated as in the table as follows. This principle has been generally applied for irrigation systems constructed by the Government fund and/or support from international and national agencies.

Share of O&M Cost for Irrigation System by MOWRAM and FWUC

Year	Government	FWUC
1 st Year	80%	20%
2 nd Year	60%	40%
3 rd Year	40%	60%
4 th Year	20%	80%
5 th Year	0%	100%

Source: Circular No.1 on the Implementation Policy for Sustainable Irrigation Systems, June 2000, MOWRAM

Title	Contents
	<ul style="list-style-type: none"> - Functions of FWUC support team members - Work plan for the FWUC support team - Review of four essential principles of PIMD - Role of facilitators and effective communication methods - Steps for organizing the FWUC - Irrigation management audit
Module 6: Monitoring and Evaluation System for PIMD	<ul style="list-style-type: none"> - Basic principles for the monitoring and evaluation system - Four steps in planning and implementing an M&E system: (i) step 1: identify information requirements, (ii) step 2: select and define indicators, (iii) step 3: data collection and management and (iv) step 4: report and use of M&E results - Examples of planning worksheets for the M&E system

Source: Training Modules of PIMD, 2003, MOWRAM

AE-1.4 Sub-decrees Relevant to Institution and O&M

Based on the above-mentioned policy context, irrigation and agriculture-related laws and regulations are tabulated as follows, all of which are drafted under Northwest Irrigation Sector Project (NWISP):

Table AE-1.4.1 List of Sub-decrees Relevant to Institution and O&M

Title	Issued in	Provisions
Basin Management		
Sub-decree on Basin Management	Draft	<ul style="list-style-type: none"> - It is currently under approval process in the Council of Law. - It aims to begin the implementation of water management plans and the creation of basin organizations to matches the Integrated Water Resources Management (IWRM) principles in Cambodia.
Water management		
Sub-decree on Farmer Water User Community	Draft	<ul style="list-style-type: none"> - It was drafted under NWISP and currently under approval process in the Council for Minister. - The objective of this Sub-decree is to effectively and sustainable manage and use the irrigation systems. This sub-decree consists of 12 chapters and is to define the basic principles and process, function and supporting system etc. - The sub-decree also fosters farmers' participation in the operation and maintenance of irrigation system through FWUC based on PIMD and TIS.
Sub-decree on Water Allocation and Licensing	Draft	<ul style="list-style-type: none"> - Together with sub-decree on FWUC, it was drafted under NWISP and currently under approval process in the Council of Law. - It is with the purpose of beginning an activity of water licensing by MOWRAM.

Source: MOWRAM

CHAPTER AE-2 REVIEW OF INSTITUTIONAL DEVELOPMENT AND O&M IMPROVEMENT IN MAJOR PREVIOUS PROJECTS

AE-2.1 General

Institutional development and O&M improvement support have been already carried out in various irrigated and agriculture sector projects previously. Japan International Cooperation Agency (JICA), Asian Development Bank (ADB) and Agence Française de Développement (AFD) has been playing an important role particularly in institutional support in irrigation sector. In order to formulate practical plan to be applied for the software component of the Project, lessons learnt and feedbacks obtained from such valuable experiences, focusing on institutional development and O&M improvement support, are compiled in this section.

AE-2.2 Prey Nup Polder Rehabilitation Project

Project Summary

Item	Description	
Location	Province	Sihanoukville
	District/Commune	Samrong
	River basin	
	Distance	230 km west of Phnom Penh
Objectives	To increase agricultural production in (paddy and other crops) polder areas located near Sihanoukville (10,500 ha) by the rehabilitation of polders and implementation of other related activities	
Scope of works	<ol style="list-style-type: none"> 1. Infrastructure rehabilitation: rehabilitation of polder to prevent salty water intrusion in paddy fields and allow fresh water management 2. Institutional support to polder management: establishment of a Farmer Water User Community (FWUC) (Polders Users Community: PUC) and development of its ability to operate and maintain polders 3. Support to agriculture development: (i) reclaim abandoned land in polder area, (ii) increase yields in paddy production and (iii) diversity production 4. Land titling: systematic registration of all agricultural land inside polders area 5. Credit: development of micro-credit services in Prey Nup district 	
Project costs	10.1 million Euros (Phase I 6.9 million Euros + Phase II 3.2 million Euros)	
Fund source	AFD (grant)	
Implementation period	1998-2002	

Source: Prey Nup Polders Rehabilitation Project, Project's rationale, achievements and stakes 2005, AFD

The Project consisted of hardware component (rehabilitation of main dykes, the polder system comprising canal network 133 km and related structures 36 sluice gates with automatic valves and lateral dykes) and software component including establishment and strengthening of Polder Users Community (PUC) and agricultural support activities. Although command area extended more than 10,000 ha as one of the largest system in the country, system itself from technical view point would be simple enough for O&M, which are one of the reasons for success according to project evaluation.² Major activities related with institutional support and O&M improvement under the Project are summarized as follows:

² Prey Nup Polders Rehabilitation Project, Project's rationale, achievements and stakes 2005, AFD

Table AE-2.2.1 Major Activities Related to Institutional Development and O&M, Lessons Learnt and Recommendations (Prey Nup Polder Rehabilitation Project)

Major Activities	Result and Lessons Learnt	Recommendations
1. Establishment and strengthening of PUC: (i) established and registered by MOWRAM in 2000 (15,000 members) and (ii) formally defined O&M responsibility among MOWRAM Sihanoukville Municipality and PUC 2. Establishment of registration system of all agricultural land inside polders area: about 22,000 official land titles delivered to land owners for a total of more than 24,000 parcels in polders 3. Introduction of micro-credit services for farmers under polders system	<ul style="list-style-type: none"> - Establishment of O&M system through the preparation of Memorandum of understanding (MOU) is useful experiences for institutional development in future project. - According to ADB, successful in institutional arrangement is due to: (i) local leadership, (ii) effective (& simple) infrastructure, (iii) continued and adequate donor supports, with assistance from NGO, active participation and supports of local authorities etc. 	<ul style="list-style-type: none"> - In order to establish sustainable O&M system, long-term support needs to be carried out with clear responsibility demarcation among stakeholders. - In particular, planning of cost sharing for O&M among stakeholders should consider capability of each stakeholder with consensus building. - Such process requires appropriate supports through software component including third parties such like NGOs.

Source: *Prey Nup Polders Rehabilitation Project, Project's rationale, achievements and stakes 2005, AFD Water Resources Management (Sector) Project, Technical Assistance Consultant's Report, Supplementally Appendix C, Relevant Lessons Learned 2008, ADB*

Prey Nup Polder management is being carried based on MOU between MOWRAM, the Municipality of Sihanoukville and PUC of Prey Nup on the sharing of responsibility over Prey Nup Polders Management. The MOU was prepared in compliance with the Circular No.1, Prakas 306 and 410 of MOWRAM, Municipal "Deyka" DK 043 and the statutes of Prey Nup Polders FWUC. Responsibility demarcation applied for Prey Nup System is tabulated as follows.

Table AE-2.2.2 Responsibility among Relevant Organizations for O&M of Prey Nup Polder System

Organizations	Operation and Maintenance	Financial and Administrative Management
PUC	<ul style="list-style-type: none"> - Secondary dykes (Intermediary dykes) - Canals in polders area - Related structures under normal water level operation - Boat entrance on all the dyke 	<ul style="list-style-type: none"> - ISF collection with support from local authorities
MOWRAM	<ul style="list-style-type: none"> - Primary dyke - Reconstruction and/or rehabilitation of primary hydraulic structures - Canals located downstream of the main dyke - Reconstruction or rehabilitation of all infrastructure in case of natural disaster 	<ul style="list-style-type: none"> - Financial arrangement for O&M, reconstruction and rehabilitation of facilities responsible - Supervision of FWUC activities by checking report from FWUC - Support FWUC as requested
Municipality of Sihanoukville	<ul style="list-style-type: none"> - Supervision of the implementation of sub-steering committee - Support any necessary cooperation and consultation between FWUC, MOWRAM and commune council - Publish any necessary municipal standard letters in order to ensure sustainable system management 	

Source: *Memorandum of Understanding between MOWRAM, Municipality of Sihanoukville and FWUC of Prey Nup Polders on the Sharing of Responsibility over Prey Nup Polders Management*

Organization chart of PUC is illustrated in the right figure. Principle of FWUC organization applied for Prey Nup System is democratic and accountable management. Member of Central Assembly and Central Board is selected by elections from the member farmers. Under the Executive Director, there are several sections such as:

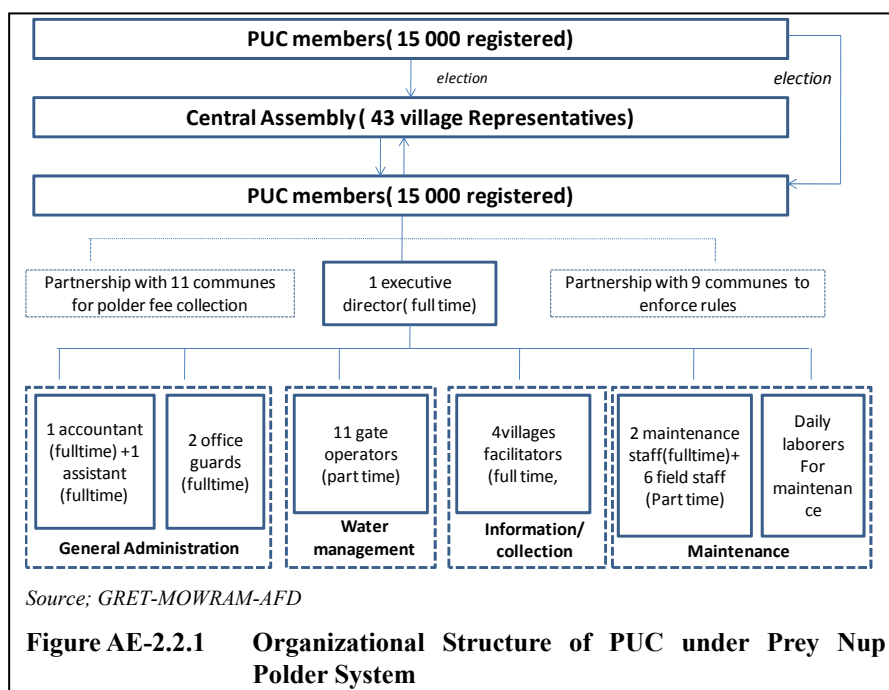


Figure AE-2.2.1 Organizational Structure of PUC under Prey Nup Polder System

(i) general administration, (ii) water management, (iii) information/collection and (iv) maintenance to carry out substantial O&M at the field level.

AE-2.3 Stung Chinit Irrigation & Rural Infrastructure Project

Project Summary

Item	Description	
Location	Province	Kampong Thom
	District/Commune	
	River basin	St. Chinit
	Distance	40 km north of Phnom Penh
Objectives	To increase agricultural production for 3,000 ha agricultural land by securing irrigation water and by constructing/rehabilitating irrigation system.	
Scope of works	1. Formulation of water User Group to manage and maintain the irrigation and drainage distribution network and improvement of farming methods (implemented by MOWRAM with AFD funding) 2. Rehabilitation and development of irrigation and drainage infrastructure (implemented by MOWRAM with AFD funding) 3. Development of access road and rural markets (implemented by MRD with ADB funding)	
Project costs	US\$ 18 million	
Fund source	ADB (loan US\$ 16 million) + AFD (grant for software)	
Implementation period	2001-2008	

Source: Review on Nationwide Irrigation Development in Cambodia 2010, JICA

This was the project targeting one of the largest single irrigation systems located in Kampong Thom Province. There are 4 components: (i) component 1, farmer community organization and extension services, (ii) component 2, irrigation infrastructure, (iii) component 3, irrigation system management and (iv) component 4, rural infrastructure, out of which component 1 and component 3 is relevant to institution and irrigation system O&M. Major activities related with institutional development and O&M improvement and lessons obtained from those are as follows:

Table AE-2.3.1 Major Activities Related to Institutional Development and O&M, Lessons Learnt and Recommendations (Stung Chinit Irrigation & Rural Infrastructure Project)

Major Activities	Result and Lessons Learnt	Recommendations
1. Support to FWUC establishment and strengthening 2. O&M system establishment by sharing responsibilities among PDOWRAM and FWUC: PDOWRAM take charge of O&M of the reservoirs, main canals and all related structures while FWUC is responsible for distribution network (secondary canals).	<ul style="list-style-type: none"> - MOWRA was somewhat reluctant to delegate as much technical authority to the PDOWRAM as was originally expected during project formulation phase. - In addition, although responsibilities of O&M of major facilities are partly transferred to PDOWRAM, capabilities and the number of staff in PDOWRAM are not necessarily sufficient to manage major structures. Therefore, facilities were partly managed by AFD support and FWUC contributions. - In addition, the Chinit Reservoir Irrigation Committee (CRIC) was formulated to coordinate between PDOWRAM and FWUC. - Commune Council was also involved in O&M particularly for the collection of ISF. 	<ul style="list-style-type: none"> - Demarcation of O&M responsibility among MOWRAM, PDOWRAM and FWUCs needs to be flexible considering capabilities in system O&M of each organization. - In addition to PDOWRAM and FWUC, involvement of reliable local administration was effective approach to establish workable organizational set-up for O&M. - Long term post-project support particularly strengthening of organizational and financial capacity is required particularly to FWUC. - Although proto-type structure is introduced in Circular No.1 on the Implementation Policy for Sustainable Irrigation Systems, more suitable organizational structure should be considered corresponding to each local condition. Involvement of local administration is often effective for sustainable O&M.
	<ul style="list-style-type: none"> - Insufficiency of coordination between hardware component and software component led to unsatisfactory among farmers. 	<ul style="list-style-type: none"> - Farmers' participation in plan and design is required as a part of software component of the Project.

Source: JICA Study Team based on Stung Chinit Irrigation and Rural Infrastructure Project, Main Lessons Learnt from Project Implementation, 2009, ADB-AFD-GRET-CEDAC

In addition, activities and outcome including assessment from the view point of quantitative figures by the technical cooperation by AFD from 2008-2009, major activities of which consisted of: (i) support to FWUC overall management and (ii) improvement of the scheme and experimentation of new method of water distribution, is tabulated as follows:

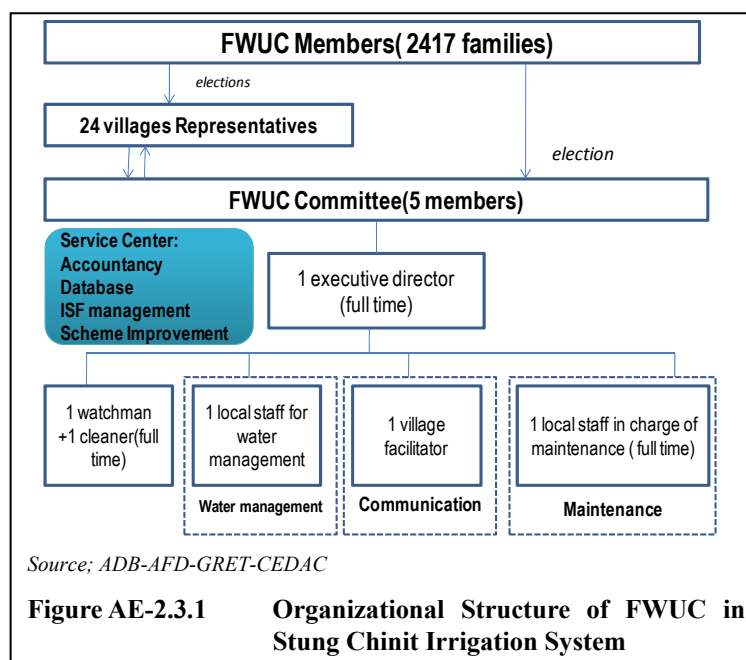
Table AE-2.3.2 AFD's Technical Cooperation and Its Outcome to enhance Institutional Set-up and O&M in Stung Chinit Irrigation & Rural Infrastructure Project

Objective	Activities	Target	Outcome
Objective 1			
Support to FWUC overall management	- Consolidation of the FWUC administrative set up	<ul style="list-style-type: none"> - Final organization chart - Update status, internal regulation - Roadmap for IMT 	<ul style="list-style-type: none"> - An final organizational chart has been drawn. - Review was made within committee. - A Letter of Agreement was signed in 2009.
	- Consolidation of the FWUC financial management	<ul style="list-style-type: none"> - Eighty percent of the ISF collected in 2009 - Financial report and budget timely prepared (March 2009) - Reliable externalized accounting mechanism 	<ul style="list-style-type: none"> - Eighty six percent collected amounting to US\$10,615. - Completed in May 2009 - Remained internal
	- Support to the collaboration with stakeholders	<ul style="list-style-type: none"> - Chinit Reservoir Irrigation Committee (CRIC) decision timely taken - Farmers' contribution to the improvement works implementation - Agricultural service implemented by PDA 	<ul style="list-style-type: none"> - Done - Contribution in each for a value of US\$12,800 - 300 ha of demonstration during the dry season

Objective	Activities	Target	Outcome
		- Build up the collaboration between FWUC and the Irrigation Service Center	- Still in progress
	- Building the FWUC capability for the overall management of the scheme	- Management of the scheme taken over by FWUC (secondary systems and below) - Budget and financial report prepared by the FWUC - FWUC director able to use simple office software - Improved leadership of the FWUC committee	- Done - Done - Done - Done (trainings completed)
	- Increase the visibility of the FWUC as the main operator of the scheme and reinforce the users' understanding of the irrigation management	- 2,600 households familiar with irrigation rules and FWUC functions	- Materials developed to enhance awareness among households under irrigation scheme
Objective 2			
Improvement of the scheme and experimentation of	- Improvement of tertiary canal network	- Rehabilitation and/or improvement of tertiary blocks based on stakeholder consultation	- Thirteen numbers of blocks improved based on consultation with villager representatives
	- Improvement of secondary networks and access	- Secondary infrastructure well maintained - Improvement of accessibility within secondary blocks	- Done based on the assessment - Improved in SC 4 and SC 5 but SC1, SC2 and SC3 still remained
	- Development of new tertiary networks	- 400 to 600 ha of additional paddy field irrigated appropriately	- 430 ha of additional paddy field provided with irrigation water

Source: Prepared by JICA Study Team based on Stung Chinit Post Project Phase and Capita;lisation, 2009, GRET

Organizational structure of FWUC by AFD's technical cooperation is illustrated in the right figure. According to ADB-AFD-GRET-CEDAC, FWUC at Stung Chinit Irrigation System is partly professionalized meaning that it involved elected farmers' representatives through an assembly of 24 villages representatives for decision making, shared by a board of 5 members as management committee, and a core team of 4 salaried staff, 15 block supervisors and 4 permanent labors. Based on the policy of gradual decrease in financial subsidy elaborated in the



Source: ADB-AFD-GRET-CEDAC

Figure AE-2.3.1 Organizational Structure of FWUC in Stung Chinit Irrigation System

Circular No.1 on “sustainable irrigation management,” AFD committed to a subsidy of US\$ 30,000 in 2009, US\$ 20,000 in 2010 and US\$ 10,000 in 2011. The organization was established in long period of consensus building. Such process would foster strong initiatives in the organization for system O&M.

AE-2.4 Northwest Irrigation Sector Project and Water Resources Management Sector Development Program

There are two major irrigation sector project and program financially supported by ADB and other donor agencies: (i) Northwest Irrigation Sector Project (NWISP), already completed, and (ii) Water Resources Management Sector Development Program (WRMSDP), currently in the initial stage of the Project as of September 2011. Project Summary of NWISP is described as follows:

Project Summary

Item	Description
Project	Northwest Irrigation Sector Project
	MOWRAM Project Code 5.21 IPP Code N-1
Project status as of March 2010	On-going since 2005 Construction of civil works for one sub-project was completed in 2009.
Location	Province Battambang, Banteay Meanchey, Pursat Siem Reap River basin St. Sreng, St. Mongkol Borey, St. Battambang, St. Moun Russey, St. Pursat, St. Baribo
Objectives	The overall objective of the Project is to support the government effort to reduce poverty in rural areas of northwest Cambodia through enhanced agricultural production, thereby alleviating food insecurity and improving farming household incomes. The immediate objective is better use of water resources and taking advantage of the potential for irrigated agriculture through (i) a comprehensive policy and strategic framework to be applied in developing water resources; (ii) better understanding, knowledge, and application of the IWRM approach in a river basin context, particularly in predicting and mitigating impacts of irrigation development on water resources and the aquatic ecosystem; (iii) improved water resource management by rehabilitating/upgrading small- to medium-scale irrigation schemes and other water management infrastructure; (iv) strengthened capacity of communities and institutions to plan, implement, manage, and maintain such infrastructure; and (v) improved agricultural support services to the beneficiary water users.
Scope of works	- Water sector institutional strengthening - Irrigation infrastructure development and management - Irrigated agricultural development
Project costs	US\$ 30.88 million (original estimate in 2003)
Fund source	ADB (loan) + AFD (grant)
Implementation period	From 2005 to 2010

Source: Review on Nationwide Irrigation Development in Cambodia 2010, JICA

Out of 39 numbers of eligible sub-projects in NWISP extended in six river basins, 11 Sub-projects have been selected and implemented as listed as follows:

Table AE-2.4.1 List of Sub-projects under NWISP

Name of Sub-project	Province	District	Water source	Irrigation Area(ha)	Project cost(US\$)
Canal No.1	Battambang	Bovel,Thmorkol	Weir	982	1,609,376
Chork Reservoir	Battambang	Moung Russie	Reservoir	1,154	1,740,723
Don Aov	Battambang, Borie	Bvel	Weir	1,100	1,637,166
Po Pi Deum	Banteay Meanchey	Mongkol Borie	Weir	1,200	999,796
Punley	Banteay Meanchey	Bakan	Reservoir	440	997,352
Anlong Svay	Pursat	Bakan	Weir	795	975,468
Krouch saeuch	Pursat	Krakor	Weir	1,000	1,499,930
Kuch Noup	Pursat	Krakor	Weir	790	830,686
Tram Mneash	Pursat	Angkor Chum	Weir	1,100	1,827,850
Kork Thnong	Siem reap	Angkor Chum	Weir	154	608,993
Ta saom	Siem reap	Not available	Weir	196	n.a.
Kandal Prek	Kandal	Not available	Not available	100	n.a.
Total				9,011	12,727,340

Source: ADB

Major institution-related activities and those lessons obtained from NWISP are summarized in the following table:

Table AE-2.4.2 Major Activities Related to Institutional Development and O&M, Lessons Learnt and Recommendations (NWISP)

Major Activities	Result and Lessons Learnt	Recommendations
1. Institutional strengthening in the water sector: (i) water resources policy and strategic framework, (ii) regulatory framework for IMT and (iii) integrated water resource management (IWRM) in river basins 2. FWUC strengthening and O&M improvement: (i) PDOWRAM staff strengthening, (ii) FWUCs and WUGs establishment, in irrigation system management, water management etc. 3. Sub-decrees drafted from above-activities: (i) water allocation and licensing, (ii) river basin management, (iii) establishment of farmer water user communities (FWUCs), and (iv) water quality	<ul style="list-style-type: none"> - This is one of first trials implemented by Project Implementation Unit (PIU) at provincial level, however, capability of PDOWRAM is not necessarily sufficient so that project implementation delayed as compared to original schedule. - Difficulties were observed for effective capacity development k - Although sub-decrees are drafted under the Project, they are still under approval process 	<ul style="list-style-type: none"> - Capability of relevant organization and quantity on technical assistance necessary for project implementation needs to be appropriately assessed during project formulation. - TOR of PIU was unclear which stagnated smooth project implementation. It should be clearly prepared during project preparatory phase based on the consensus with stakeholders.

Source: JICA Study Team based on Report and Recommendation of the President to the Board of Directors on a Proposed Loan to the Kingdom of Cambodia for the Northwest Irrigation Sector Project

On the basis of lessons obtained from NWISP, WRMSDP will be implemented with joint financial assistance from ADB (loan + grant) and OPEC Fund for International Development focusing on 3 major outputs: (i) output A, enhanced capacity for sustainable water resources management, (ii) output B, enhanced capacity of MOWRAM to manage and deliver irrigation services and (iii) output C, sustainable rehabilitation of small- and medium-scale irrigation schemes in the Tonle Sap basin.

AE-2.5 Technical Service Centre for Irrigation System Project Phase-2

Project Summary

Item	Description
Project	Technical Service Centre for Irrigation System Project Phase-2
	MOWRAM Project Code - IPP Code -
Project status as of March 2010	Completed in 2009 Phase-3 is under implementation since 2009
Location	Province Phnom Penh / Pursat / Kandal / Takeo River basin St. Pursat, St. Prek Thnot
Objectives	The Project objective is: (i) to improve the technical capacity of MOWRAM and PDOWRAM, (ii) to enhance farmers' knowledge, who participate in the Project activities, in water management at tertiary canal level.
Scope of works	According to the evaluation report, the following outputs are expected from the Project activities. Output 1 - Establish the training system - Set up the technical manual - Manage the technical information Output 2 - The technical capacity of the engineers and technicians in MOWRAM and PDOWRAM is well trained through the trainings at TSC and on-the-job-training (OJT) at Model Site and Pilot Sites. Output 3 - The trained engineers and technicians in PDOWRAM construct the tertiary canals, which make it possible for farmers to easily access irrigation water. - Farmers start to conduct water management activities at the tertiary canals in cooperation with PDOWRAM.
Project costs	Long-term Expert: 111 M/M, Short-term Expert: 35.6 M/M (1,067 M/D)
Fund source	JICA
Implementation period	From 2006 to 2009

Source: Evaluation Report, 2009, JICA

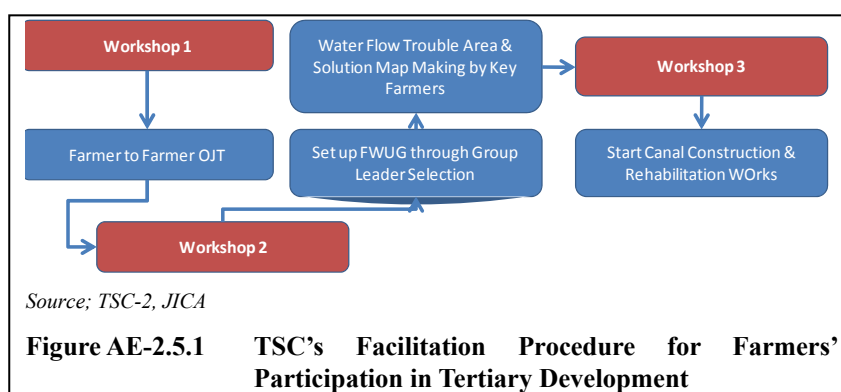
Evaluation report jointly prepared by MOWRAM and JICA shows the following achievement and lessons obtained from the Project activities.

Table AE-2.5.1 Major Activities Related to Institutional Development and O&M, Lessons Learnt and Recommendations (TSC-2)

Major Activities	Result and Lessons Learnt	Recommendations
1.1.1 Development of training curricula 1.1.2 Establishment of systemized training materials 1.2.1 Make a technical manual list 1.2.2 Compile technical manuals 1.2.3 Translate technical manuals into Khmer 1.3.1 Collect and organize technical information in irrigation 1.3.2 Provide technical information 2.1 Conduct the trainings at TSC for the engineers and technicians in MOWRAM and PDOWRAM 2.2 Conduct OJT at Model Site and Pilot Sites for the engineers and technicians in MOWRAM and PDOWRAM 3.1 Provide technical assistance on the construction of tertiary canals at Pilot Site 3.2 Provide technical assistance on farmers' participatory water management at Pilot Sites	Corresponding to project purpose, the following achievements are obtained. - In evaluation of the 32 training courses conducted by the Project, an average of the 70 % of the participants achieved the designated target in the curricula. - Ninety four percents of trainees attended in the training course were satisfied with the training course of TSC. - Ten FWUCs at model site and pilot sites have been organized and in operation. - Water management activities such as planning meeting and canal dredging were implemented in pilot sites with a total number of 411 farmer participants.	Two issues are recommended for the future (after the completion of the Project). - Efforts for realization of the Road Map for the institutionalization of TSC TSC has formulated the Road Map for the institutionalization of TSC. On this basis, TSC is expected to function: (i) to provide technical training to the technical staff of MOWRAM and PDOWRAM, (ii) to conduct experiments and researches in water resources, irrigation and meteorology sector, (iii) to award the academic education with degree programs and (iv) to provide technical assistance to the irrigation projects by MOWRAM and PDOWRAM. In order to do so, necessary institutional coordination with relevant organizations as well as budgetary arrangement is required. - Human resource development of TSC personnel Further effort to develop capability of TSC staff is inevitable to realize institutionalization as mentioned above. - Utilization of the experiences and outputs of the Project by PDOWRAM The manuals prepared through the Project are practical guideline for field-use, therefore, it is recommended that they will be widely utilized in other projects.

Source: Evaluation Report, 2009, JICA (as of December 3rd 2009)

As one of the salient features in relation to institutional development, TSC-2 has developed methodology to demonstrate tertiary canal construction through farmers' participation, general procedure of which is shown in the right figure:



In addition, TSC-2 has developed varieties of training curricula related with irrigation planning, construction management, O&M of irrigation facilities etc. as tabulated as follows. Such outputs need to be disseminated and also effectively utilized for institutional development activities in the future projects.

Table AE-2.5.2 List of Training Programs Conducted during TSC-2

No.	Date (Start)	Date (finish)	Training course title	No. of participant	No. of OJT Participants
1	29-Jan-07	2-Feb-07	Discharge measurement I	20	20
2	2-Feb-07	9-Feb-07	Meteorology& crop water requirement I	20	20
3	13-Feb-07	27-Feb-07	Irrigation & water resource Management plan by GIS 1	10	-
4	5-Mar-07	16-Mar-07	Basic survey I	19	19
5	19-Mar-07	23-Mar-07	Supervision on contraction site	19	19
6	23-Apr-07	27-Apr-07	Participatory of farmers for sustainable irrigation system management	19	19
7	16-Jul-07	27-Jul-07	Irrigation and water management plan by GIS2	10	-
8	30-Jul-07	10-Aug-07	Basic survey II	20	20
9	20-Aug-07	24-Aug-07	Training for irrigation system design	20	
10	3-Sep-07	7-Sep-07	Discharge Measurement II	20	20
11	10-Sep-07	14-Sep-07	Meteorology& crop water requirement II	19	19
12	17-Sep-07	21-Sep-07	Design and drawing by Auto CAD	10	-
13	22-Oct-07	26-Oct-07	Participatory of farmers for sustainable irrigation system management	14	14
14	1-Nov-07	8-Nov-07	Construction management	20	20
15	13-Nov-07	16-Nov-07	data Processing of Total Station	10	-
16	3-Dec-07	7-Dec-07	Design and drawing for irrigation canal and canal structure by Auto CAD	10	-
17	14-Jan-08	18-Jan-08	Operation and maintenance irrigation facilities	8	8
18					
19	2-Feb-08	7-May-08	Topographic and rout survey	24	24
20					
21	7-Apr-08 21-Apr-08	9-Apr-08 22-Apr-08	Operation and maintenance irrigation facilities	9	9
22	5-May-08	9-May-08	Participatory of farmers for sustainable irrigation system management	19	19
23	26-May-08	6-Jun-08	Design Drawing & cost estimation of irriagtion canal and Structure by Excel and Auto CAD	14	-
24	23-Jun-08	27-Jun-08	Irrigation Planning	20	-
25	7-Jun-08	11-Jul-08	Construction management	20	20
26	11-Aug-08	15-Aug-08	Operation and maintenance irrigation facilities	19	19
27	18-Aug-08	22-Aug-08	Structural design and calculation for Irrigation Facilities	20	-
28	25-Aug-08	19-Sep-08	Irrigation Planning by GIS	13	-
29					
30	5-Oct-08	24-Oct-08	Discharge measurement, Meteorology, Crop water requirement, & Irrigation planning	57	57
31					
32	3-Nov-08	7-Nov-08	Participatory of farmers for sustainable irrigation system management	19	19
				502	365

Source: Evaluation Report, 2009, JICA (as of December 3rd 2009)

CHAPTER AE-3 INSTITUTIONS CONCERNED FOR THE PROJECT

AE-3.1 Ministry of Water Resources and Meteorology

(1) History and Organization Structure

MOWRAM was independently of MAFF in 1999 under the Sub-degree 58 with the mission of development and management of water resources of the country in an effective, equitable and sustainable manner by integration of river basin water management, pro-poor management of water resources, water management facilities, water-related hazards and land resources. Figure AE-3.1.1 shows the organization structure of MOWRAM as of June 2011. MOWRAM is composed of seven technical departments, three administrative departments, Technical Service Center for Irrigation and Meteorology (TSC) and twenty four Provincial Department of Water Resources and Meteorology (PDOWRAMs). There are five categories in staff qualification; (i) engineer, (ii) technician, (iii) vocational staff, (iv) qualified staff and (v) non-qualified staff. Total number of staff is 666 at central level and 623 at provincial level as of March 2011.

Table AE-3.1.1 Number of Categorized Staff in MOWRAM

Level	Engineer	Technician	Vocational	Qualified	Non-qualified	Total
Central	330	160	29	11	136	666
Provincial	97	120	69	23	314	623

Source: Government Officer Statistic, MOWRAM March 31, 2011

(2) Duties and Responsibilities

The duties and responsibilities imposed on MOWRAM are quoted from MOWRAM's guide paper:

- Identify policy and strategy development of water resources, to business development, maintenance and preservation in accordance with the RGC's policies.
- Study and research potential water resources including surface water, ground water and weather, to confirm technical field fitting to national frame work.
- Develop the short, medium and long term plan for business development and preservation on water resources and meteorology to serve national economic for alternative livelihood of urban and rural people.
- Manage and control all business making on water resources directly and indirectly, and minimize the disaster.
- Develop the regulation, legislation and other documents to ensure the management and monitoring on the implementation of water resources.
- Collect and document information on meteorology and hydrology, and use them to serve national and international related sectors for national benefits.
- If necessary, provide support and technical advice to stakeholders such as private sector, NGOs, community and people to appropriately correct/better balance on water resources business making.
- Widen and introduce more model technology in order to better train and propagate widely it.
- Participate in executing all works related to Mekong River Basin in accordance with duties and responsibilities of MOWRAM.
- Strengthen and promote national and international cooperation on water resources and meteorology.

(3) Budget and Expenditures of MOWRAM

The annual budgets and actual expenditures of MOWRAM are shown in Table AE-3.1.2.

Table AE-3.1.2 Summary of Budget and Expenditures of MOWRAM

(Unit: million Riel)

Item	2007	2008	2009	2010	2011
Budget (Thousand US\$)**	13,210 3,210	14,327 3,482	18,756 4,558	90,366* 21,960	113,954* 27,692
Actual Expenditure (Thousand US\$)**	12,392 3,011	15,650 3,803	17,268 4,196	88,316* 21,462	n.a.

Source: Department of Finance, MOWRAM

*: including investment budget for irrigation system (70million Riel in 2010 and 90 million Riel in 2011)

**: 1US\$=4115 Riel

As can be seen in the above table, the budget even excluding investment budget for irrigation system has been increased with considerable high rate.

(4) Demarcation of role and responsibility of Ministry of Water Resources and Meteorology and Provincial Department of Water Resources and Meteorology

MOWRAM has a Provincial Department of Water Resources and Meteorology (PDOWRAM) in the Provinces, each of which subordinates district offices in each district. Basic demarcation of role and responsibility of MOWRAM and PDOWRAM for irrigation development and O&M as well as organization for FWUC s is as shown below.

Table AE-3.1.3 Demarcation of Roles and Responsibility

Activity	Small scale (up to 200 ha)	Medium scale (200 ha to 5000 ha)	Large scale (Above 5000 ha)
Planning and Survey	PDOWRAM	MOWRAM & PDOWRAM	MOWRAM & PDOWRAM
Construction and Repair	FWUC	MOWRAM & PDOWRAM	MOWRAM
O&M	FWUC	PDOWRAM & FWUC	MOWRAM & FWUC
Formation of FWUCs	PDOWRAM	MOWRAM & PDOWRAM	MOWRAM

Source: JICA Survey Team

MOWRAM involves development and rehabilitation as well as formation of FWUCs in medium or large scale development program, while PDOWRAM deals mainly small scale schemes and minor repairs, as well as O&M of medium of major facilities in medium scale schemes.

AE-3.2 Farmer Water Users Community

As having been introduced above, in 1999, RGC issued Circular No.1 on Implementation Policy for Sustainable Irrigation Systems. The Circular promulgates the following six principles of reform:

- Farmer Water Users Community (FWUC) will be a formal legal entity recognized by government and civil society.
- Irrigation system development will be done only at the request of FWUC and FWUC will participate in all aspects of scheme development.
- Water users will be obligated to pay for the cost of routine O&M and develop a fund to pay for emergency repairs.
- Irrigation systems will be maintained and improved over time, in partnership between FWUC and government.
- Water delivery will be arranged by FWUC in an equitable and reliable manner.
- MOWRAM will be responsible to provide technical and managerial support, monitoring and evaluation and other support as needed.

In June 2000, MOWRAM issued Prakas 306, which promotes the Policy for Sustainability of O&M of Irrigation Systems, elaborating the new Participatory Irrigation Management and Development (PIMD) policy to be implemented by MOWRAM. The Policy describes the structure and functions of FWUC and lower-level farmer water users group (FWUG), basis for calculating the Irrigation Service Fee (ISF) and the responsibility of government to provide training and extension, monitoring and evaluation, environmental assessment and agency human resource development. MOWRAM also issued a brief document that explains eight steps for organizing and establishing FWUC. MOWRAM is currently finalizing a sub degree on establishing FWUC. This FWUC sub degree follows deeply Circular No.1 and Prakas 306, especially for the organization and structure, FWUC Statute, establishment procedures and also roles and responsibilities, and financial support from RGC. The main objective of the sub degree is to provide FWUC with legal status. PIMD specifies the essential rights and obligations of FWUC as follows:

Table AE-3.2.1 Rights and Obligations of FWUC

Item	Description
Right	<ul style="list-style-type: none"> - Clear water use rights that are consistent with government regulations, FWUC interests and capacity of local water control structures - Protection of FWUC against irrigation land use conversion within FWUC area - Right to federate up to the main scheme level - Authority to require water users to become members of FWUC or pay for water service - Right to make and enforce rules - Right to choose Irrigation Service Providers and hire or release O&M staff - Right to make and implement the Irrigation Service Plan and budget - Right to set, collect and use funds from an ISF - Right to make legal contracts and own property - Right to determine cropping patterns by consensus among water users
Obligations	<ul style="list-style-type: none"> - Obligation to comply with government policy and regulations for the water and agriculture sectors - Obligation to use and preserve irrigation system infrastructure consistent with transfer agreements - Obligation to function according to agreed principles of democratic participation, transparency, honesty and interest in the public welfare - Obligation to protect the environment

Source: Module 2 on Participatory Irrigation Management and Development Policy, Legal and Institutional Framework

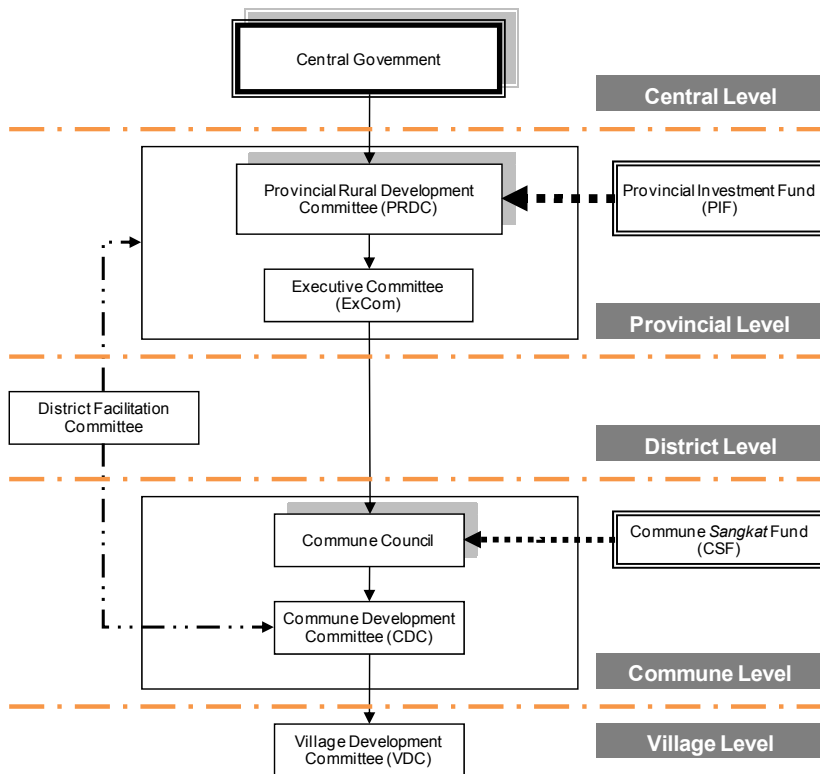
According to MOWRAM, although detail provincial breakdown data is not available, there are some 328 FWUCs established nationally as of the end of 2007, of which total of 144 have been registered by MOWRAM³. Depending upon the source of project support, some FWUCs have been registered at provincial level only. In general, FWUC is composed of one chief, two vice chiefs, one accountant and all leaders of FWUGs. FWUG consists of one group leader and one assistant.

³ Program Design Document for Strategy for Agriculture and Water 2010-2013 (Draft)

AE-3.3 Other Rural Organizations

(1) Linkage of Rural Public Administration

The linkage of rural administration under the provincial to the village level is illustrated in the right figure. After the initiatives of decentralization particularly supported by SEILA Program, there are two principal decentralized fund sources at provincial and commune levels: (i) Provincial Investment Fund (PIF) and (ii) Commune Sangkat Fund (CSF). Among others, two organizations, Provincial Rural Development Committee (PRDC) and Commune Council (CC), which are influential to decentralized development including irrigation development, O&M etc. at the local level, are described as follows:



Source: JICA Study Team

Figure AE-3.3.1 Linkage of Rural Public Administration

(2) Provincial Rural Development Committee (PRDC)

PRDC was originally established under the Decision on the Establishment of the Provincial Rural Development Committee. After the decentralized mechanism is facilitated by SEILA program, PIF is allocated directly to PRDC to correspond to rural needs including irrigation system development and rehabilitation. Executive committee (ExCom) is the implementing unit through coordinating with Provincial Office of relevant Ministries.

(3) Commune Council (CC)

In the country, there are 1,621 communes and *sangkat*, as the lowest administrative organization headed by a commune chief, each of which has commune council. Commune and *sangkats* Council elections commenced in 2002. Council chief and members are elected every 5 years. Each council has approximately 7 to 15 members which is depending upon the size of communes. Commune councils have their own budget including tax and non-tax revenues. In addition, also supported by SEILA program, as similar to PIF, CSF is directly allocated to commune council to carry out economic and social development at commune level including rural infrastructure maintenance at commune level. In relation to irrigation sector, as one of the important activities, “*maintain security and public order*”,⁴ CC plays an important role in: (i) discussion on land acquisition, (ii) monitoring and evaluation, (iii) discussion on O&M of village road, and (iv) development and maintenance of irrigation facilities including tertiary canal systems.

⁴ Proposed Asian Development Fund Grant and Technical Assistance Grant Kingdom of Cambodia: Commune Council Development Project 2, 2006, ADB

CHAPTER AE-4 SOUTHWEST PHNOM PEHN IRRIGATION AND DRAINAGE REHABILITATION AND IMPROVEMENT PROJECT

AE-4.1 General

Southwest Phnom Penh Irrigation and Drainage Rehabilitation and Improvement Project (SPPIDRIP) consists of:

- Roleang Chrey Headworks Rehabilitation Sub-project (RCHRSP) in Kampong Speu Province,
- Upper Slakou Irrigation System Rehabilitation Sub-project (USISRSP) in Takeo Province,
- Kandal Stung-Bati Irrigation System Rehabilitation Sub-project (KSBISRSP),
- Main Canal 35 Rehabilitation Sub-project (MC35RSP),
- Srass Prambai Water Recession Rehabilitation Sub-project (SPWRRSP) and
- Daun Pue Irrigation System Rehabilitation Sub-project (DPISRSP).

This Chapter describes the present conditions of relevant organizations and their activities related with irrigation O&M under each Sub-project, proposed O&M plan and soft component to enhance O&M capability of stakeholders.

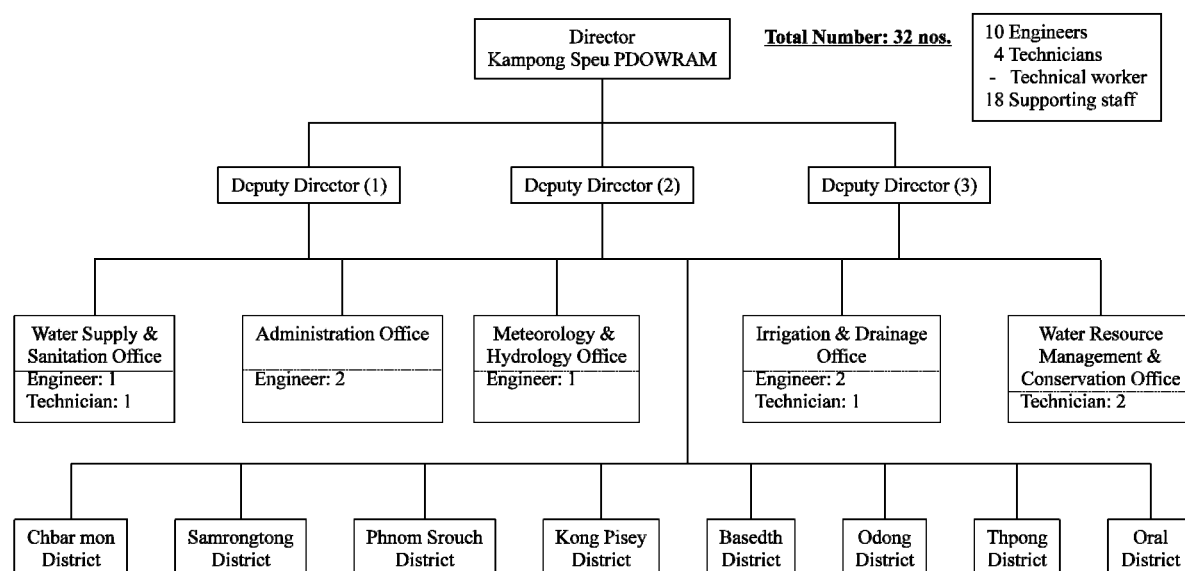
AE-4.2 Roleang Chrey Headworks Rehabilitation Sub-project

Roleang Chrey Headworks is located in Kampong Speu Province. Kampong Speu PDOWRAM is mainly responsible for its O&M. In this section, organization and its activities of Kampong Speu PDOWRAM and FWUCs under the command area of Roleang Chrey Headworks are given including present institutional strengthening program and constraints.

AE-4.2.1 Kampong Speu Provincial Department of Water Resources and Meteorology

(1) Organization

Kampong Speu PDOWRAM is located in almost center of the upstream part of the Roleang Chrey Irrigation System, about 10 km from the Roleang Chrey Regulator. PDWORAM has five sections of (i) administration and personal, (ii) meteorology and hydrology, (iii) irrigated agriculture, (iv) water resources protection management, and (v) water supply and sanitation, and manages 8 district offices. The staff of the PDOWRAM as of 2011 consists of one Chief of Department (Director), three Vice-chief of Department, nine technical staff and 19 administrative staff, total of which are 29 males and 3 females. Organizational structure of PDOWRAM Kampong Speu Province is illustrated as follows:



Source: PDOWRAM Kampong Speu Province

Figure AE-4.2.1.1 Organization of Kampong Speu PDOWRAM

Major technical missions of the provincial department are to (i) prepare development plans, (ii) research and observe natural disasters, (iii) collect meteorological and hydrological data, (iv) implement operation and maintenance of irrigation systems, (v) organize and train FWUC, and (vi) study, plan, design and construct small scale projects.

(2) Operation and Maintenance of Roleang Chrey Headworks

Operation of Roleang Chrey Headworks is carried out intensively by the gate keeper employed by PDOWRAM Kampong Speu who is stationed at the site. Major O&M activities for the facilities are tabulated as follows:

Table AE-4.2.1.1 Major O&M Activities for Roleang Chrey Headworks by Kampong Speu PDOWRAM

Item	Activities
Water Level Observation	- Water level is checked and recorded for three times a day (7:00, 12:00 and 19:00).
Gate Operation	- After observation, gate keeper report to PDOWRAM for instruction. - In case of flooding (more than 7.37 m in water level of Prek Thnot River measured at the upstream of Roleang Chrey Headworks), the operator opens gates for releasing water to the downstream.
Water Management	- Through coordination among Kampong Speu, Kandal, Takeo PDOWRAM and Phnom Penh Municipality, water distribution schedule is prepared. And the gates operation is carried out on this basis. - Discharge measurement for NMC and SMC is done by staff gauges installed at the intakes.
Maintenance Works	- Major maintenance work is carried out by MOWRAM based on the request from Kampong Speu PDOWRAM. - Due to budgetary constraints, greasing is only applied and no maintenance work is provided. - Last major repair of the gates was in 2006 to replace cables of automatic gates (7 nos.).

Source: JICA Survey Team based on Field Interview

(3) Considerations Necessary for Software Component Implementation

The result obtained through the interview survey to Kampong Speu PDOWRAM disclosed the following activities and/or constraints are identified and considerations are to be made for the implementation of software component program under SPPIDRIP:

Table AE-4.2.1.2 Consideration Necessary for the Implementation Software Component (Kampong Speu PDOWRAM)

Item	Present Conditions	Considerations
O&M Activities		
O&M of Facilities	<ul style="list-style-type: none"> - Roleang Chrey Headworks and main canals (NMC and SMC) are maintained by PDOWRAM in accordance with the regulation of MOWRAM. - Although routine maintenance and minor repair is carried out by PDOWRAM, major rehabilitation works are conducted by MOWRAM on the basis of PDOWRAM's request. - Major investment of facilities are as follows: (i) rehabilitation of SMC in 2002, (ii) Rehabilitation of secondary canal in 2003 through Food-for-Work Program under World Food Program and Commune Fund, (iii) Provision of generators for the operation of Roleang Chrey Headworks in 2007-2008 by JICA. 	<ul style="list-style-type: none"> - Timely allocation of necessary budget for repairing of facilities and cost of operation by PDOWRAM staff needs to be conducted through close communication with MOWRAM and PDOWRAM. - Rehabilitation works carried out with the assistance for non-irrigation-related activities are not necessarily recognized by PDOWRAM. Coordination among development partners is necessary to be facilitated.
Frequency	- Frequency of O&M: twice in general (dry and rainy season)	
Others	- There are 15 portable pumps in number in PDOWRAM Kampong Speu (250 m ³ /h). During drought period, service to pump up river water for irrigation is provided by PDOWRAM based on farmers' request. Such service is free of charge.	
Capacity Development Program and Technical Support		
Training Program	<ul style="list-style-type: none"> - Regular trainings are not provided but they are carried out in project basis. - The training programs recently conducted are as follows (i) water management by PRASAC, (ii) FWUC formation and strengthening by SEILA, (iii) irrigation water requirement by TSC and (iv) remote sensing by TSC (JICA). 	- Combination of theoretical and practical training program would be useful to materialize physical accomplishment at the field level.
Training Programs the staffs are interested in	<ul style="list-style-type: none"> - Meteo-hydrological observation and analysis using collected data - Weather and water demand forecasting⁵ - Water management including water saving irrigation 	
Intension of PDOWRAM		
Constraints	<ul style="list-style-type: none"> - Illegal off-takes are widely observed in Kampong Speu Province and they cannot be comprehensively managed only by PDOWRAM themselves. Rights and duties of FWUC including punishment needs to be regularized based on Sub-decree on FWUC, which is under approval process at the Council for Minister. - Insufficient budget in both field operation and staff salary is permanent constraints to carry out activities at the field level 	<ul style="list-style-type: none"> - Approval of relevant sub-decree is the responsibility of the government and it cannot be covered by the software component. However, awareness raising of farmers as well as FWUCs needs to be considered in the software component. - In order to alleviate problems occurred due to insufficiency in budget, external funded projects provide MOWRAM and PDOWRAM salary supplements or allowances. Such practice would be temporary and expedient measure, however, it should be considered in the project implementation to achieve successful outputs in the limited period of time.
Future Plan	<ul style="list-style-type: none"> - At present, participation of FWUC is insufficient, however, joint O&M mechanism needs to be established among PDOWRAM and FWUCs at the field level. - Cropping intensity will increase to 200 % (although it is based upon water availability). - Detail plan is under preparation, however, organizational restructuring is in consideration to strengthen water management and maintenance of facilities by establishment of two task force at the provincial level: (i) water management team and (ii) rehabilitation team. 	

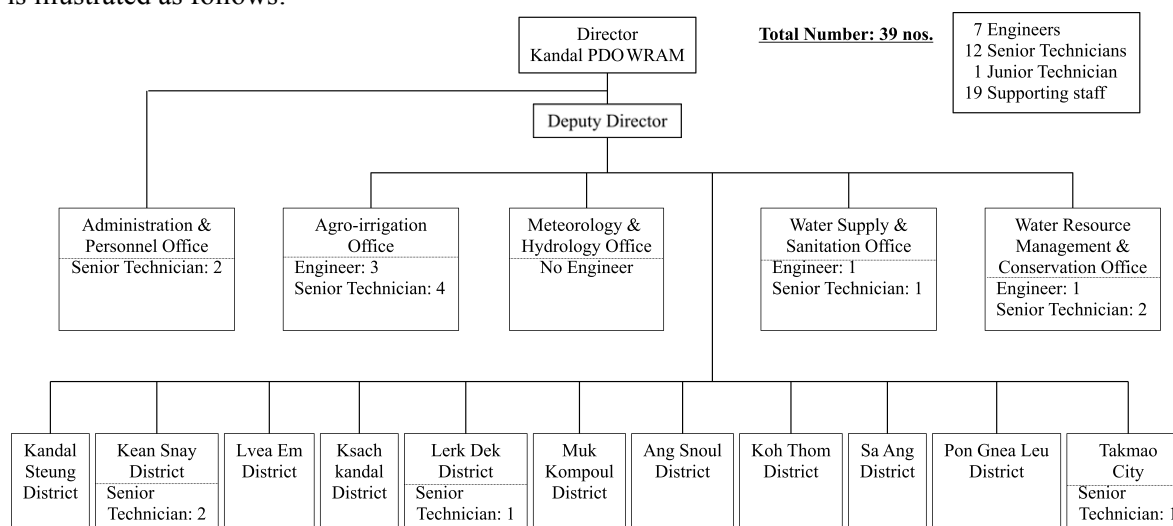
Source: JICA Survey Team based on Field Interview

⁵ Since the Project, Farmer Led Agricultural Innovation for Resilience (FLAIR) is currently implemented in Kampong Speu Province with the support of Oxfam by considering climate change, staffs in PDOWRAM Kampong Speu are interested in this kind of topics for training program.

AE-4.2.2 Kandal Provincial Department of Water Resources and Meteorology

(1) Organization

Kandal PDOWRAM consists of five technical and administrative sections as similar to that in Kampong Speu Province: (i) administration & personnel, (ii) irrigated-agriculture, (iii) meteorology and hydrology, (iv) water supply and sanitation and (v) water resource management and conservation, under which, in addition, there are 11 district offices. Organizational structure of Kandal PDOWRAM is illustrated as follows:



Source: PDOWRAM Kandal Province

Figure AE-4.2.2.1 Organization of Kandal PDOWRAM

There are 40 numbers of staff, out of which 7 staff are categorize as engineer. Insufficiency of district level staff would be one of the issues as there are no staff allocated to Pon gnea leu district.

(2) Considerations Necessary for Software Component Implementation

Kandal PDOWRAM is one of the administrative bodies relevant to water management of Roleang Chrey Headworks. As explained above, operation of Roleang Chrey Headworks is carried out based on the discussion among Kampong Speu, Takeo, Kandal Provinces and Phnom Penh Municipality. General activities related with O&M of irrigation systems in the province and capacity development and technical support, and intension of PDOWRAM based on interview survey are tabulated as follows:

Table AE-4.2.2.1 Consideration Necessary for the Implementation Software Component (Kandal PDOWRAM)

Item	Present Conditions	Considerations
O&M Activities		
O&M of Facilities	<ul style="list-style-type: none"> - PDOWRAM supplies farmers with pumps, which are originally provided by SEILA program, based their request (small 7 nos.: 150m³/h, large 5 nos.: 1,000 m³/h). - FWUCs manage those pumps with the support of District staff under PDOWRAM (ISF: Riel 40,000/ha/cropping season). 	<ul style="list-style-type: none"> - Provision of pumps would be special cases and such practice cannot be applicable to all the areas. Such equipment provision would be clearly regularized.
Capacity Development Program and Technical Support		
Training Program	<ul style="list-style-type: none"> By TSC-2 (JICA). - O&M of irrigation facilities - Participatory Irrigation Management and Development (PIMD) - Irrigation water requirement - Construction management By FAO <ul style="list-style-type: none"> - O&M of facilities 	<ul style="list-style-type: none"> - Training programs have been organized by project-basis particularly by TSC (JICA). Since the role of Kandal PDOWRAM for Roleang Chrey Headworks is coordination with relevant provinces and municipality for gate operation, program to facilitate such coordination would be included in

Item	Present Conditions	Considerations
Training Programs the staffs are interested in	<ul style="list-style-type: none"> - FWUC support - O&M of facilities - Land Improvement District (LID) of Japan for organizational improvement (as a reference) - Remote sensing - Geographic Information System (GIS) - Financial management 	the software component activities.
Intension of PDOWRAM		
Constraints	<ul style="list-style-type: none"> - Insufficient capability of district staff to conduct field activities (O&M, conflict management etc.) - Insufficient budget in PDOWRAM to carry out major repairs and rehabilitation of irrigation facilities 	- Insufficient budget is one of the common constraints in PDOWRAM. Budget arrangement by MOWRAM is required in timely manner for field level work by PDOWRAM staff.
Future Plan	<ul style="list-style-type: none"> - Enhancement of staff capability in irrigation system O&M and water management - Facilitation of FWUCs in PIMD 	

Source: JICA Survey Team based on Field Interview

AE-4.2.3 Farmer Water Users Community

(1) General Information

As for FWUC, it was established in accordance with the FWUC statute issued in June 2000. In Kampong Speu and Kandal Provinces, it was reported that 25 FWUCs were established in the area of M/P, but none of them are officially registered. Most of FWUCs are generally inactive, primarily due to lack of functional irrigation systems. This situation has not been changed since the M/P Stage in 2008. Under the Roleang Chrey Irrigation System, six numbers of FWUCs exist at present as of 2011 as shown in the table below and institutional overview of those FWUCs is summarized in Table AE-4.2.3.2.

Table AE-4.2.3.1 Basic Information on FWUC in Roleang Chrey Irrigation System

No.	Community Name	Location		Nos. of village	Participated Family No.	Member		Irrigated area (ha)
		Commune	District			Total	Female	
1	N-6	Tropaeng Korng	Samrong Torng	8	427	2,259	1,310	148.29
2	North Roleang Chrey Main Canal	Tang Kroch, Chbar morn, Rokarthom, Vor sor, Tropaeng korng, Sambo	Chba Morn and Samrongtong	52	3,222	16,625	7,305	1,639.00
3	South Roleang Chrey main canal	Karheng, Kandorl dom, Svay krovan, Roleang Chek, Rolaeng kreul Sen Dey, Rokar koh, Veal	Samrong Torng and Kong Pisey	22	2,262	10,068	8,086	1,036.51
4	Beung Arch Ka Ek	Rolaeng Chork	Samrong Tong	12	570	3,015	2,045	245.20
5	Phum Roung	Svay Krour Van	Chbar Morn	11	439	2,402	1,329	211.19
6	O'veng	Ka Heng	Samrong Tong	23	2,432	7,036	4,382	976.00
	Total		4 districts	128	9,352	41,405	24,457	4,256.00

Source: PDOWRAM

Out of 6 FWUCs in number as introduced in the above table, Irrigated Agriculture On-farm Technology Improvement Pilot Project was carried out during M/P. In addition, this area is selected as one of the pilot sites in TSC-3 covering 200 ha. MOWRAM is currently undertaking the nationwide program for formation of FWUC under the FAO EU Food Facility Project⁶, in line with the government policy and strategy on FUWC. Under this project, the first stage was completed and the guidelines were prepared, of which the second stage is planned to be implemented by Kampong Speu PDOWRAM.

Meanwhile FO was defined in the Status of FOs in Cambodia, MAFF 1999 as; “An organization which is a collective entity of farmers in a village or in a number of contiguous villages who have come

⁶ Refer to FAO EU Food Facility Project, Organization of farmer Water User Communities, June 2011 (in Khmer language)

together for an economic activity related to agriculture”. Under the coordination of MAFF, there are four FOs; Agricultural Cooperatives, Community Forestry Communities, Fishery Communities, and VAHW Associations. According to the report from PDA Kampong Speu and Kandal Provinces, there are 3 agricultural cooperatives in the Target Area. One is in Preah Nipean Commune, one is in Prey Nheat Commune, and the last is in Roleang Kruek Commune of Kampong Speu Province. This situation has not been changed since the M/P Stage in 2008.

(2) Constraints and Needs of FWUCs

As having been introduced, basic information obtained through interview survey is shown in Table AE-4.2.3.2. Level and quantity of external support previously provided differs among 6 FWUCs surveyed. Among others, FWUC O’veng was originally established in 2001. It was selected as the site for Irrigated Agriculture On-farm Technology Improvement Pilot Project under the Study on Comprehensive Agricultural Development of Prek thnot River Basin (JICA), activities of which consists of: (i) preliminary land holding map preparation practice, (ii) water use map preparation practice, (iii) water loss identification and reduction practice, (iv) FWUC administration practice, (v) FWUC sub-group establishment practice, (vi) proper irrigation water use education practice etc. In addition, FWUC Phum Rong was financially supported by the World Bank under the Flood Emergency Rehabilitation Project (FERP) to strengthen the group in 2005. Constraints and needs recognized by FWUCs are summarized as follows, which needs to be considered for the implementation of the software component programs under SPPIDRIP

Table AE-4.2.3.3 Constraints and Needs recognized by FWUCs in Kampong Speu Province

Item	Constraints	Needs	Training Programs in which Group is interested
Hardware Aspect	<ul style="list-style-type: none"> - Insufficient tertiary canals and those related structures - Deterioration of secondary and tertiary canals and those related structures 	<ul style="list-style-type: none"> - Rehabilitation of secondary canals and those related structures - New development of tertiary canals and those related structures - Construction of FWUC office 	<ul style="list-style-type: none"> - O&M of irrigation facilities - Water management - Administrative management for the group - Conflict management among group members - Awareness raising of the group members
Software Aspect	<ul style="list-style-type: none"> - Difficulty in water management due to conflict among member farmers - Insufficient awareness among farmers for the importance of irrigation water - Insufficient farmers’ participation in O&M of facilities and water management - Conflict among FWUC members and non-members 	<ul style="list-style-type: none"> - Strengthen organizational capacity as well as individual farmers in O&M of facilities and irrigation water management - Encouragement of farmers to participate in group work - Awareness raising on the importance of irrigation water and O&M of irrigation facilities - Establishment of new group by younger generation 	<ul style="list-style-type: none"> - Leadership training - Farming techniques (rice and other crops)

Source: JICA Survey Team based on Field Interview

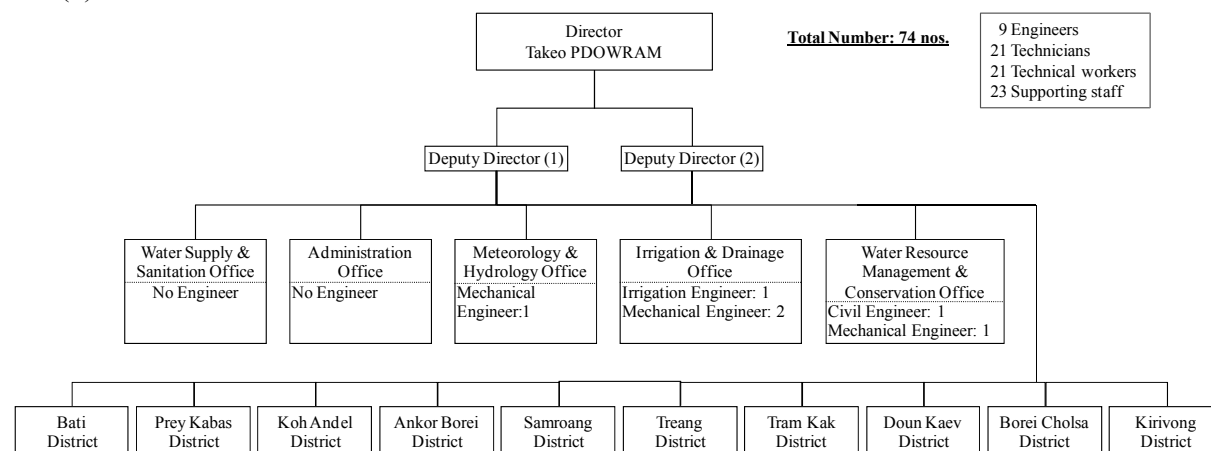
AE-4.3 Upper Slakou Irrigation System Rehabilitation Sub-project

AE-4.3.1 Takeo Provincial Department of Water Resources and Meteorology

(1) Organization

Takeo PDOWRAM headed by the Director, has five sectional offices and 10 district offices as shown in the following figure. There are five offices consisting of: (i) Irrigation and drainage office mainly for maintenance of the existing irrigation facilities, (ii) Water supply office for checking water quality

and resources for domestic water supply, (iii) Hydrology and meteorology office for observing and recording the concerned data, (iv) Water resources management office for solving conflicts about water and (v) Administration Sections.



Note: Each District office has 2staff in average
 Source: PDOWRAM Takeo Province

Figure AE-4.3.1.1 Organization of Takeo PDOWRAM

Because of insufficient budget for rehabilitation and construction of irrigation facilities in PDOWRAM, the maintenance works have been stagnated. According to the information, the part of annual work budge has been provided by the provincial government.

Ninety four reservoirs exist in the Takeo Province, which have been maintained by Takeo PDOWRAM, however, only half of them are functional at present. Available equipment for O&M is one excavator and one operation vehicle (one set of heavy equipment such as bulldozer, backhoe, grader, roller) will be available in August 2011 through grant of Japanese Government. Only one full set of meteorological equipment is available at Takeo, and 10 rainfall stations at the district offices are operational. Takeo PDOWRAM has development plan to increase the irrigation area within the Province from 85,000 ha in rainy season (50% of total potential area of 170,000 ha) to 136,000 ha (to 80%). However, due to lack of fund and implementation capacity, it is hard to set the clear schedule and program to implement it. Strengthening of capacity on planning, design and construction management as well as support services to FWUCs are urgently needed.

Under such conditions, Takeo PDOWRAM has strong intention to second his staff to the implementation organization of USISRSP in design, construction and strengthening of FWUCs, for grading up his implementation capability.

It is noted that Takeo PDOWRAM is confident of clearing the buildings (houses, storages and shops) as well as private bridges/ culverts on the existing canal routes. According to the inventory survey made in 2011, there are at least 43 buildings within ROW of the canals.

(2) Considerations Necessary for Software Component Implementation

On the basis of the interview survey to Takeo PDOWRAM , the following activities and/or constraints are identified and considerations are required for the implementation of software component program under SPPIDRIP:

Table AE-4.3.1.1 Consideration Necessary for the Implementation Software Component (Takeo PDOWRAM)

Item	Present Conditions	Considerations
O&M Activities		
O&M of Facilities	<ul style="list-style-type: none"> - Gate operation of Kpob Trobek Reservoir - Spillway gate operation - both of which are carried out in collaboration with PDOWRAM 	<ul style="list-style-type: none"> - Demarcation of responsibility among PDOWRAM Takeo Province and FWUC is not clear in O&M of Kpob Trobek Reservoir.
Frequency	<ul style="list-style-type: none"> - Gate operation of Kpob Trobek Reservoir: every day - Spillway gate: irregular when the automatic gates needs manual operation 	<ul style="list-style-type: none"> - As similar to other relevant PDOWRAM, timely allocation of necessary budget needs to be conducted through close communication with MOWRAM and PDOWRAM.
Others	<ul style="list-style-type: none"> - Different from Kandal PDOWRAM, no pump and/or other equipment are provided to farmers for supplemental irrigation. 	
Capacity Development Program and Technical Support		
Training Program	<ul style="list-style-type: none"> - Regular trainings are not provided but they are carried out in project basis. - The training programs recently conducted are as follows (i) water management for FWUC (16 nos.), (ii) O&M of irrigation system (102 nos. in 4 series), (iii) administration (16 nos.), (iv) conflict management (16 nos.) and (v) integrated water resource management (IWRM). - Program (i) and (ii) were organized by PDOWRAM in 2005 and (iii) and (iv) were by PDOWRAM together with commune council also in 2005. Program (v) was facilitated by TSC. - In addition to irrigation trainings, agriculture-related trainings are conducted for farmers with the assistance of Cambodia Agricultural Value Chain Program (CAVAC).⁷ 	<ul style="list-style-type: none"> - Training program by TSC is considerably appreciated by Takeo PDOWRAM. The accumulated know-how in TSC needs to be effectively utilized in the software component program. - Agriculture trainings are conducted with the assistance of CAVAC (AusAid-assisted). PDOWRAM is required to effectively make coordination among training programs by different development partners to attain more fruitful outcomes at the field level.
Training Programs the staffs are interested in	<ul style="list-style-type: none"> - O&M of irrigation facilities - Promotion of farmers' participation in O&M and water management - Solving problems among stakeholders 	
Intension of PDOWRAM		
Constraints	<ul style="list-style-type: none"> - At present, farmers' participation in O&M of facilities and water management is not necessarily active. It would be difficult to change attitude and behavior of farmers under the command area of Slakou Irrigation System. - Slakou Irrigation System is not complete. Particularly, insufficient development of secondary and tertiary canals is one of the constraints to conduct proper water management within the system. - Since the budget of PDOWRAM is not sufficient, support to FWUCs by PDOWRAM staff is not in satisfactory level. 	<ul style="list-style-type: none"> - As having been pointed out in both PDOWRAM Kampong Speu and Kandal Provinces, budget arrangement particularly for PDOWRAM level is of critical importance in software component activities. Such cost needs to be considered in the plan. - In order to facilitate consensus for ISF payment by FWUC members, awareness raising needs to be included as one of the important program in the software component.
Future Plan	<ul style="list-style-type: none"> - Rehabilitation of irrigation facilities needs to be promoted based on prioritization of rehabilitation needs. - Supporting activities to FWUCs by PDOWRAM staff needs to be strengthened to establish participatory irrigation management system. - By facilitating FWUCs, consensus building for the payment of ISF will be made among farmers. 	

Source: JICA Survey Team based on Field Interview

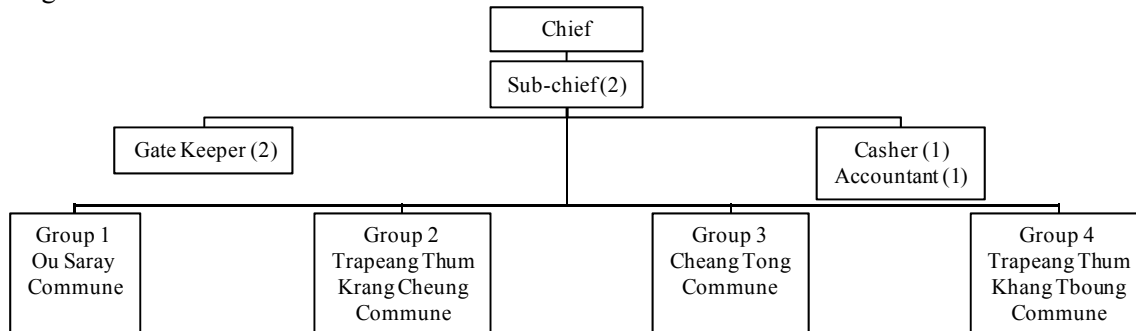
⁷ CAVAC commenced in 2009 and will be implemented over a five year period with the assistance of AusAid. Target area of CAVAC covers three provinces: (i) Kampong Thom, (ii) Kamot and (iii) Takeo. Overall objective of CAVAC is accelerated growth in the value of agricultural production and smallholder income in the rice based farming system of targeted provinces, under which there are four components: (i) component 1, agribusiness development, (ii) component 2, water management, (iii) component 3, research and extension and (iv) component 4, business enabling environment.

Source: Program Design Document, 2008, CAVAC

AE-4.3.2 Farmer Water Users Community

(1) General Information

There were no FWUCs in USISRSP Area in 2002. However, Kpob Trobek FWUC was established at Ou Saray commune in 2005. Member farmers of this FWUC are counted for around 3,340 HHs, who stay in four communes as shown in the following figure. In the same year, Kpob Trobek Reservoir was rehabilitated, hence, in collaboration with Takeo PDOWRAM, this FWUC has carried out management of abstracted water from the reservoir for paddy cultivation. Meanwhile, the F/S Report mentioned that there is no FO in USISRSP Area. This situation has not been changed since the F/S Stage in 2002.



Source: JICA Survey Team based on Interview to Kpob Trobek FWUC

Figure AE-4.3.2.1 Organization of Kpob Trobek FWUC

Institutional overview of Kpob Trobek FWUC is summarized in Table AE-4.3.2.1. As one of the outstanding issues, interview survey disclosed that Kpob Trobek FWUC has started collection of ISF since 2009. Collection rate of ISF in 2009 cropping season, with the charge of 20,000 Riel/ha, reached 80% of member farmers. Although no collection was made in 2010 due to serious drought, the community is planning to collect 30,000 Riel/ha in 2011 cropping season.

(2) Constraints and Needs of FWUCs

As similar to FWUCs in Kampong Speu Province, capacity development program for the community has been organized by project-basis with financial and technical support from various development partners. Such trainings as water management and O&M of irrigation facilities were organized by PDOWRAM with the support of TSC-2 (JICA) in 2008. Major constraints and needs recognized by FWUC are tabulated as follows, which needs to be considered for the implementation of the software component for USISRSP:

Table AE-4.3.2.2 Constraints and Needs recognized by FWUCs Kpob Trobek

Item	Constraints	Needs	Training Programs in which Group is interested
Hardware Aspect	<ul style="list-style-type: none"> - Deterioration of main and secondary canal systems - Insufficient development of tertiary irrigation systems - Automatic regulating gates (4 nos.) on Kpob Trobek Reservoir not functioning properly 	<ul style="list-style-type: none"> - Rehabilitation of secondary canals and those related structures - New development of tertiary canals and those related structures 	<ul style="list-style-type: none"> - Water management - Administrative management for the group - Financial management - Conflict management
Software Aspect	<ul style="list-style-type: none"> - Insufficient awareness among farmers for the importance of irrigation water and O&M of irrigation system - Difficulty in ISF collection due to insufficient understanding among farmers 	<ul style="list-style-type: none"> - Encouragement of farmers to participate in group work - Awareness raising on the importance of irrigation water and O&M of irrigation 	

Source: JICA Survey Team based on Field Interview

AE-4.4 Kandal Stung-Bati Irrigation System Rehabilitation Sub-project

AE-4.4.1 Kandal Provincial Department of Water Resources and Meteorology

Kandal Stung-Bati Irrigation System Rehabilitation Sub-project (KSBISRSP) consists of: (i) Kandal Stung Extension Area and (ii) Kandal Stung-Bati Area. The former is managed by Kandal PDOWRAM while the latter is by Takeo PDOWRAM. The organizations and considerations necessary for software component implementation are described above.

AE-4.4.2 Farmers' Organization

(1) General Information

FWUC has not been established in both Kandal Stung Extension Area and Kandal Stung-Bati Area. Instead, farmers have been collaboratively working together for irrigation system O&M through unofficial farmers' group headed by relevant commune chiefs (13 nos.), under which 84 village chiefs are working together, intensively supported by Kandal PDOWRAM after two main pumps were installed in 1993. Five numbers of portable pumps, together with diesel for operation, are provided to communes for secondary canal level water management from MOWRAM. Institutional overview of those farmers' groups is summarized in Table AE-4.4.2.1.

In fact, however, farmers' group activities are still limited and largely depending upon technical and administrative support from MOWRAM and PDOWRAM in water management and O&M of facilities. Assessments and reviews of farmers' group activities from the view point of group administration, water management and O&M of irrigation facilities identify the following issues affecting irrigation service and management performance in KSBISRSP.

- Payment of ISF is completely not carried out by farmers at present due to such regulations unprepared as well as insufficient awareness among farmers in importance of irrigation system O&M.
- Member list of farmers of the group would remain incomplete to understand overall activities of the groups.
- Farmers' groups in both areas do not clearly understand demarcation of O&M responsibility among MOWRAM, PDOWRAM and farmers' group.
- Members complain of sometimes insufficient and irregular water supply by the operation of main pumps resulting in poor agricultural production.
- Canals and facilities maintenance and upkeep are less than the required level, therefore, it is difficult to organize and mobilize farmers as groups.

In such conditions, only Chambei commune under Kandal Stung Bati Extension Area is planning to start collection of ISF from rainy season cropping of 2012.

(2) Constraints and Needs of Farmers' Group

The field survey revealed that, although regular annual trainings are provided by MOWRAM and PDOWRAM for water management and O&M of irrigation facilities, the capability of irrigation system O&M in both groups are under development. Constraints and needs recognized by farmers' groups are summarized as follows, which needs to be considered for the implementation of the software component programs under SPPIDRIP.

Table AE-4.4.2.2 Constraints and Needs recognized by Farmers' Group KSBISRSP

Item	Constraints	Needs	Training Programs in which Group is interested
Hardware Aspect	<ul style="list-style-type: none"> - Deterioration of main and secondary canal systems (eg. main canal: canal No.59 and 60, and secondary canal: No.81, 83 and 85 particularly pointed out in Kandal Stung Bati Extension Area) - Insufficient development of main canal system (such as: no weir constructed on Stung Touch River to carry out irrigated-agriculture in the extension area) - Insufficient development of tertiary canal systems for all the area 	<ul style="list-style-type: none"> - Rehabilitation of main & secondary canals and those related structures - Development of main system in technically feasible manner - New development of tertiary canals and those related structures to carry out effective on-farm level water management 	<ul style="list-style-type: none"> - Group formation support - Basic group management skills - Water management - Administrative management for the group - Financial management - Conflict management including facilitation of collaborative relationship with non-farmer stakeholders
Software Aspect	<ul style="list-style-type: none"> - Insufficient awareness among farmers to carry out water management and O&M of irrigation facilities by themselves at secondary and tertiary canal levels - No group maturity in collection of ISF (not yet collected) - Conflict among farmers and/or between farmers and fishermen on irrigation system O&M 	<ul style="list-style-type: none"> - Encouragement of farmers to participate in group work - Awareness raising on the importance of irrigation water and O&M of irrigation 	

Source: JICA Survey Team based on Field Interview

AE-4.5 Main Canal 35 Rehabilitation Sub-project

AE-4.5.1 Kampong Speu Provincial Department of Water Resources and Meteorology

Main Canal 35 Rehabilitation Sub-project (MC35RSP) is practically managed by Kampong Speu PDOWRAM. The organizations and considerations necessary for software component implementation are explained in section AE-4.2.1.

AE-4.5.2 Farmers' Organization

(1) General Information

As similar to KSBISRSP, FWUC has not been established in MC35RSP area yet while farmers' group is formulated in November 2009 to carry out water management and O&M of irrigation facilities supported by Kampong Speu PDOWRAM. The organization is headed by 1 chairman and 3 vice chairmen (commune chiefs), under which there are 9 villages' chiefs as representative of each village under irrigation system. Since the main canals are highly deteriorated with insufficient permanent water management structures, secondary canal systems have not been developed, farmers' group activities are still limited at present. Institutional overview of those farmers' groups is summarized in Table AE-4.5.2.1.

(2) Constraints and Needs of Farmers' Group

The field survey revealed that, since regular annual trainings are provided by MOWRAM and PDOWRAM for water management and O&M of irrigation facilities, the capability of irrigation system O&M in the group are under development. Constraints and needs recognized by farmers' groups in MC35RSP are summarized as follows, which needs to be considered for the implementation of the software component programs under SPPIDRIP.

Table AE-4.5.2.2 Constraints and Needs recognized by Farmers' Group MC35RSP

Item	Constraints	Needs	Training Programs in which Group is interested
Hardware Aspect	<ul style="list-style-type: none"> - Highly deteriorated facilities overall due to flooding in every wet season - No permanent water management structures - Insufficient water availability in dry season - Insufficient development of secondary and tertiary systems for all the area 	<ul style="list-style-type: none"> - Rehabilitation of appurtenant structures on main reservoir of the system - Rehabilitation of main & secondary canals and those related structures - Development of new reservoir under Canal 35 irrigation system - New development of tertiary canals and those related structures for on-farm level water management 	<ul style="list-style-type: none"> - Group formation support - Basic group management skills - Water management - Administrative management for the group - Financial management - Conflict management including facilitation of collaborative relationship with non-farmer stakeholders
Software Aspect	<ul style="list-style-type: none"> - Conflict between up and downstream farmers over water use - No group maturity in collection of ISF (not yet collected) 	<ul style="list-style-type: none"> - Encouragement of farmers to participate in group work - Awareness raising on the importance of irrigation water and O&M of irrigation 	

Source: JICA Survey Team based on Field Interview

AE-4.6 Srass Prambai Water Recession Rehabilitation Sub-project

AE-4.6.1 Kandal Provincial Department of Water Resources and Meteorology

Srass Prambai Water Recession Rehabilitation Sub-project (SPWRRSP) is managed by Kandal PDOWRAM. The organizations and considerations necessary for software component implementation are explained in section AE-4.2.2.

AE-4.6.2 Farmers' Organization

(1) General Information

Until now, FWUC has not been established in SPWRRSP area. Instead, informal farmers' group is formulated to be in charge of water management and minor maintenance of reservoir dike and canals with the support of Kandal PDOWRAM. The group is headed by chief (1 no.) and vice-chiefs (2 nos.), under which there are 32 persons as village representatives from the villages under Srass Prambai system. According to Kandal PDOWRAM, although no equipment is owned by the group, portable pumps are provided from PDOWRAM to carry out supplemental irrigation on the basis of farmers' request. Fishermen in the reservoir would be also one of the important stakeholders for Srass Prambai System as they regularly pay communes fee of 5,000 – 10,000 Riel/fisherman/year, part of which are utilized for reservoir maintenance. Institutional overview of the group is summarized in Table AE-4.6.2.1.

(2) Constraints and Needs of Farmers' Group

The field survey revealed that the capability of irrigation system O&M in both groups is still low since no regular trainings are not provided by MOWRAM/PDOWRAM and/or any other organizations. Constraints and needs recognized by farmers' groups in MC35RSP are summarized as follows, which needs to be considered for the implementation of the software component programs under SPPIDRIP.

Table AE-4.6.2.2 Constraints and Needs recognized by Farmers' Group SPWRRSP

Item	Constraints	Needs	Training Programs in which Group is interested
Hardware Aspect	<ul style="list-style-type: none"> - Deterioration of reservoir dike and appurtenant structures to manage water 	<ul style="list-style-type: none"> - Rehabilitation of reservoir dike and appurtenant structures including sluice gates as top 	<ul style="list-style-type: none"> - Group formation support - Basic group management skills

Item	Constraints	Needs	Training Programs in which Group is interested
	<ul style="list-style-type: none"> - Highly deteriorated facilities due to flooding in every rainy season - No permanent structures on canal system - Insufficient development of secondary and tertiary systems for all the area 	<ul style="list-style-type: none"> - priority - Rehabilitation of main & secondary canals and those related structures 	<ul style="list-style-type: none"> - Water management - Administrative management for the group - Financial management - Conflict management including facilitation of collaborative relationship with non-farmer stakeholders
Software Aspect	<ul style="list-style-type: none"> - Conflict between up and downstream farmers over water use - No group maturity in collection of ISF (not yet collected) 	<ul style="list-style-type: none"> - Encouragement of farmers to participate in group work - Awareness raising on the importance of irrigation water and O&M of irrigation - Development of collaborative relationship between farmers and fishermen 	

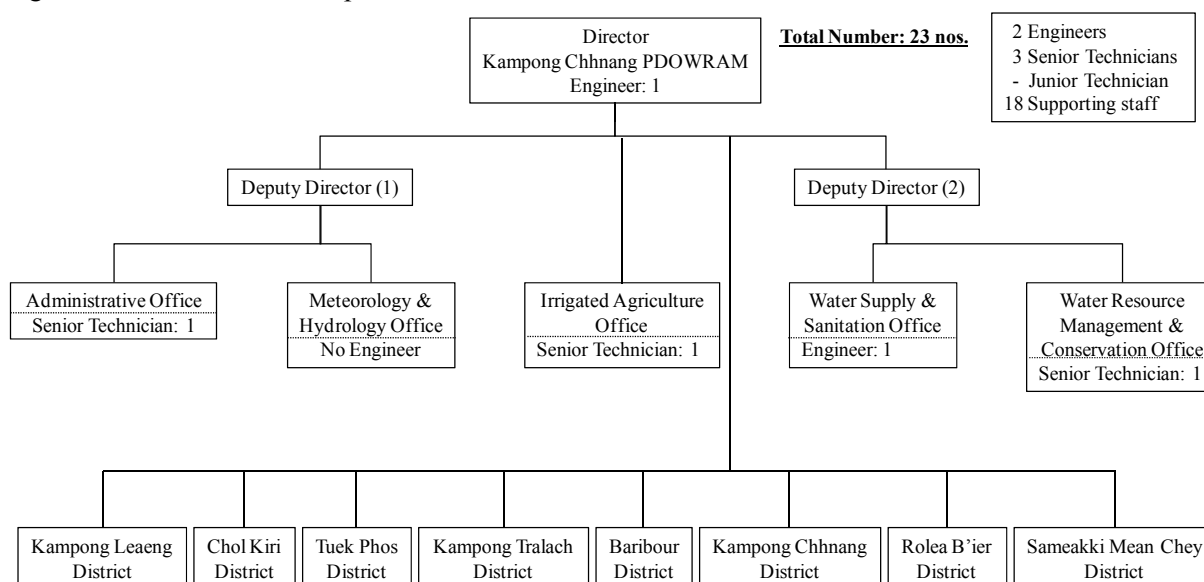
Source: JICA Survey Team based on Field Interview

AE-4.7 Daun Pue Irrigation System Rehabilitation Sub-project

AE-4.7.1 Kampong Chhnang Provincial Department of Water Resources and Meteorology

(1) Organization

Kampong Chhnang PDOWRAM has 5 technical and administrative sections consisting of: (i) administration, (ii) meteorology & hydrology, (iii) irrigated agriculture, (iv) water supply & sanitation and (v) water resource management & conservation, under which there are 8 district offices to carry out field level irrigation system support. The number of staff of the PDOWRAM as of January 2012 is 23 headed by: (i) one Chief of Department (Director) and three Deputy Directors. Its organizational structure is depicted as follows:



Source: PDOWRAM Kampong Chhnang

Figure AE-4.7.1.1 Organization of Kampong Chhnang PDOWRAM

(2) Considerations Necessary for Software Component Implementation

Through the interview survey to Kampong Chhnang PDOWRAM, the following activities and/or constraints are identified and considerations are to be made for the implementation of software component program under SPPIDRIP in order to enhance capability of the staff in Kampong Chhnang PDOWRAM.

Table AE-4.7.1.1 Consideration Necessary for the Implementation Software Component (Kampong Chhnang PDOWRAM)

Item	Present Conditions	Considerations
O&M Activities		
O&M of Facilities	<ul style="list-style-type: none"> - Before cropping season if significant damage is identified for main canal - Maintenance only when farmers submitted request - Provision of portable pumps and fuels to irrigation systems, including Daun Pue Irrigation System, in the province based on the request although no pump operation is available 	<ul style="list-style-type: none"> - Demarcation of responsibility among Kampong Chhnang PDOWRAM and FWUC is not clear when the facilities are rehabilitated for Daun Pue Irrigation System - As similar to other relevant PDOWRAM, timely allocation of necessary budget needs to be conducted through close communication with MOWRAM and PDOWRAM.
Frequency	<ul style="list-style-type: none"> - Once a week for inspection and advice to farmers' group by district staff 	
Others	<ul style="list-style-type: none"> - According to PDOWRAM, 140 million Riel in total is allocated annually for conducting O&M of irrigation systems in the Province. 	
Capacity Development Program and Technical Support		
Training Program	<ul style="list-style-type: none"> - Regular trainings are not provided for PDOWRAM staff but such programs are carried out in project basis particularly the training workshops organized by TSC. - PDOWRAM organized training program for farmers from selected irrigation systems in the province. The number of participants attended for the training in 2011 was 16. 	<ul style="list-style-type: none"> - Training program by TSC is considerably appreciated by Kampong Chhnang PDOWRAM Province. The accumulated know-how in TSC needs to be effectively utilized in the software component program.
Training Programs the staffs are interested in	<ul style="list-style-type: none"> - Topographic survey - Irrigation plan and design - O&M of irrigation facilities - Remote sensing and GIS applicable to irrigation planning - Promotion of farmers' participation in O&M and water management - Solving problems among stakeholders 	
Intension of PDOWRAM		
Constraints	<ul style="list-style-type: none"> - Irrigation system development is incomplete including Daun Pue Irrigation System. Lack of permanent weir and insufficient main and secondary canals is one of the constraints to conduct proper water management within the system. - Due to abovementioned challenging conditions in irrigation system from hardware view point at present, farmers' participation in O&M of irrigation facilities and water management is not necessarily active. It would be difficult to change attitude and behavior of farmers under the command area of Daun Pue Irrigation System without hardware improvement. - Since the budget and number of staff of PDOWRAM is not sufficient, support to FWUCs by PDOWRAM staff is not at satisfactory level. 	<ul style="list-style-type: none"> - As having been pointed out in other provinces, budget arrangement particularly for PDOWRAM level is of critical importance in software component activities. Such cost needs to be considered in the planning of software component. - In order to facilitate consensus for ISF payment by FWUC members, awareness raising needs to be included as one of the important program in the software component. As mentioned in the later section, FWUC needs to be newly established in the Daun Pue Irrigation System, effective awareness raising program needs to be carried out by enhanced facilitation skills of PDOWRAM staff. - Building collaborative relationship also with local authorizes including commune council and village development committee needs to be considered.
Future Plan	<ul style="list-style-type: none"> - Rehabilitation of irrigation facilities needs to be promoted based on prioritization of rehabilitation needs including Daun Pue Irrigation System. - Supporting activities to FWUCs by PDOWRAM staff needs to be strengthened to establish participatory irrigation management system. - By facilitating FWUCs, consensus building for the payment of ISF will be made among farmers. - Fund for physical investment as well as supporting activities at PDOWRAM level needs to be timely allocated. 	

Source: JICA Survey Team based on Field Interview

AE-4.7.2 Farmers' Organization

(1) General Information

FWUC has not been established in the area of Daun Pue Irrigation System Rehabilitation Sub-project (DPISRSP) while informal farmers group was established in 2007 headed by the chief of Chieb Commune. Under the chief of the group, one vice chairman and 13 village representatives together carry out group works necessary for irrigation system O&M with the support of PDOWRAM including provision of materials for rehabilitation. No permanent weir is available and canals are highly deteriorated, therefore, regular maintenance and/or repair of makeshift wooden weir and de-silting of canals are presently considerable burdens for the groups according to the interview. Institutional overview of the group is summarized in Table AE-4.7.2.1.

(2) Constraints and Needs of Farmers' Group

No regular trainings have been provided to farmers' group by MOWRAM /PDOWRAM and any other organizations. The field survey have confirmed that the group's capability in organizational management, irrigation water management and O&M of irrigation facilities would be still challenging level. Constraints and needs recognized by existing farmers' group in DPISRSP are summarized as follows:

Table AE-4.7.2.2 Constraints and Needs recognized by Farmers' Group DPISRSP

Item	Constraints	Needs	Training Programs in which Group is interested
Hardware Aspect	<ul style="list-style-type: none"> - No permanent intake weir available - Highly deteriorated and sedimented main canal - Lack of water management structures on main canal - Insufficient secondary and tertiary canals 	<ul style="list-style-type: none"> - Construction of permanent weir on the main water source - Rehabilitation of main canals and construction of appurtenant water management structures on main canal - Construction of secondary canals and related structures 	<ul style="list-style-type: none"> - Group formation support - Basic group management skills - Water management - Administrative management for the group - Financial management - Conflict management over water and land including facilitation of collaborative relationship with non-farmer stakeholders
Software Aspect	<ul style="list-style-type: none"> - Insufficient materials for O&M (such as sand bags/plastic sheets, wood, bamboo etc.) - Conflict among upstream and downstream farmers over water and land - Weak organizational capability of the group in collection of ISF (not yet collected) 	<ul style="list-style-type: none"> - Encouragement of farmers to participate in group work - Awareness raising on the importance of irrigation water and O&M of irrigation facilities - Development of collaborative relationship among stakeholders 	

Source: JICA Survey Team based on Field Interview

AE-4.8 Annual Budget for Related Four PDOWRAMs

The total number of each PDOWRAM including district offices ranges from 3 to 74 as of March 2011. The annual budgets and actual expenditures of PDOWRAM relevant to SPPIDRIP consisting of: (i) Kampong Speu, (ii) Kandal, (iii) Takeo and (iv) Kampong Chhnang are tabulated as follows:

Table AE-4.8.1 Annual Budgets of Related Four PDOWRAMs

PDOWRAM	2007		2008		2009		2010		2011	
	10 ⁶ Riel	10 ³ US\$	10 ⁶ Riel	10 ³ US\$	10 ⁶ Riel	10 ³ US\$	10 ⁶ Riel	10 ³ US\$	10 ⁶ Riel	10 ³ US\$
Kampong Speu	278	68	575	140	501	122	553	134	509	124
Kandal	323	78	346	84	458	111	522	127	484	118
Takeo	395	96	529	129	770	187	918	223	904	220
Kampong Chhnang	327	80	199	48	215	52	416	101	409	100

*: 1US\$= 4,115 Riel

Source: each PDOWRAM

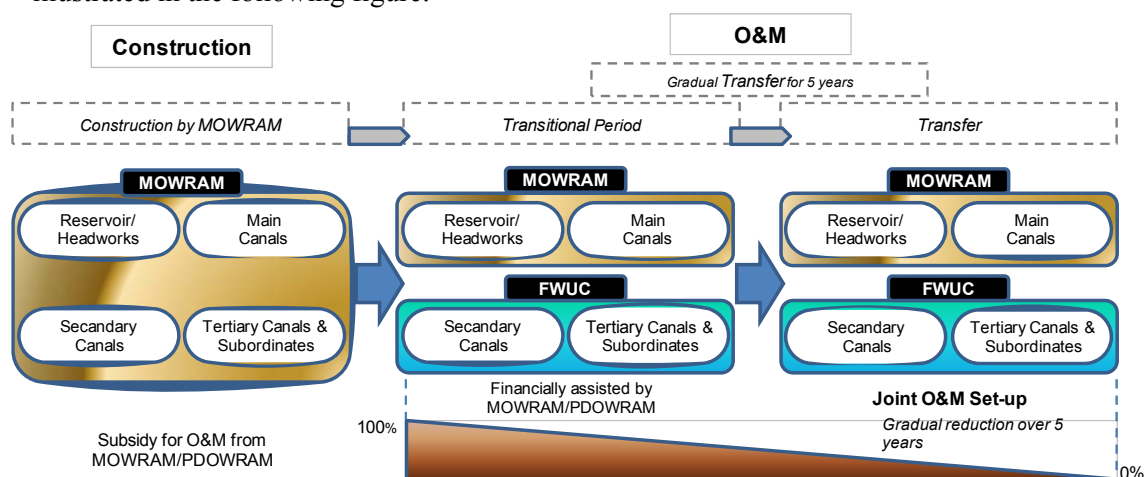
As can be seen in the above table, there is no definite tendency in budget amount change. It might depend upon the implementation of new project (s).

AE-4.9 O&M Plan

AE-4.9.1 Basic Consideration

Important principles on the establishment of O&M system of rehabilitated irrigation facilities are as follows:

- Existing FWUC will be re-formulated and/or restructured in each area covering: (i) 570 ha for model area of RCHRSP and (ii) 3,500 ha for USISRSP.
- New FWUC will be established and strengthened utilizing existing farmers' group as foundations in 4 Sub-projects: KSBISRSP (3,350 ha), MC35RSP (1,200 ha), SPWRRSP (1,200 ha) and DPISRSP (1,151 ha).
- O&M responsibility of rehabilitated facilities will be transferred to FWUC to be established. Level of facilities to be transferred are not clearly stated in the policy paper, therefore, demarcation of responsibility among the Government and FWUC depends upon the capability of FWUC.
- On the basis of the policy, in reality, it would be proposed that main facilities such as reservoir/headworks and main canals will be managed by PDOWRAM with the support and supervision by MOWRAM while management of secondary and tertiary canal level of facilities will be carried out by FWUC.
- Transfer of facilities (secondary canal level facilities in case of SPPIDRIP) to FWUC will be gradually carried out in conformity with Circular No.1 on the Implementation Policy for Sustainable Irrigation Systems showing that step-by-step reduction of government subsidy for the irrigation facilities over 5 years after completion of the construction works. This concept is illustrated in the following figure:



Source: JICA Survey Team

Figure AE-4.9.1.1 Transfer of O&M of Rehabilitated Facilities

- In this process, involvement of existing FWUCs or new FWUC to be established in all the sub-project areas is of necessity from D/D to operation stage in order to raise awareness and sense of ownership for irrigation facilities in the groups.
- As pointed out by the lessons from Prey Nup Polder Development Project, agreement and/or MOU should be made between MOWRAM/PDOWRAM, FWUC and local authorities

(provincial government and commune councils) for establishment of joint management structures as well as transfer of management responsibility of designated facilities based on the consensus building among those stakeholders through spending a certain period of time.

- Although O&M responsibility of secondary and tertiary canals will be transferred to FWUC, periodical monitoring and technical advice on O&M are required by PDOWRAM at the field level. In this connection, appropriate information management system is required such as record of O&M of facilities, water management, meetings etc. for both PDOWRAM and FWUCs.
- It is proposed that comparatively large scale maintenance works for major facilities will remain the responsibility of MOWRAM. Employment of contractors needs to be considered to carry out such works.

AE-4.9.2 Demarcation of O&M Responsibility

Regarding the transfer of the management responsibility to the FWUC for irrigation facilities and water allocation, the Circular No.1 on the Implementation Policy for Sustainable Irrigation Systems describes as follows:

*Based on the capacity of the farmer organizations, the irrigation schemes shall be transferred to the FWUCs for their sustainable operation and maintenance and for the promotion of irrigated agriculture. Irrigation systems not fully transferred shall be jointly manage by the FWUC and the government.*⁸

According to this explanation, level of facilities to be transferred to FWUC would be determined depending upon the capability of FWUC. In the case of SPPIDRIP, it would be realistic that responsibility on O&M of secondary and tertiary systems and below can be gradually transferred to FWUCs, through 5 years, in line with transfer policy while such major facilities, for example, as Tunnup Lok, to be constructed by USISRSP, and Kpob Trobek reservoirs and Roleang Chrey Headworks, to be rehabilitated under RCHRSP, will be continuously managed by MOWRAM and PDOWRAM. O&M responsibility of irrigation systems under SPPIDRIP among stakeholders for rehabilitated facilities is proposed in the following table:

Table AE-4.9.2.1 O&M Responsibility among Stakeholders for Irrigation Systems under SPPIDRIP

Level of Facilities O&M Activities	Reservoir/ Headworks	Main Canals	Secondary Canals	Tertiary Canals and Below
Annual O&M Planning	PDOWRAM	PDOWRAM	PDOWRAM/ FWUC	Sub-FWUG
Cropping Schedule Preparation	-	-	FWUC/FWUG	Sub-FWUG
Operation	PDOWRAM	PDOWRAM	FWUC/FWUG	Sub-FWUG
Maintenance	PDOWRAM	PDOWRAM	FWUC/FWUG	Sub-FWUG

Source: JICA Survey Team

Circular No. 1 also described that transfer of O&M responsibility requires: (i) registration of FWUC and (ii) conclusion of agreement between the Department of Irrigated Agriculture of MOWRAM and FWUC. Such arrangement will be considered in the activities of software component on the basis of discussion and consultation with FWUC.

⁸ Page 4 of Circular No.1 on the Implementation Policy for Sustainable Irrigation Systems, MOWRAM

AE-4.9.3 Staff Required for O&M of Rehabilitated Irrigation Systems

Number of staff to be required for operation and maintenance of Sub-project irrigation systems are tabulated as follows:

Table AE-4.9.3.1 Number of Staff Required for O&M of Sub-projects Irrigation System under SPPIDRIP

Organization	Position	No(s).	General Task
Central Level			
PMU Japan Support Fund	Project Director	1	- Overall management of O&M
	Manager	1	- Coordination with relevant departments
Sub-total of Central Level (=1)		2	
Provincial Level			
Project Implementation Unit (PIU)			
- Kampong Speu Province <i>Roleang Chrey Irrigation System & Main Canal 35 System</i>	Project Manager	2	Roleang Chrey Irrigation System (1 no.) - Overall management of O&M at provincial level - Coordination with Central Level Main Canal 35 System (1 no.) - Overall management of O&M at provincial level - Coordination with Central Level
	Irrigation/O&M	2	Roleang Chrey Irrigation System (1 no.) - Water management and O&M at model area extending 570ha Main Canal 35 System (1 no.) - Water management and O&M at Main Canal 35 System (850 ha)
	Gate Keeper	2	Roleang Chrey Irrigation System (1 no.) - Gate operation of Roleang Chrey Headworks Main Canal 35 System (1 no.) - Gate operation of Reservoir
Sub-total of Kampong Speu Province (=2)		6	
- Takeo Province <i>Upper Slakou Irrigation System & Kandal-Stung Bati Irrigation System</i>	Project Manager	2	Upper Slakou Irrigation System (1 no.) - Overall management of O&M at provincial level - Coordination with Central Level Kandal-Stung Bati Irrigation System (1 no.) - Overall management of O&M at provincial level - Coordination with Central Level
	Irrigation/O&M	3	Upper Slakou Irrigation System (2 nos.) - Water management and O&M of the system in 3,400ha Kandal-Stung Bati Irrigation System (1 no.) - Water management and O&M of the system (1,600 ha)
	Gate Keeper	1	Upper Slakou Irrigation System (1 no.) - Gate operation of Tumnu Lok and Kpob Trobek Reservoirs
Sub-total of Takeo Province (=3)		6	
- Kandal Province <i>Kandal Stung Extension Irrigation System & Srass Prambai Water Recession System</i>	Project Manager	2	Kandal Stung Extension Irrigation System (1 no.) - Overall management of O&M at provincial level - Coordination with Central Level Srass Prambai Water Recession System (1 no.) - Overall management of O&M at provincial level - Coordination with Central Level
	Irrigation/O&M	3	Kandal Stung Extension Irrigation System (2 no.) - Water management and O&M of the system (1,750ha) Srass Prambai Water Recession System (1 no.) - Water management (gate operation of the reservoir) and O&M of the system (1,200ha)
Sub-total of Kandal Province (=4)		5	

Organization	Position	No(s).	General Task
- Kampong Chhnang Province <i>Daun Pue Irrigation System</i>	Project Manager	1	- Overall management of O&M at provincial level - Coordination with Central Level
	Irrigation/O&M	1	- Water management and O&M of the system (1,150ha)
Sub-total of Kampong Chhnang Province (=5)		2	
Sub-total of Provincial Level (=6=1+2+3+4+5)		19	
Grand Total (=1+6)		21	

Source: JICA Survey Team

AE-4.9.4 Operation Plan

Out of 6 Sub-projects, UPSISRSP, MC35RSP and SPWRRSP have a reservoir as water source for irrigation to their command areas. Therefore, operation of intake gates installed at the reservoir should be carefully controlled by observing the water level of reservoir and irrigation calendar. Prior to operation of intake gate, it is essential to prepare a H-V curve and also install the gauging staff in the reservoir. As for MC35RSP, headworks will be newly constructed in order to abstract the river water and to supply it to subsequent main canal. The headworks are of barrage type like Roleang Chrey Regulator, therefore gate operation should be made in the same manner with Roleang Chrey Regulator, especially for flood. In particular, attention should be paid to operation of RCHRSP and KSBISRSP (Kandal Stung Area) since water source for them is the Prek Thnot river and Stung Tasal dam as shown in Figure AE-4.11.6.4. Also, as shown in this figure, there is an on-going Stung Tasal dam project located upstream of Prek Thnot river, and high cropping intensity of these Sub-projects are realized due to released discharge from the Stung Tasal dam according to the water balance study. Thus, careful operation should be required for the Stung Tasal dam, RCHRSP and KSBISRSP (Kandal Stung area). In order to make appropriate operation of them, it is proposed to establish the Prek Thnot River Basin Management Unit in MOWRAM and to procure the necessary inputs such as manpower, transportation equipment, computers, and wireless communication equipment under SPPIDRIP.

AE-4.9.5 Maintenance Plan

(1) Maintenance Activities

Maintenance aims at restoring the system to its full functional performance. It is imperative that in order to remain engaged in agricultural development and consolidation continuously, the irrigation facilities shall always be kept in serviceable condition. Maintenance works can be classified into four categories :

- Regular maintenance works to regularly maintain and improve facilities rehabilitated and constructed under SPPIDRIP
- Periodic and time-bound Maintenance & Repairs including repair of damage portions of facilities
- Emergency maintenance consisting of repair and rehabilitation of occasional damage of the facilities caused by natural disaster such as flood, heavy rainfall and any other causes, and
- Annual maintenance such like the works requiring large volumes and/or special technical skill and know-how.

Regular maintenance or routine maintenance is carried out on a day to day basis, as and where and when required. It is essentially a low-cost activity carried out on local basis, but it is very effective for preventing further damages the repair of which might involve large funding.

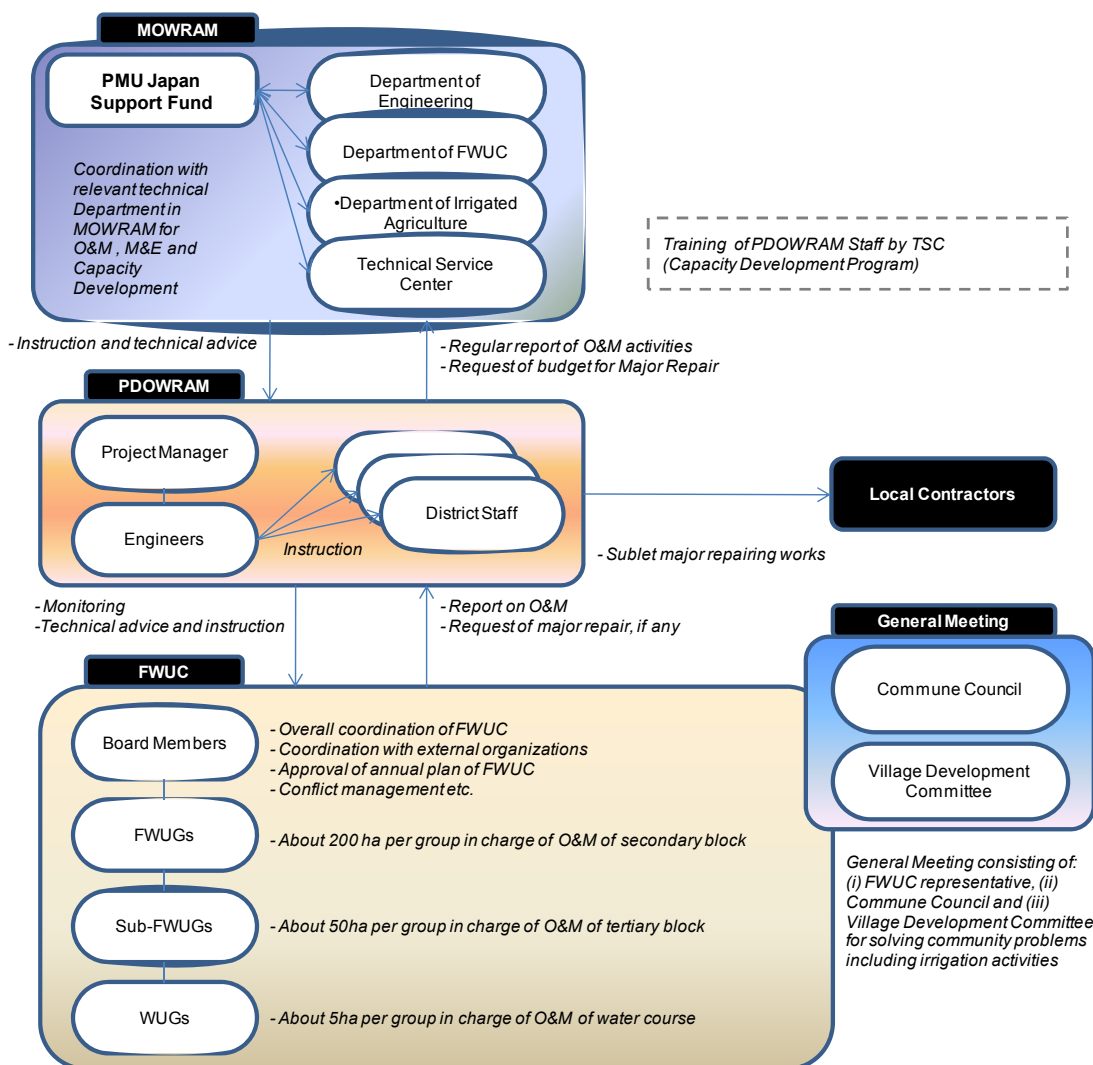
Periodic and time-bound maintenance is a planned activity and its aim is to prepare the irrigation system for specific services related to cropping calendar and its requirement. Desilting of channels and restoring their conveyance capacity before the start of cropping season, strengthening and raising of banks after rainy season, restoring the farm roads after rains etc., fall in this category.

Emergency maintenance and repairs are carried out to restore a sudden and/or serious damage which has caused, or may cause, interruption to irrigation. Canal breaches or damages to regulatory structures come under such calamities which call for emergency maintenance and repairs. It requires quick yet decisive measures, which first aim to contain the damage by temporary repairs and then consolidating it by permanent repairs followed by its maintenance.

Annual maintenance requires comparatively large volumes and/or special skills such as re-fill of embankment for reservoir and canals, concrete structure repair so forth. As mentioned above, to carry out such works, it would be realistic to employ contractors in contract-basis.

(2) Organizational Set-up

Proposed organizational set-up from the central level to field levels for O&M of irrigation facilities under SPPIDRIP is illustrated in the following figure.



Source: JICA Survey Team

Figure AE-4.9.5.1 Proposed Organizational Set-up for O&M of Irrigation Facilities under SPPIDRIP

Tasks in O&M among stakeholders for irrigation facilities for Sub-projects Irrigation System under SPPIDRIP are tabulated as follows:

Table AE-4.9.5.1 General Job Description of O&M for Sub-projects Irrigation System under SPPIDRIP

Organization	Department/ Position	Job Description
Central Level		
MOWRAM	PMU Japan Support Fund	- Overall coordination with relevant technical Department in MOWRAM and external organization for O&M, monitoring and evaluation and capacity development of PDOWRAM
	Department of Engineering	- In coordination with PMU Japan Support Fund, in charge of engineering advice and instruction
	Department of FWUC	- In coordination with PMU Japan Support Fund, in charge of establishment and strengthening of FWUC
	Department of Irrigated Agriculture	- In coordination with PMU Japan Support Fund, relevant organizations within MOWRAM, MAFF and PDA, in charge of promotion of irrigated agriculture in the command area using rehabilitated irrigation facilities
Provincial Level		
PDOWRAM	Project Manager	- Overall coordination at the provincial level - Approval of annual O&M plan prepared by engineer and district staff - Report of provincial and field level activities to MOWRAM - Budget request to MOWRAM for major repairing works based on inspection by Engineers/District Staff - Contract management of sublet work of local contractors
	Engineer/District Staff	- Preparation of annual O&M including budgetary plan - Regular monitoring and evaluation of FWUC at the field level - Instruction to FWUC based on annual O&M plan - Technical advice to FWUC - Regular inspection of irrigation facilities at the main canal level - Report preparation of facilities' conditions based on regular inspection - Report preparation of O&M activities - Operation of major facilities such as reservoir/headworks
Commune and Village Level		
FWUC	Board of FWUC	- Overall coordination of FWUC activities - Coordination with external organizations such as commune councils and village development committees - Approval of annual plan prepared by FWUC - Conflict management among the group
	FWUGs	- Established for approximately 200 ha per group in charge of O&M of secondary block - Operation of turnout gate on the main canal in consultation with PDOWRAM
	Sub-FWUG	- Established for approximately 50 ha per group in charge of O&M of tertiary block - Operation of turnout gate on the secondary canal in consultation with PDOWRAM
	WUGs	- Established for approximately 5 ha per group in charge of O&M of tertiary block - Operation of division box on the tertiary canals
Others	General Meeting	- It is proposed that this organization be newly established to facilitate coordination at the community level, members of which would consist of: (i) FWUC representative, (ii) Commune Council members and (iii) Village Development Committee members. - In charge of broad-based conflict management in the community including irrigation water management - O&M of community infrastructure such as village roads - Coordination of land acquisition within the community

Source: JICA Survey Team

AE-4.9.6 Procurement of Office Equipment for O&M

Equipment necessary for the Project will be procured for central and provincial levels including Prek Thnot River Basin Management Unit, FWUCs and the Consultant such as vehicles, computers, photocopy machines, stationery etc. as tabulated as follows:

Table AE-4.9.6.1 List of Office and Equipment for O&M

Organization/Irrigation System	Equipment	No(s).
Central Level		
PMU Japan Support Fund	Vehicle	5
	Motor cycle	10
Provincial Level		
Kampong Speu PDOWRAM	Vehicle	1
	Motor cycle	5
	Photocopy machine	1
	Office furniture	1 (set)
	Computer	1 (set)
Kandal PDOWRAM	Vehicle	1
	Motor cycle	5
	Photocopy machine	1
	Office furniture	1 (set)
Takeo PDOWRAM	Vehicle	1
	Motor cycle	5
	Photocopy machine	1
	Office furniture	1 (set)
Kampong Chhnang PDOWRAM	Vehicle	1
	Motor cycle	5
	Photocopy machine	1
	Office furniture	1 (set)
FWUC		
Roleang Chrey System	Office	1
	Office furniture	1 (set)
	Photocopy machine	1
Upper Slakou Irrigation System	Office	1
	Office furniture	1 (set)
	Photocopy machine	1
Kandal Stung-Bati Irrigation System	Office	1
	Office furniture	1 (set)
	Photocopy machine	1
Main Canal 35 System	Office	1
	Office furniture	1 (set)
	Photocopy machine	1
Srass Prambai Water Recession System	Office	1
	Office furniture	1 (set)
	Photocopy machine	1
Daun Pue Irrigation System	Office	1
	Office furniture	1 (set)
	Photocopy machine	1
River Basin Management Unit		
Prek Thnot River Basin Management Unit	Photocopy machine	1
	Office furniture	1 (set)
	Vehicle	1
	Motor cycle	4
	Wireless communication system	1 (set)
Consultant		
Consultant for D/D and C/S	Vehicle	5
	Motor cycle	10
Total		
Transportation equipment	Vehicle	15
	Motor cycle	44
Office equipment	Photocopy machine	11
	Office furniture	11 (set)
Office Building	Office for FWUC	6
Telecommunication system	Wireless communication system	1 (set)

Source: JICA Survey Team

AE-4.10 Software Component to Effectively Utilize Rehabilitated Facilities

AE-4.10.1 General

(1) Proposed Activities and Implementation Period

On the basis of approach and strategy of SPPIDRIP stressing integration of hardware and software component to successfully accomplish its objective, three activities are proposed under the software component of SPPIDRIP to establish organizational set-up in order to effectively utilize rehabilitated irrigation facilities as follows:

- Capacity Development of MOWRAM and PDOWRAM Staff on O&M
- Formation and Strengthening of FWUC
- Strengthening of Agricultural Extension Services

(2) General Framework

Software component under SPPIDRIP will be conducted based on such principles as: (i) follow-up of output of TSC-3 supported area in both Roleang Chrey and Slakou Irrigation Systems, (ii) extension to other areas and (iii) integration of output of TSC-3 supported area and the extension area in both RCHRSP and USISRSP so as to demonstrate proper water management and increase rice production in the model area (570 ha) under RCHRSP and command area extending 3,500 ha under USISRSP.⁹ Different from RCHRSP and USISRSP, on the other hand, FWUCs have not been established in other 4 Sub-projects and also they are not selected as model areas by TSC-3. It can be judged that more intensive support in consolidation of institutional set-up is required at the outset of software component. General framework of SPPIDRIP's software component is tabulated as follows:

Table AE-4.10.1.1 General Framework Software Component under SPPIDRIP

No.	Title	Activities	Implemented by	Main Target Group
1	Capacity Development of MOWRAM and PDOWRAM Staff on O&M	<ul style="list-style-type: none"> - Preparation of practical O&M guidelines for rehabilitated facilities - Dissemination and training workshop - Training management - Periodical monitoring and evaluation - Follow-up workshop 	Technical Consultant (Short-term Foreign Consultant) for work plan preparation and trial training Training programs execution and M&E by PMU Japan Support Fund with TSC	MOWRAM and PDOWRAM Staff
2.	Formation and Strengthening of FWUC	<ul style="list-style-type: none"> - Support to awareness raising - Support to establishment of FWUC - Support implementation of training programs (organizational management, water management & O&M of tertiary canal systems) - Support and monitoring of water management and O&M of irrigation facilities 	MOWRAM and PDOWRAM staff by employing national consultants	FWUCs in 6 Sub-projects Irrigation Systems
3	Strengthening of Agricultural Extension Services ¹⁰	<ul style="list-style-type: none"> - TOT for capacity development of group leaders to act as extension facilitator - Demonstration Plots 	Technical Consultant (Short-term Foreign Consultant) for work plan preparation and trial training Training programs execution and M&E by PDA staff and national consultants under the control of PMU Japan Support Fund	FWUCs in Sub-projects 6 Irrigation Systems

Source; JICA Survey Team

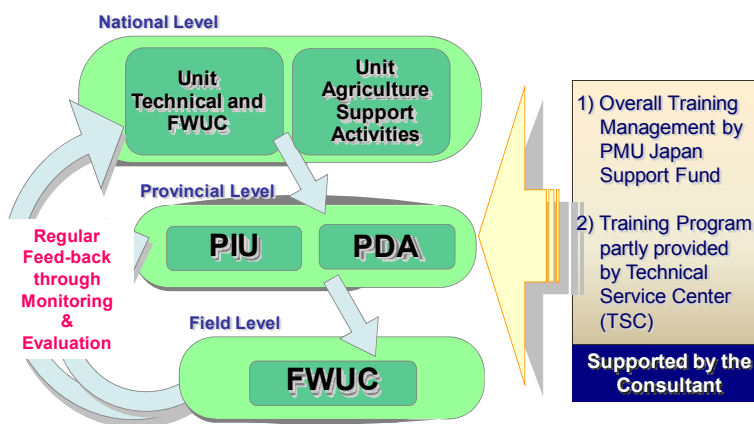
⁹ Facilities' rehabilitation (tertiary canals) for TSC-3 supported areas is excluded from the scope of RCHRSP and USISRSP. At present, detailed work plan for FWUC strengthening and improvement of irrigation system O&M has not been prepared. Therefore, work plan of software component should be prepared during D/D and implementation stage by MOWRAM through considering the progress and output by TSC-3 support.

¹⁰ Out of 3 components proposed, "Strengthening of Agricultural Extension Services" is explained in details in Annex C: Agriculture.

As explained in the above table, technical consultants will be employed to support MOWRAM for the implementation of software component from planning to overall monitoring. In the next section, necessary consultant inputs are proposed for each subproject separately. It would be effective if such style as same technical consultants consistently carry out planning and implementation support of software component in the course of the program in 6 subprojects so that accumulated know-how and output from the software component can be effectively shared among subprojects.

(3) Capacity Development through Training-of-Trainers (TOT)

It is proposed that software component will be generally carried out through Training-of-Trainers (TOT or cascading system of training) approach, where trainees at one level become trainers at the other level. This method will facilitate the mechanism of information flows and feedback from training



Source; JICA Survey Team

Figure AE-4.10.1.1 General Image of TOT (Cascading System Training) to be Applied for SPPIDRIP

programs among lower to higher levels of stakeholders. Such approach has been widely carried out by the previous irrigation projects with development partners and the TSC of MOWRAM, images of which are illustrated in the right figure. In practice, national level units: (i) technical and FWUC and (ii) agriculture support activities under PMU Japan Support Fund will train staff of PIU at the provincial level, in coordination with relevant technical departments in MOWRAM, and trained PIU staff will train the members of FWUC at the field level.

As already explained in the previous sections, there are useful accumulated training curricula in the Technical Service Centre of MOWRAM, having been supported by the technical cooperation project by JICA. In addition, training modules for PIMD developed by MOWRAM as introduced in section AE-1.3 may be utilized as basic guidelines. In this process, therefore, such know-how is expected to be effectively disseminated and utilized.

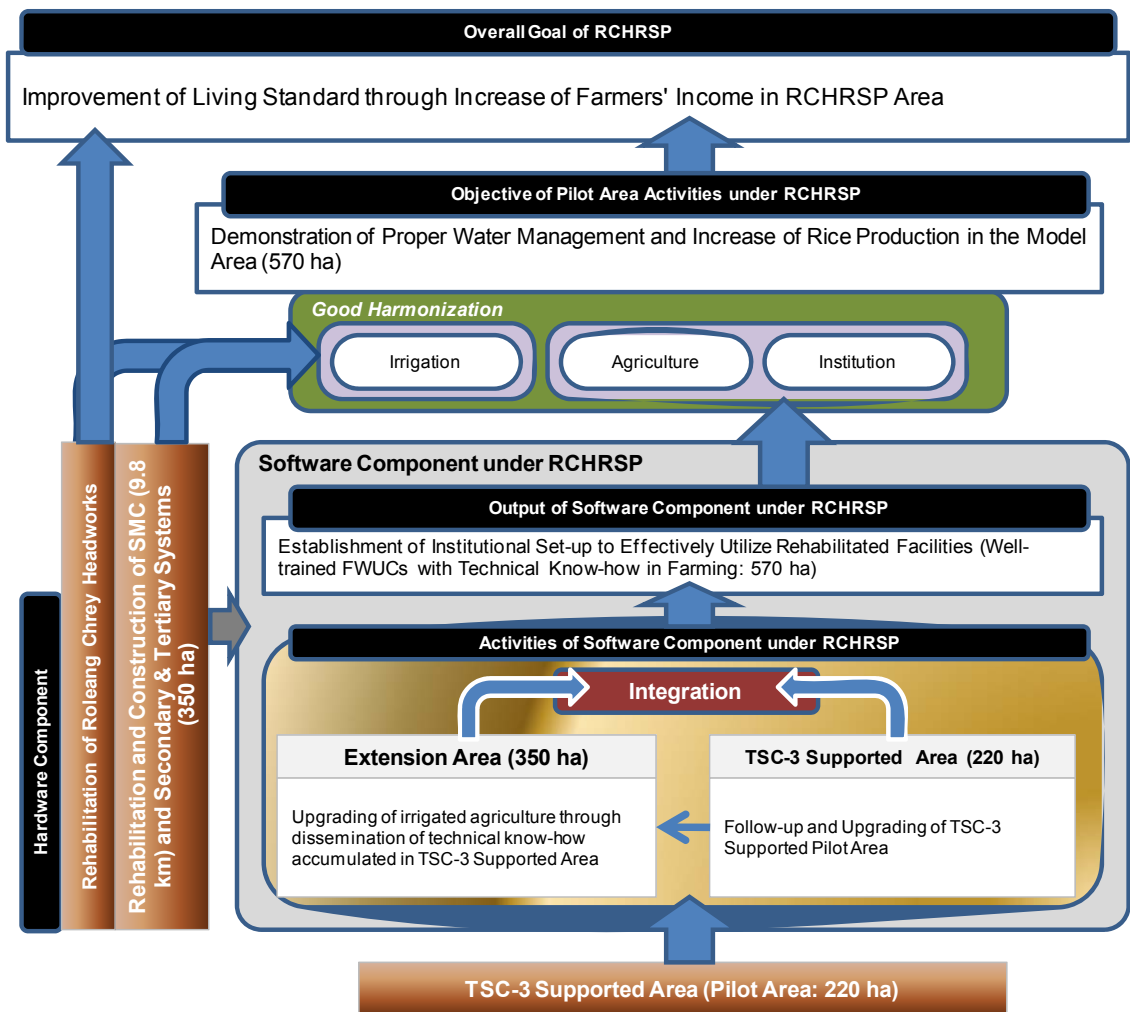
(4) Employment of Financial Management Consultant

Two programs, Formation and Strengthening of FWUC and Strengthening of Agricultural Extension Services software component is proposed to be implemented with the initiatives of MOWRAM using special account for the activities. In order to expedite its implementation through maintaining transparency of their disbursement, financial management consultant will be employed to be in charge of necessary administrative works for software component under special account.

AE-4.10.2 Software Component under RCHRSP

AE-4.10.2.1 Approach

On the basis of proposed framework mentioned in the previous section, proposed approach of software component under RCHRSP is illustrated as follows:



Source: JICA Survey Team

Figure AE-4.10.2.1.1 Approach of Software Component under RCHRSP

South Main Canal (SMC) is 26 km in total recently constructed by MOWRAM, out of which the target area of software component under RCHRSP is extended to 570 ha located under upper reach of SMC originally proposed as “Upper South Main Canal Irrigated Agriculture Improvement Project” in the Study on Comprehensive Agricultural Development of Prek Thnot River Basin (JICA). Since JICA’s technical cooperation, TSC-3 is preparing to commence their pilot project in the upstream of this area, software component of RCHRSP is proposed for: (i) follow-up of TSC-3 supported area (220 ha) and (ii) extension of technical know-how to remaining area (350 ha). RCHRSP objective will be accomplished by integrating the results from both areas.

(1) Overall Goal of RCHRSP

Overall goal of RCHRSP is “improvement of living standard through increase of farmers’ income in the RCHRSP Area.”

(2) Objective of Pilot Area Activities under RCHRSP

Objective of pilot area activities under RCHRSP is, with the support of hardware component by rehabilitation of Roleang Chrey Headworks, SMC and construction of Secondary & Tertiary Canal System, demonstration of proper water management and increase of rice production in the model area (570 ha) under the command area of the Roleang Chrey Headworks through good harmonization of irrigation, agriculture and institution. Output of software component under RCHRSP is “establishment

of institutional set-up to effectively utilize rehabilitated facilities (well-trained FWUCs with technical know-how in farming: 570 ha).”

AE-4.10.2.2 Activities

Activities of Capacity Development of MOWRAM and PDOWRAM Staff on O&M and Formation and Strengthening of FWUC of RCHRSP are explained as follows:

(1) Capacity Development of MOWRAM and PDOWRAM Staff on O&M

Focal point of proposed activities for capacity development of MOWRAM and PDOWRAM staff under RCHRSP is given to O&M of Roleang Chrey Headworks including coordination among irrigation systems under the Headworks through Prek Thnot River Basin Management Unit summarized in the following table:

Table AE-4.10.2.2.1 Proposed Activities for Capacity Development of MOWRAM and PDOWRAM Staff on O&M (RCHRSP)

Narrative Summary of Proposed Activities	
<p>Objective</p> <ul style="list-style-type: none"> - Institutional set-up for O&M within MOWRAM and PDOWRAM is established to effectively utilize irrigation facilities at the main canal level. 	
<p>Output</p> <p>(a) Improvement of technical capability on O&M of MOWRAM and PDOWRAM Staff</p> <ol style="list-style-type: none"> 1) Capability of relevant MOWRAM staff is enhanced in instructing and supporting field level O&M activities of irrigation facilities by PDOWRAM staff 2) Capability of PDOWRAM staff is improved in O&M skills for irrigation facilities. <p>(b) Monitoring and evaluation is properly carried out by MOWRAM and PDOWRAM staff for field activities at Roleang Chrey Irrigation System.</p> <ol style="list-style-type: none"> 1) Support and instruction for PDOWRAM Staff’s field activities is carried out timely by MOWRAM. 2) Monitoring and instruction to district staff activities are timely carried out by PDOWRAM staff. 	
<p>Activity (4 years)</p> <p>(a) O&M Training (Roleang Chrey Headworks and Irrigation System in the model area: 570 ha)</p> <ol style="list-style-type: none"> 1) Water management training for MOWRAM staff: 4 nos.(1 time/year) 2) Water management training for PDOWRAM staff: 8 nos. (2 times/year) 3) Maintenance training for MOWRAM staff: 4 nos. (1 time/year) 4) Maintenance training for PDOWRAM staff: 8 nos.(2 times/year) <p>(b) Monitoring and Evaluation</p> <ol style="list-style-type: none"> 1) Monitoring and evaluation of field activities by MOWRAM staff 2) Monitoring and evaluation of field activities by PDOWRAM staff 	<p>Input</p> <ul style="list-style-type: none"> - Foreign consultant: 1.5 M/M (O&M Expert) - National consultant: 6 M/M (Irrigation Expert 3 M/M and O&M Expert 3 M/M) - Vehicle - Training materials - Monitoring cost - Other direct cost (allowance for participants, fuel etc.)
<p>Training Subject</p> <p>(a) Overall Training Management</p> <ul style="list-style-type: none"> - Outline of O&M and strengthening of FWUCs - Outline of agriculture support services - O&M of major and minor facilities - FWUC’s participation in irrigation system management - Facilitation skills of FWUCs - Coordination among relevant agencies <p>(b) Roleang Chrey Headworks Gate O&M</p> <ul style="list-style-type: none"> - Gate operation rule including coordination among relevant organizations (Kampong Speu, Takeo, Kandal Provinces and Phnom Penh Municipality through Prek Thnot River Basin Management Unit) - Gate maintenance including emergency repair <p>(c) Irrigation O&M</p> <ul style="list-style-type: none"> - Irrigation planning at the model area (570 ha) - Water management at main and secondary canal levels - Maintenance work including repairing at main and secondary canal levels 	

Narrative Summary of Proposed Activities	
(d) Monitoring and evaluation - Meteo-hydrological data including rainfall, temperature, evaporation, humidity etc. at RCHRSP area - River water level and runoff for the water source - Monitoring and evaluation of O&M works at main and secondary canal levels - Monitoring and evaluation of O&M works at secondary and tertiary canal level by FWUC - Monitoring and evaluation of FWUC activities	

Source; JICA Survey Team

(2) Formation and Strengthening of FWUC

Formation and strengthening of FWUC under RCHRSP will be implemented for model area extending 570ha based on the organization to be established through the support of TSC-3 as being planned. The proposed activities for are tabulated as follows:

Table AE-4.10.2.2.2 Proposed Activities for Formation and Strengthening of FWUC (RCHRSP)

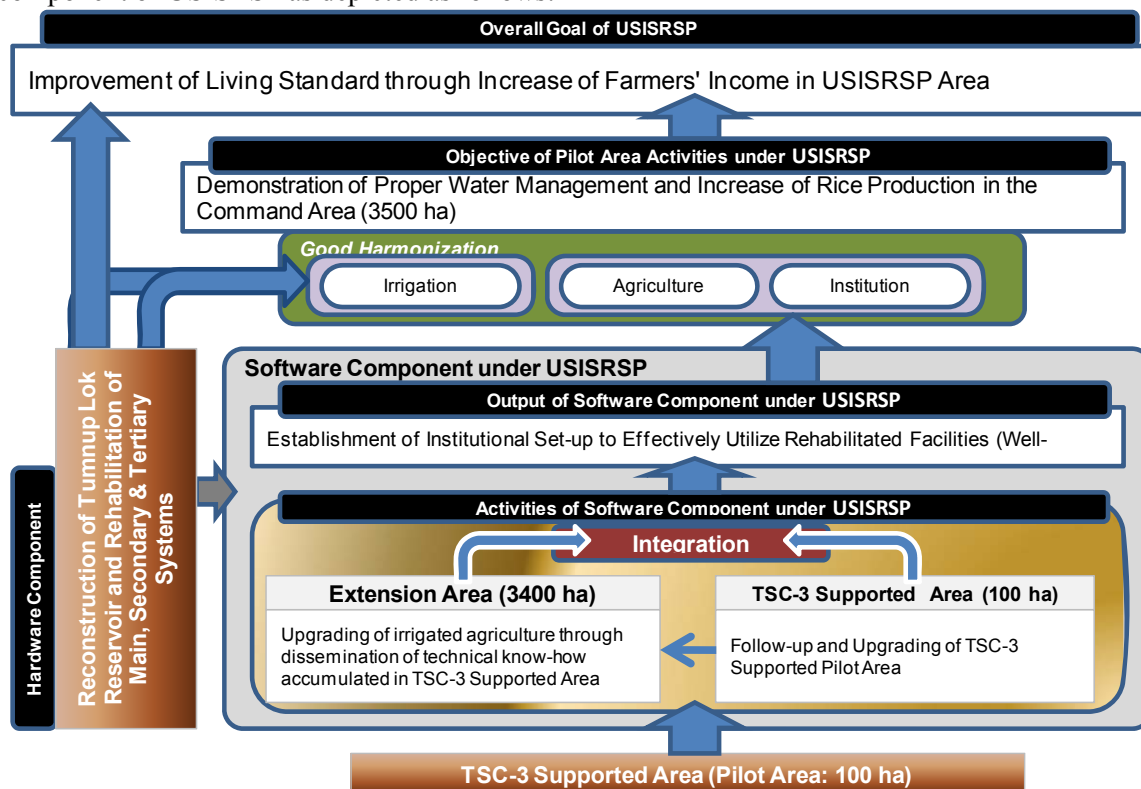
Narrative Summary of Proposed Activities	
Objective - FWUC is established and strengthened in the model area of Roleang Chrey Irrigation System to properly carry out O&M of secondary and tertiary canal level facilities.	
Output (a) Improvement of technical capability on Training Management of PDOWRAM staff 1) Training management through TOT is understood by PDOWRAM staff. (b) FWUC establishment and strengthening (FWUC: 1 no., FWUG: 3 nos., Sub-FWUG: 22 nos.) 1) FWUC is established and registered to cover model area (570 ha). 2) Member of FWUC in model area of Roleang Chrey Irrigation System understands irrigation O&M skills and necessary activities. (c) Monitoring and evaluation is properly carried out by MOWRAM and PDOWRAM staff for FWUC activities at Roleang Chrey Irrigation System. 1) Support and instruction for PDOWRAM Staff's support activities to FWUC is carried out timely by MOWRAM. 2) Monitoring and instruction to FWUC activities are timely carried out by PDOWRAM staff.	
Activity (7 years) (a) TOT for PDOWRAM Staff 1) Training to PDOWRAM staff: 7 nos. (1 time/year) (b) Training to FWUC 1) Organizational strengthening (awareness raising, organizational management, financial management, conflict resolution etc.): 8 nos. (2 times/year) 2) O&M (irrigation plan, water management, maintenance of facilities etc.): 14 nos. (2 times/year) (c) Monitoring and Evaluation 1) Monitoring and evaluation of field activities by MOWRAM staff 2) Monitoring and evaluation of field activities by PDOWRAM staff	Input - National consultant: 10.5 M/M (Institutional Expert: 1.5 M/M / year × 7 years) - Vehicle - Training materials - Monitoring cost - Other direct cost (allowance for participants, fuel, registration etc.)
Training Subject Target FWUC: 1 no., FWUG: 3 nos., Sub-FWUG: 22 nos. (a) FWUC and its formation - Irrigation plan - FWUC and its objectives and organization - FWUC formation process - Responsibility/duty and right etc. (b) FWUC management - Formation process of FWUC - Organizational management - Financial management including bank account, cash book, accounting book, ISF, revenue and expense of FWUC - Conflict management - Budgeting (c) O&M of irrigation facilities - Irrigation plan for model area - Water management at secondary, tertiary and water course level - Maintenance work including repair work - Preparation of annual water management schedule - ISF and cost for O&M	

Source; JICA Survey Team

AE-4.10.3 Software Component under USISRSP

AE-4.10.3.1 Approach

In general, similar approach as RCHRSP will be applied for the implementation of software component of USISRSP as depicted as follows:



Source; JICA Survey Team

Figure AE-4.10.3.1.1 Approach of Software Component under USISRSP

In the command area of Slakou Irrigation System as well, JICA's technical cooperation, TSC-3 is under preparation to start pilot project covering 100 ha under secondary canal blocks (secondary canal No.1 and No.2). Therefore, maximum utilization of output from TSC-3 pilot area will be useful to materialize overall improvement of O&M in the command area of Slakou Irrigation System. Software component under USISRSP is similarly proposed for: (i) follow-up of TSC-3 supported area (100 ha) and (ii) extension of technical know-how to remaining area (3,400 ha). USISRSP objective will be attained by integrating the results from both areas.

(1) Overall Goal of USISRSP

USISRSP's overall goal is "improvement of living standard through increase of farmers' income in USISRSP Area.

(2) Objective of Software Component under USISRSP

Objective of software component under USISRSP is, with the support of hardware component by the construction of Tumnup Lok reservoir, rehabilitation of main & secondary systems and new construction of tertiary system, demonstration of proper water management and increase of rice production in the Slakou Irrigation System (3,500 ha) through good harmonization of irrigation, agriculture and institution. Output of software component under USISRSP is "establishment of institutional set-up to effectively utilize rehabilitated facilities (well-trained FWUCs with technical know-how in farming: 3,400 ha)."

AE-4.10.3.2 Activities

Among three activities proposed for software component, two activities: (i) Capacity Development of MOWRAM and PDOWRAM Staff on O&M and (ii) Formation and Strengthening of FWUC of USISRSP are described as follows:

(1) Capacity Development of MOWRAM and PDOWRAM Staff on O&M

In order to establish institutional set-up for effective O&M of rehabilitated facilities, proposed activities for capacity development of MOWRAM and PDOWRAM staff on O&M under USISRSP are tabulated as follows:

Table AE-4.10.3.2.1 Proposed Activities for Capacity Development of MOWRAM and PDOWRAM Staff on O&M (USISRSP)

Narrative Summary of Proposed Activities	
<p>Objective</p> <ul style="list-style-type: none"> - Institutional set-up for O&M within MOWRAM and PDOWRAM is established to effectively utilize irrigation facilities at the main canal level. 	
<p>Output</p> <p>(a) Improvement of technical capability on O&M of MOWRAM and PDOWRAM Staff</p> <ol style="list-style-type: none"> 1) Capability of relevant MOWRAM staff is enhanced in instructing and supporting field level O&M activities of irrigation facilities by PDOWRAM staff 2) Capability of PDOWRAM staff is improved in O&M skills for irrigation facilities. <p>(b) Monitoring and evaluation is properly carried out by MOWRAM and PDOWRAM staff for field activities at Slakou Irrigation System.</p> <ol style="list-style-type: none"> 1) Support and instruction for PDOWRAM Staff's field activities is carried out timely by MOWRAM. 2) Monitoring and instruction to district staff activities are timely carried out by PDOWRAM staff. 	
<p>Activity (4 years)</p> <p>(a) O&M Training (Slakou Irrigation System: 3,500 ha)</p> <ol style="list-style-type: none"> 1) Water management training for MOWRAM staff: 4 nos. (1 time/year) 2) Water management training for PDOWRAM staff: 8 nos. (2 times/year) 3) Maintenance training for MOWRAM staff: 4 nos. (1 time/year) 4) Maintenance training for PDOWRAM staff: 8 nos. (2 times/year) <p>(b) Monitoring and Evaluation</p> <ol style="list-style-type: none"> 1) Monitoring and evaluation of field activities by MOWRAM staff 2) Monitoring and evaluation of field activities by PDOWRAM staff 	<p>Input</p> <ul style="list-style-type: none"> - Foreign consultant: 1.5 M/M (O&M Expert) - National consultant: 6 M/M (Irrigation Expert 3 M/M and O&M Expert 3 M/M) - Vehicle - Training materials - Monitoring cost - Other direct cost (allowance for participants, fuel etc.)
<p>Training Subject</p> <p>(a) Overall Training Management</p> <ul style="list-style-type: none"> - Outline of O&M and strengthening of FWUCs - Outline of agriculture support services - O&M of major and minor facilities - FWUC's participation in irrigation system management - Facilitation skills of FWUCs - Coordination among relevant agencies <p>(b) Tumnap Lok and Kpob Trobek Reservoirs Gate O&M</p> <ul style="list-style-type: none"> - Gate operation rule including coordination among relevant organizations - Water management of Tumnap Lok and Kpob Trobek Reservoirs - Gate maintenance including emergency repair <p>(c) Irrigation O&M</p> <ul style="list-style-type: none"> - Irrigation planning in the Slakou Irrigation System (3,500 ha) - Water management at main and secondary canal levels - Maintenance work including repairing at main and secondary canal level <p>(d) Monitoring and evaluation</p> <ul style="list-style-type: none"> - Meteo-hydrological data including rainfall, temperature, evaporation, humidity etc. at USISRSP area - River water level and runoff for the water source - Monitoring and evaluation of O&M works at main and secondary canal level - Monitoring and evaluation of O&M works at secondary and tertiary canal level by FWUC - Monitoring and evaluation of FWUC activities 	

Source: JICA Survey Team

(2) Formation and Strengthening of FWUC

Proposed activities for formation and strengthening of FWUC under USISRSP are tabulated as follows:

Table AE-4.10.3.2.2 Proposed Activities for Formation and Strengthening of FWUC (USISRSP)

Narrative Summary of Proposed Activities	
Objective - FWUC is established and strengthened in the command area of Slakou Irrigation System to properly carry out O&M of secondary and tertiary canal level facilities.	
Output (a) Improvement of technical capability on Training Management of PDOWRAM staff 1) Training management through TOT is understood by PDOWRAM staff. (b) FWUC establishment and strengthening (FWUC: 1 no., FWUG: 14 nos., Sub-FWUG: 106 nos.) 1) FWUC is established and registered to cover Slakou Irrigation area (3,500 ha). 2) Member of FWUC in Slakou Irrigation System understand irrigation O&M skills and necessary activities. (c) Monitoring and evaluation is properly carried out by MOWRAM and PDOWRAM staff for FWUC activities at Slakou Irrigation System. 1) Support and instruction for PDOWRAM Staff's support activities to FWUC is carried out timely by MOWRAM. 2) Monitoring and instruction to FWUC activities are timely carried out by PDOWRAM staff.	
Activity (7 years) (a) TOT for PDOWRAM Staff 1) Training to PDOWRAM staff: 7 nos. (1 time/year) (b) Training to FWUC 1) Organizational strengthening (awareness raising, organizational management, financial management, conflict resolution etc.): 14 nos. (2 times/year) 2) O&M (irrigation plan, water management, maintenance of facilities etc.): 8 nos. (2 times/year) (c) Monitoring and Evaluation 1) Monitoring and evaluation of field activities by MOWRAM staff 2) Monitoring and evaluation of field activities by PDOWRAM staff	Input - National consultant: 21 M/M (Institutional Expert: 3 M/M / year × 7 years) - Vehicle - Training materials - Monitoring cost - Other direct cost (allowance for participants, fuel, registration etc.)
Training Subject Target FWUC: 1 no., FWUG: 14 nos., Sub-FWUG: 106 nos. (a) FWUC and its formation - Irrigation plan - FWUC and its objectives and organization - FWUC formation process - Responsibility/duty and right etc. (b) FWUC management - Formation process of FWUC - Organizational management - Financial management including bank account, cash book, accounting book, ISF, revenue and expense of FWUC - Conflict management - Budgeting (c) O&M of irrigation facilities - Irrigation plan for model area - Water management at secondary, tertiary and water course level - Maintenance work including repair work - Preparation of annual water management schedule - ISF and cost for O&M	

Source: JICA Survey Team

Based on the results of the verification study at pilot projects carried out during the Study on Comprehensive Agricultural Development of Prek Thnot River Basin by JICA (2005-2008), the following issues need to be considered for the process of establishment and strengthening of FWUC:

- Preparation of the cadastre and cadastral map through PRA and a participatory mapping,
- Training programs starting from how to organize and facilitate meeting,
- Construction of office building,
- Intensive training on financial management
- Information dissemination in the community through, such as FWUC magazines,
- Management transfer by the initiative of the government staffs with the assistance of FWUC,

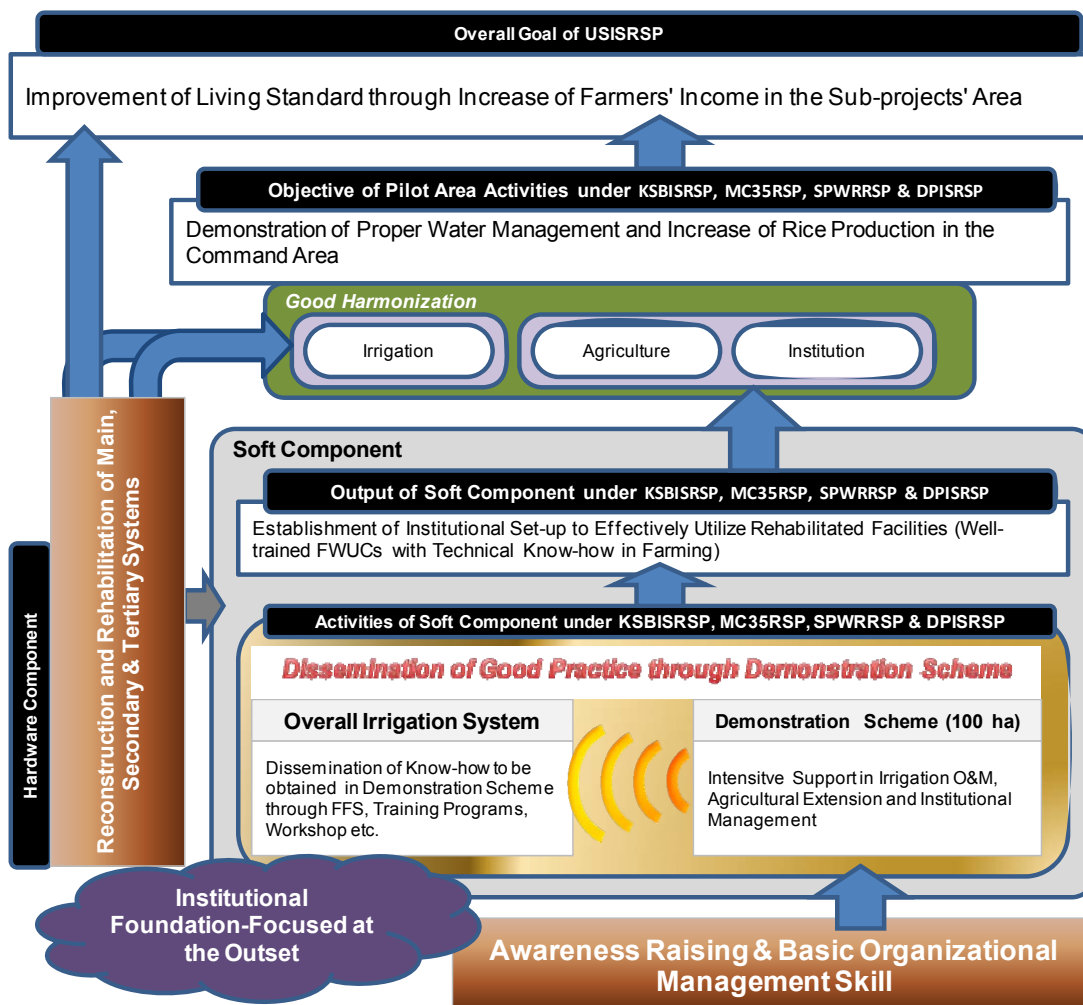
- Training on simple feasibility study, and
- Continuous support services by MOWRAM

Such useful recommendations need to be fully considered for the implementation of software component under SPPIDRIP.

AE-4.10.4 Software Component under KSBISRSP

AE-4.10.4.1 Approach

FWUC has not been established in the command area of KSBISRSP so that software component needs to be more intensive and institutional foundation-focused in the supporting process. In particular, attention needs to be given to awareness raising and basic organizational management skill of FWUC at the initial stage. Proposed approach of software component under KSBISRSP is illustrated as follows:



Source: JICA Survey Team

Figure AE-4.10.4.1.1 Approach of Software Component under KSBISRSP

As for the institutional maturity, conditions of four sub-projects consisting of: (i) KSBISRSP, (ii) MC35RSP, (iii) SPWRRSP and (iv) DPISRSP are similar as:

- No FWUC has been established while informal farmers' groups are formulated headed by commune chief,

- Existing irrigation facilities are highly deteriorated and activities of farmers' group are quite limited in water management and facilities' O&M, and
- Institutional support programs have not been actively carried out by MOWRAM, PDOWRAM and/or other relevant supporting partners.

Above-illustrated approach is, therefore, proposed to be applied for KSBISRSP, MC35RSP, SPWRRSP and DPISRSP in common.

(1) Overall Goal of KSBISRSP

Overall goal of KSBISRSP is "improvement of living standard through increase of farmers' income in KSBISRSP area."

(2) Objective of Software Component under KSBISRSP

Software component under KSBISRSP aims to, with the support of hardware component by construction and rehabilitation of main & secondary irrigation systems and new construction of tertiary system, demonstrate proper water management and to increase rice production in the Kandal Stung Extension Area (1,750 ha) and Kandal Stung-Bati Area (1,600 ha) through good harmonization of irrigation, agriculture and institution. Output of software component under KSBISRSP is "establishment of institutional set-up to effectively utilize rehabilitated facilities (well-trained FWUCs with technical know-how in farming at Kandal Stung Extension and Bati Area amounting to 3,350 ha)."

AE-4.10.4.2 Activities

Out of three activities proposed for software component, two activities: (i) Capacity Development of MOWRAM and PDOWRAM Staff on O&M and (ii) Formation and Strengthening of FWUC of KSBISRSP are described as follows:

(1) Capacity Development of MOWRAM and PDOWRAM Staff on O&M

The activities for capacity development of MOWRAM and PDOWRAM staff on O&M under KSBISRSP are proposed as shown in the following table:

Table AE-4.10.4.2.1 Proposed Activities for Capacity Development of MOWRAM and PDOWRAM Staff on O&M (KSBISRSP)

Narrative Summary of Proposed Activities	
Objective - Institutional set-up for O&M within MOWRAM and PDOWRAM is established to effectively utilize irrigation facilities at the main canal level.	
Output (a) Improvement of technical capability on O&M of MOWRAM and PDOWRAM Staff 1) Capability of relevant MOWRAM staff is enhanced in instructing and supporting field level O&M activities of irrigation facilities by PDOWRAM staff 2) Capability of PDOWRAM staff is improved in O&M skills for irrigation facilities. (b) Monitoring and evaluation is properly carried out by MOWRAM and PDOWRAM staff for field activities at Kandal Stung Extension Area and Kandal Stung-Bati Area. 1) Support and instruction for PDOWRAM Staff's field activities is carried out timely by MOWRAM. 2) Monitoring and instruction to district staff activities are timely carried out by PDOWRAM staff.	
Activity (4 years) (a) O&M Training (Kandal Stung Extension and Kandal Stung-Bati System: 3,350 ha) 1) Water management training for MOWRAM staff: 4 nos. (1 time/year) 2) Water management training for PDOWRAM staff: 8 nos. (2 times/year) 3) Maintenance training for MOWRAM staff: 4 nos. (1 time/year) 4) Maintenance training for PDOWRAM staff: 8 nos. (2 times/year) (b) Monitoring and Evaluation 1) Monitoring and evaluation of field activities by MOWRAM staff 2) Monitoring and evaluation of field activities by PDOWRAM staff	Input - Foreign consultant: 1.5 M/M (O&M Expert) - National consultant: 6 M/M (Irrigation Expert 3 M/M and O&M Expert 3 M/M) - Vehicle - Training materials - Monitoring cost - Other direct cost (allowance for participants, fuel etc.)

Narrative Summary of Proposed Activities	
<p>Training Subject</p> <p>(a) Overall Training Management</p> <ul style="list-style-type: none"> - Outline of O&M and strengthening of FWUCs - Outline of agriculture support services - O&M of major and minor facilities - FWUC's participation in irrigation system management - Facilitation skills of FWUCs - Coordination among irrigation systems in the basins - Coordination among relevant agencies <p>(b) Major Facilities O&M (Pump stations)</p> <ul style="list-style-type: none"> - Pump operation rule including coordination among relevant organizations - Water management through appropriate gate operation at main and secondary canal levels - Gate maintenance including emergency repair <p>(c) Irrigation O&M</p> <ul style="list-style-type: none"> - Irrigation planning in the Kandal Stung Extension Area and Kandal Stung-Bati Area (3,350 ha) - Water management at main and secondary canal levels - Maintenance work including repairing at main and secondary canal level <p>(d) Monitoring and evaluation</p> <ul style="list-style-type: none"> - Meteo-hydrological data including rainfall, temperature, evaporation, humidity etc. at KSBISRSP area - River water level and runoff for the water source - Monitoring and evaluation of O&M works at main and secondary canal level - Monitoring and evaluation of O&M works at secondary and tertiary canal level by FWUC - Monitoring and evaluation of FWUC activities 	

Source; JICA Survey Team

(2) Formation and Strengthening of FWUC

FWUC has not been established in both Kandal Stung Extension and Kandal Stung-Bati areas. Proposed activities for formation and strengthening of FWUC under KSBISRSP are tabulated as follows:

Table AE-4.10.4.2.2 Proposed Activities for Formation and Strengthening of FWUC (KSBISRSP)

Narrative Summary of Proposed Activities	
<p>Objective</p> <ul style="list-style-type: none"> - FWUC is established and strengthened in the command area of Kandal Stung Extension and Kandal Stung-Bati Area to properly carry out O&M of secondary and tertiary canal level facilities. 	
<p>Output</p> <p>(a) Improvement of technical capability on Training Management of PDOWRAM staff</p> <ol style="list-style-type: none"> 1) Training management through TOT is understood by PDOWRAM staff. <p>(b) FWUC establishment and strengthening (FWUC: 1 no., FWUG: 18 nos., Sub-FWUG: 67 nos.)</p> <ol style="list-style-type: none"> 1) FWUC is established and registered to cover Kandal Stung Extension and Bati Irrigation area (3,350 ha). 2) Member of FWUC in Kandal Stung Extension and Kandal Stung-Bati Area understand irrigation O&M skills and necessary activities. <p>(c) Monitoring and evaluation is properly carried out by MOWRAM and PDOWRAM staff for FWUC activities at Kandal Stung Extension and Kandal Stung-Bati Area.</p> <ol style="list-style-type: none"> 1) Support and instruction for PDOWRAM Staff's support activities to FWUC is carried out timely by MOWRAM. 2) Monitoring and instruction to FWUC activities are timely carried out by PDOWRAM staff. 	
<p>Activity (7 years)</p> <p>(a) TOT for PDOWRAM Staff</p> <ol style="list-style-type: none"> 1) Training to PDOWRAM staff: 7 nos. (1 time/year) <p>(b) Training to FWUC</p> <ol style="list-style-type: none"> 1) Organizational strengthening (awareness raising, organizational management, financial management, conflict resolution etc.): 14 nos. (2 times/year) 2) O&M (irrigation plan, water management, maintenance of facilities etc.): 8 nos. (2 times/year) <p>(c) Monitoring and Evaluation</p> <ol style="list-style-type: none"> 1) Monitoring and evaluation of field activities by MOWRAM staff 2) Monitoring and evaluation of field activities by PDOWRAM staff 	<p>Input</p> <ul style="list-style-type: none"> - National consultant: 42 M/M (Institutional Expert: 6 M/M / year × 7 years) - Vehicle - Training materials - Monitoring cost - Other direct cost (allowance for participants, fuel, registration etc.)
<p>Training Subject</p> <p>Target</p> <p>FWUC: 1 no., FWUG: 17 nos., Sub-FWUG: 67 nos.</p> <p>(a) FWUC and its formation</p>	

Narrative Summary of Proposed Activities	
<ul style="list-style-type: none"> - Irrigation plan - FWUC and its objectives and organization - FWUC formation process - Responsibility/duty and right etc. (b) FWUC management <ul style="list-style-type: none"> - Formation process of FWUC - Organizational management - Financial management including bank account, cash book, accounting book, ISF, revenue and expense of FWUC - Conflict management - Budgeting (c) O&M of irrigation facilities <ul style="list-style-type: none"> - Irrigation plan for model area - Water management at secondary, tertiary and water course level - Maintenance work including repair work - Preparation of annual water management schedule - ISF and cost for O&M 	

Source: JICA Survey Team

AE-4.10.5 Software Component under MC35RSP

AE-4.10.5.1 Approach

The approach for software component to be applied for MC35RSP is same as that described in KSBISRSP.

(1) Overall Goal of MC35RSP

Overall goal MC35RSP is “improvement of living standard through increase of farmers’ income in MC35RSP Area.”

(2) Objective of Software Component under MC35RSP

Objective of software component under MC35RSP is, with the support of hardware component by construction and rehabilitation of reservoir, main & secondary irrigation systems and new construction of tertiary system, demonstration of proper water management and increase of rice production in Main Canal 35 System through good harmonization of irrigation, agriculture and institution. Output of software component under MC35RSP is “establishment of institutional set-up to effectively utilize rehabilitated facilities (well-trained FWUCs with technical know-how in farming: 1,200 ha).”

AE-4.10.5.2 Activities

Among three activities proposed for software component, two activities: (i) Capacity Development of MOWRAM and PDOWRAM Staff on O&M and (ii) Formation and Strengthening of FWUC of MC35RSP are described as follows:

(1) Capacity Development of MOWRAM and PDOWRAM Staff on O&M

O&M of rehabilitated reservoir, main and secondary irrigation canal systems and support to FWUC for O&M of tertiary canal systems are the integral tasks by MOWRAM and PDOWRAM. Proposed activities for capacity development of MOWRAM and PDOWRAM staff on O&M under MC35RSP are tabulated as follows:

Table AE-4.10.5.2.1 Proposed Activities for Capacity Development of MOWRAM and PDOWRAM Staff on O&M (MC35RSP)

Narrative Summary of Proposed Activities	
Objective	
<ul style="list-style-type: none"> - Institutional set-up for O&M within MOWRAM and PDOWRAM is established to effectively utilize irrigation facilities at the main canal level. 	

Narrative Summary of Proposed Activities	
<p>Output</p> <p>(a) Improvement of technical capability on O&M of MOWRAM and PDOWRAM Staff</p> <p>1) Capability of relevant MOWRAM staff is enhanced in instructing and supporting field level O&M activities of irrigation facilities by PDOWRAM staff</p> <p>2) Capability of PDOWRAM staff is improved in O&M skills for irrigation facilities.</p> <p>(b) Monitoring and evaluation is properly carried out by MOWRAM and PDOWRAM staff for field activities at Main Canal 35 System.</p> <p>1) Support and instruction for PDOWRAM Staff's field activities is carried out timely by MOWRAM.</p> <p>2) Monitoring and instruction to district staff activities are timely carried out by PDOWRAM staff.</p>	
<p>Activity (4 years)</p> <p>(a) O&M Training (Main Canal 35 System: 1,200 ha)</p> <p>1) Water management training for MOWRAM staff: 4 nos. (1 time/year)</p> <p>2) Water management training for PDOWRAM staff: 8 nos. (2 times/year)</p> <p>3) Maintenance training for MOWRAM staff: 4 nos. (1 time/year)</p> <p>4) Maintenance training for PDOWRAM staff: 8 nos. (2 times/year)</p> <p>(b) Monitoring and Evaluation</p> <p>1) Monitoring and evaluation of field activities by MOWRAM staff</p> <p>2) Monitoring and evaluation of field activities by PDOWRAM staff</p>	<p>Input</p> <ul style="list-style-type: none"> - Foreign consultant: 1.5 M/M (O&M Expert) - National consultant: 6 M/M (Irrigation Expert 3 M/M and O&M Expert 3 M/M) - Vehicle - Training materials - Monitoring cost - Other direct cost (allowance for participants, fuel etc.)
<p>Training Subject</p> <p>(a) Overall Training Management</p> <ul style="list-style-type: none"> - Outline of O&M and strengthening of FWUCs - Outline of agriculture support services - O&M of major and minor facilities - FWUC's participation in irrigation system management - Facilitation skills of FWUCs - Coordination among relevant agencies <p>(b) Major Reservoir O&M</p> <ul style="list-style-type: none"> - Reservoir operation rule including coordination among relevant organizations - Reservoir maintenance including emergency repair <p>(c) Irrigation O&M</p> <ul style="list-style-type: none"> - Irrigation planning in Main Canal 35 System (1,200 ha) - Water management at main and secondary canal levels - Maintenance work including repairing at main and secondary canal levels <p>(d) Monitoring and evaluation</p> <ul style="list-style-type: none"> - Meteo-hydrological data including rainfall, temperature, evaporation, humidity etc. at MC35RSP area - River water level and runoff for the water source - Monitoring and evaluation of O&M works at main and secondary canal levels - Monitoring and evaluation of O&M works at secondary and tertiary canal level by FWUC - Monitoring and evaluation of FWUC activities 	

Source; JICA Survey Team

(2) Formation and Strengthening of FWUC

As similarly proposed in KSBISRSP, FWUC has not been established under the area of MC35RSP. In order to establish effective O&M set-up at farmers' level, proposed activities for formation and strengthening of FWUC under MC35RSP are tabulated as follows:

Table AE-4.10.5.2.2 Proposed Activities for Formation and Strengthening of FWUC (MC35RSP)

Narrative Summary of Proposed Activities
<p>Objective</p> <ul style="list-style-type: none"> - FWUC is established and strengthened in the command area of Main Canal 35 System to properly carry out O&M of secondary and tertiary canal level facilities.
<p>Output</p> <p>(a) Improvement of technical capability on Training Management of PDOWRAM staff</p> <p>1) Training management through TOT is understood by PDOWRAM staff.</p> <p>(b) FWUC establishment and strengthening (FWUC: 1 no., FWUG: 6 nos., Sub-FWUG: 20 nos.)</p> <p>1) FWUC is established and registered to cover Main Canal 35 System area (850 ha).</p> <p>2) Member of FWUC in Main Canal 35 System Area understand irrigation O&M skills and necessary activities.</p> <p>(c) Monitoring and evaluation is properly carried out by MOWRAM and PDOWRAM staff for FWUC activities at Main Canal 35 System Area.</p> <p>1) Support and instruction for PDOWRAM Staff's support activities to FWUC is carried out timely by MOWRAM.</p> <p>2) Monitoring and instruction to FWUC activities are timely carried out by PDOWRAM staff.</p>

Narrative Summary of Proposed Activities	
<p>Activity (7 years) (a) TOT for PDOWRAM Staff 1) Training to PDOWRAM staff: 7 nos. (1 time/year) (b) Training to FWUC 1) Organizational strengthening (awareness raising, organizational management, financial management, conflict resolution etc.): 14 nos. (2 times/year) 2) O&M (irrigation plan, water management, maintenance of facilities etc.): 8 nos. (2 times/year) (c) Monitoring and Evaluation 1) Monitoring and evaluation of field activities by MOWRAM staff 2) Monitoring and evaluation of field activities by PDOWRAM staff</p>	<p>Input - National consultant: 21 M/M (Institutional Expert: 3 M/M / year × 7 years) - Vehicle - Training materials - Monitoring cost - Other direct cost (allowance for participants, fuel, registration etc.)</p>
<p>Training Subject Target FWUC: 1 no., FWUG: 6 nos., Sub-FWUG: 20 nos. (a) FWUC and its formation - Irrigation plan - FWUC and its objectives and organization - FWUC formation process - Responsibility/duty and right etc. (b) FWUC management - Formation process of FWUC - Organizational management - Financial management including bank account, cash book, accounting book, ISF, revenue and expense of FWUC - Conflict management - Budgeting (c) O&M of irrigation facilities - Irrigation plan for model area - Water management at secondary, tertiary and water course level - Maintenance work including repair work - Preparation of annual water management schedule - ISF and cost for O&M</p>	

Source: JICA Survey Team

AE-4.10.6 Software Component under SPWRRSP

AE-4.10.6.1 Approach

The approach for software component under SPWRRSP is same as that described in KSBISRSP.

(1) Overall Goal of SPWRRSP

Overall goal SPWRRSP is “improvement of living standard through increase of farmers’ income in SPWRRSP area.”

(2) Objective of Software Component under SPWRRSP

Objective of software component under SPWRRSP is, with the support of hardware component by construction and rehabilitation of reservoir dyke and canal systems, demonstration of proper water management and increase of rice production in Sras Prambai System through good harmonization of irrigation, agriculture and institution. Output of software component under SPWRRSP is “establishment of institutional set-up to effectively utilize rehabilitated facilities (well-trained FWUCs with technical know-how in farming: 1,200 ha).”

AE-4.10.6.2 Activities

Three activities are proposed for software component under SPWRRSP, out of which two activities: (i) Capacity Development of MOWRAM and PDOWRAM Staff on O&M and (ii) Formation and Strengthening of FWUC of SPWRRSP are described as follows:

(1) Capacity Development of MOWRAM and PDOWRAM Staff on O&M

Enhancement of relevant government staff is indispensable for effective O&M of SPWRRSP particularly joint operation of rehabilitated reservoir with FWUC. To do so, proposed activities for

capacity development of MOWRAM and PDOWRAM staff on O&M under SPWRRSP are tabulated as follows:

Table AE-4.10.6.2.1 Proposed Activities for Capacity Development of MOWRAM and PDOWRAM Staff on O&M (SPWRRSP)

Narrative Summary of Proposed Activities	
<p>Objective</p> <ul style="list-style-type: none"> - Institutional set-up for O&M within MOWRAM and PDOWRAM is established to effectively utilize irrigation facilities at the main canal level. 	
<p>Output</p> <p>(a) Improvement of technical capability on O&M of MOWRAM and PDOWRAM Staff</p> <ol style="list-style-type: none"> 1) Capability of relevant MOWRAM staff is enhanced in instructing and supporting field level O&M activities of irrigation facilities by PDOWRAM staff 2) Capability of PDOWRAM staff is improved in O&M skills for irrigation facilities. <p>(b) Monitoring and evaluation is properly carried out by MOWRAM and PDOWRAM staff for field activities at Srrass Prambai System.</p> <ol style="list-style-type: none"> 1) Support and instruction for PDOWRAM Staff's field activities is carried out timely by MOWRAM. 2) Monitoring and instruction to district staff activities are timely carried out by PDOWRAM staff. 	
<p>Activity (4 years)</p> <p>(a) O&M Training (Srrass Prambai System: 1,200 ha)</p> <ol style="list-style-type: none"> 1) Water management training for MOWRAM staff: 4 nos. (1 time/year) 2) Water management training for PDOWRAM staff: 8 nos. (2 times/year) 3) Maintenance training for MOWRAM staff: 4 nos. (1 time/year) 4) Maintenance training for PDOWRAM staff: 8 nos. (2 times/year) <p>(b) Monitoring and Evaluation</p> <ol style="list-style-type: none"> 1) Monitoring and evaluation of field activities by MOWRAM staff 2) Monitoring and evaluation of field activities by PDOWRAM staff 	<p>Input</p> <ul style="list-style-type: none"> - Foreign consultant: 1.5 M/M (O&M Expert) - National consultant: 6 M/M (Irrigation Expert 3 M/M and O&M Expert 3 M/M) - Vehicle - Training materials - Monitoring cost - Other direct cost (allowance for participants, fuel etc.)
<p>Training Subject</p> <p>(a) Overall Training Management</p> <ul style="list-style-type: none"> - Outline of O&M and strengthening of FWUCs - Outline of agriculture support services - O&M of major and minor facilities - FWUC's participation in irrigation system management - Facilitation skills of FWUCs - Coordination among relevant agencies <p>(b) Reservoir O&M</p> <ul style="list-style-type: none"> - Gate operation rule including coordination among relevant organizations - Water management of Reservoir - Gate maintenance including emergency repair <p>(c) Irrigation O&M</p> <ul style="list-style-type: none"> - Irrigation planning in Srrass Prambai System (1,200 ha) - Water management at canal systems <p>(d) Monitoring and evaluation</p> <ul style="list-style-type: none"> - Meteo-hydrological data including rainfall, temperature, evaporation, humidity etc. - Reservoir water level and runoff for the water source - Monitoring and evaluation of O&M works at canal systems - Monitoring and evaluation of FWUC activities 	

Source: JICA Survey Team

(2) Formation and Strengthening of FWUC

Until now, FWUC has not been organized in Srrass Prambai system and informal farmers group is in place for executing limited O&M activities . Since Srrass Prambai is a water recession system, major activities of FWUC will be focused on reservoir O&M. Proposed activities for formation and strengthening of FWUC under SPWRRSP are tabulated as follows:

Table AE-4.10.6.2.2 Proposed Activities for Formation and Strengthening of FWUC (SPWRRSP)

Narrative Summary of Proposed Activities
<p>Objective</p> <ul style="list-style-type: none"> - FWUC is established and strengthened in the command area of Srrass Prambai System to properly carry out O&M of main reservoir and canal systems together with PDOWRAM.

Narrative Summary of Proposed Activities	
<p>Output</p> <p>(a) Improvement of technical capability on Training Management of PDOWRAM staff 1) Training management through TOT is understood by PDOWRAM staff.</p> <p>(b) FWUC establishment and strengthening (FWUC: 1 no., FWUG: 5 nos.) 1) FWUC is established and registered to cover Srass Prambai System area (1,200 ha). 2) Member of FWUC in Srass Prambai System Area understand irrigation O&M skills and necessary activities.</p> <p>(c) Monitoring and evaluation is properly carried out by MOWRAM and PDOWRAM staff for FWUC activities at Srass Prambai System Area. 1) Support and instruction for PDOWRAM Staff's support activities to FWUC is carried out timely by MOWRAM. 2) Monitoring and instruction to FWUC activities are timely carried out by PDOWRAM staff.</p>	
<p>Activity (7 years)</p> <p>(a) TOT for PDOWRAM Staff 1) Training to PDOWRAM staff: 7 nos. (1 time/year)</p> <p>(b) Training to FWUC 1) Organizational strengthening (awareness raising, organizational management, financial management, conflict resolution etc.): 14 nos. (2 times/year) 2) O&M (irrigation plan, water management, maintenance of facilities etc.): 8 nos. (2 times/year)</p> <p>(c) Monitoring and Evaluation 1) Monitoring and evaluation of field activities by MOWRAM staff 2) Monitoring and evaluation of field activities by PDOWRAM staff</p>	<p>Input</p> <ul style="list-style-type: none"> - National consultant: 21 M/M (Institutional Expert: 3 M/M / year × 7 years) - Vehicle - Training materials - Monitoring cost - Other direct cost (allowance for participants, fuel, registration etc.)
<p>Training Subject</p> <p>Target FWUC: 1 no., FWUG: 6 nos. (no sub-FWUG will be developed.)</p> <p>(a) FWUC and its formation</p> <ul style="list-style-type: none"> - Irrigation plan - FWUC and its objectives and organization - FWUC formation process - Responsibility/duty and right etc. <p>(b) FWUC management</p> <ul style="list-style-type: none"> - Formation process of FWUC - Organizational management - Financial management including bank account, cash book, accounting book, ISF, revenue and expense of FWUC - Conflict management - Budgeting <p>(c) O&M of irrigation facilities</p> <ul style="list-style-type: none"> - Irrigation plan for model area - Water management at main reservoir with the support of PDOWRAM - Water management at canal systems - Maintenance work including repair work - Preparation of annual water management schedule - ISF and cost for O&M 	

Source: JICA Survey Team

AE-4.10.7 Software Component under DPISRSP

AE-4.10.7.1 Approach

The approach for software component to be applied for DPISRSP is same as that described in KSBISRSP.

(1) Overall Goal of DPISRSP

Overall goal of DPISRSP is “improvement of living standard through increase of farmers’ income in DPISRSP Area.”

(2) Objective of Software Component under DPISRSP

Software component under DPISRSP aims to, with the support of hardware component by construction and rehabilitation of weir, main & secondary systems and new construction of tertiary system, demonstrate proper water management and increase rice production in Daun Pue Irrigation System through good harmonization of irrigation, agriculture and institution. Output of software component under DPISRSP is “establishment of institutional set-up to effectively utilize rehabilitated facilities (well-trained FWUCs with technical know-how in farming: 1,150 ha).”

AE-4.10.7.2 Activities

In SPPIDRIP, among three activities proposed for software component, two activities: (i) Capacity Development of MOWRAM hand PDOWRAM Staff on O&M and (ii) Formation and Strengthening of FWUC of DPISRSP are described as follows:

(1) Capacity Development of MOWRAM and PDOWRAM Staff on O&M

Major activities of MOWRAM and PDOWRAM are O&M of rehabilitated facilities consisting of headworks, main and secondary canal systems of Daun Pue Irrigation system. In order for relevant staff to perform such important tasks, proposed activities for capacity development of MOWRAM and PDOWRAM staff on O&M under DPISRSP are tabulated as follows:

Table AE-4.10.7.2.1 Proposed Activities for Capacity Development of MOWRAM and PDOWRAM Staff on O&M (DPISRSP)

Narrative Summary of Proposed Activities	
<p>Objective</p> <ul style="list-style-type: none"> - Institutional set-up for O&M within MOWRAM and PDOWRAM is established to effectively utilize irrigation facilities at the main canal level. 	
<p>Output</p> <ul style="list-style-type: none"> (a) Improvement of technical capability on O&M of MOWRAM and PDOWRAM Staff <ul style="list-style-type: none"> 1) Capability of relevant MOWRAM staff is enhanced in instructing and supporting field level O&M activities of irrigation facilities by PDOWRAM staff 2) Capability of PDOWRAM staff is improved in O&M skills for irrigation facilities. (b) Monitoring and evaluation is properly carried out by MOWRAM and PDOWRAM staff for field activities at Daun Pue Irrigation System. <ul style="list-style-type: none"> 1) Support and instruction for PDOWRAM Staff’s field activities is carried out timely by MOWRAM. 2) Monitoring and instruction to district staff activities are timely carried out by PDOWRAM staff. 	
<p>Activity (4 years)</p> <ul style="list-style-type: none"> (a) O&M Training (Daun Pue Irrigation System: 1,150 ha) <ul style="list-style-type: none"> 1) Water management training for MOWRAM staff: 4 nos. (1 time/year) 2) Water management training for PDOWRAM staff: 8 nos. (2 times/year) 3) Maintenance training for MOWRAM staff: 4 nos. (1 time/year) 4) Maintenance training for PDOWRAM staff: 8 nos. (2 times/year) (b) Monitoring and Evaluation <ul style="list-style-type: none"> 1) Monitoring and evaluation of field activities by MOWRAM staff 2) Monitoring and evaluation of field activities by PDOWRAM staff 	<p>Input</p> <ul style="list-style-type: none"> - Foreign consultant: 1.5 M/M (O&M Expert) - National consultant: 6 M/M (Irrigation Expert 3 M/M and O&M Expert 3 M/M) - Vehicle - Training materials - Monitoring cost - Other direct cost (allowance for participants, fuel etc.)
<p>Training Subject</p> <ul style="list-style-type: none"> (a) Overall Training Management <ul style="list-style-type: none"> - Outline of O&M and strengthening of FWUCs - Outline of agriculture support services - O&M of major and minor facilities - FWUC’s participation in irrigation system management - Facilitation skills of FWUCs - Coordination among relevant agencies (b) Major Intake Weir Gate O&M <ul style="list-style-type: none"> - Gate operation rule including coordination among relevant organizations - Water management of Intake Weirs - Gate maintenance including emergency repair (c) Irrigation O&M <ul style="list-style-type: none"> - Irrigation planning in Daun Pue System (1,150 ha) - Water management at main and secondary canal levels - Maintenance work including repairing at main and secondary canal levels (d) Monitoring and evaluation <ul style="list-style-type: none"> - Meteo-hydrological data including rainfall, temperature, evaporation, humidity etc. at DPISRSP area - River water level and runoff for the water source - Monitoring and evaluation of O&M works at main and secondary canal levels - Monitoring and evaluation of O&M works at secondary and tertiary canal level by FWUC - Monitoring and evaluation of FWUC activities 	

Source: JICA Survey Team

(2) Formation and Strengthening of FWUC

No FWUC has been established instead informal farmers' group is currently organized. However, their activities for O&M of irrigation facilities are quite limited. Proposed activities for formation and strengthening of FWUC under DPISRSP are tabulated as follows:

Table AE-4.10.7.2.2 Proposed Activities for Formation and Strengthening of FWUC (DPISRSP)

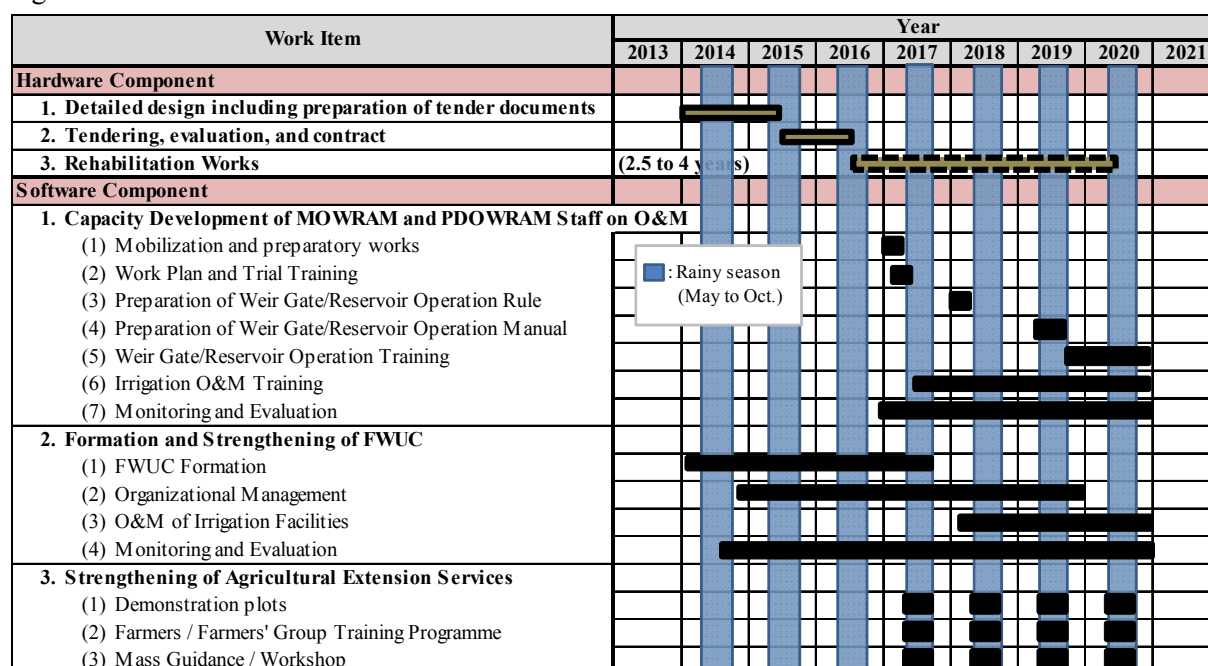
Narrative Summary of Proposed Activities	
<p>Objective</p> <ul style="list-style-type: none"> - FWUC is established and strengthened in the command area of Daun Pue Irrigation System to properly carry out O&M of secondary and tertiary canal level facilities. 	
<p>Output</p> <ul style="list-style-type: none"> (a) Improvement of technical capability on Training Management of PDOWRAM staff <ul style="list-style-type: none"> 1) Training management through TOT is understood by PDOWRAM staff. (b) FWUC establishment and strengthening (FWUC: 1 no., FWUG: 4 nos., Sub-FWUG: 23 nos.) <ul style="list-style-type: none"> 1) FWUC is established and registered to cover Daun Pue Irrigation System area (1,150 ha). 2) Member of FWUC in Daun Pue Irrigation System Area understand irrigation O&M skills and necessary activities. (c) Monitoring and evaluation is properly carried out by MOWRAM and PDOWRAM staff for FWUC activities at Daun Pue Irrigation System Area. <ul style="list-style-type: none"> 1) Support and instruction for PDOWRAM Staff's support activities to FWUC is carried out timely by MOWRAM. 2) Monitoring and instruction to FWUC activities are timely carried out by PDOWRAM staff. 	
<p>Activity (7 years)</p> <ul style="list-style-type: none"> (a) TOT for PDOWRAM Staff <ul style="list-style-type: none"> 1) Training to PDOWRAM staff: 7 nos. (1 time/year) (b) Training to FWUC <ul style="list-style-type: none"> 1) Organizational strengthening (awareness raising, organizational management, financial management, conflict resolution etc.): 14 nos. (2 times/year) 2) O&M (irrigation plan, water management, maintenance of facilities etc.): 8 nos. (2 times/year) (c) Monitoring and Evaluation <ul style="list-style-type: none"> 1) Monitoring and evaluation of field activities by MOWRAM staff 2) Monitoring and evaluation of field activities by PDOWRAM staff 	<p>Input</p> <ul style="list-style-type: none"> - National consultant: 21 M/M (Institutional Expert: 3 M/M / year × 7 years) - Vehicle - Training materials - Monitoring cost - Other direct cost (allowance for participants, fuel, registration etc.)
<p>Training Subject</p> <p>Target FWUC: 1 no., FWUG: 4 nos., Sub-FWUG: 23 nos.</p> <ul style="list-style-type: none"> (a) FWUC and its formation <ul style="list-style-type: none"> - Irrigation plan - FWUC and its objectives and organization - FWUC formation process - Responsibility/duty and right etc. (b) FWUC management <ul style="list-style-type: none"> - Formation process of FWUC - Organizational management - Financial management including bank account, cash book, accounting book, ISF, revenue and expense of FWUC - Conflict management - Budgeting (c) O&M of irrigation facilities <ul style="list-style-type: none"> - Irrigation plan for model area - Water management at secondary, tertiary and water course level - Maintenance work including repair work - Preparation of annual water management schedule - ISF and cost for O&M 	

Source; JICA Survey Team

AE-4.10.8 Implementation Schedule of Software Component under SPPIDRIP

Beneficiary farmers should be provided with the necessary information about Sub-projects in each area by means of public consultation, workshops and meetings as soon as D/D starts. Such activities will be a kick-off part of institutional development followed by group formation and strengthening. Therefore, substantial activities on Formation and Strengthening of FWUC are planned to be implemented from 2014 to 2020 over 7 years in concurrence with the progress of hardware component. On the other hand, two activities, Capacity Development of MOWRAM and PDOWRAM Staff on O&M and Strengthening of Agricultural Extension Services will be carried out from 2017 to 2020

over 4 years. Overall implementation time schedule of software component is illustrated in Figure AE-4.10.8.1.



Source: JICA Survey Team

Figure AE-4.10.8.1 Overall Implementation Schedule of Software Component under SPPIDRIP

(1) Capacity Development of MOWRAM and PDOWRAM Staff on O&M

The program will be implemented based on existing organizational set-up within MOWRAM and PDOWRAM. Foreign consultant will be assigned at the initial stage of the program to prepare work plan and conduct training needs assessment and trial trainings in the early 2017. In succession, PMU Japan Support Fund will manage overall activities with employing national consultants and utilizing technical curricula accumulated in TSC over 4 years until 2020.

(2) Formation and Strengthening of FWUC

This program will be implemented from 2014 for 2020 commencing with FWUC formation activities followed by capacity strengthening of organizational management and O&M of irrigation facilities. Overall activities will be monitored and evaluated by PMU Japan Support Fund for regular feed-back to improve supporting process. Although FWUCs have been already established in both RCHRSP and USISRSP Areas, their activities and areal coverage are limited. Therefore, adequate time needs to be allocated for formation and/or restructuring of existing FWUCs.

(3) Strengthening of Agricultural Extension Services

The program will focus on improvement of agricultural productivity (rice and vegetables such as cucumber, string bean, tomato, mung bean etc.) in early rainy season and rainy season cropping over 4 years from 2017 to 2020. Intensive training will be carried out through trial farming in demonstration plots in each Sub-project area, FFS and mass guidance/workshop, particularly during early rainy and rainy season, to be technically managed by PDA at the field under the control of technical unit of PMU Japan Support Fund.

AE-4.11 Implementation Organization

AE-4.11.1 General

A practical and functional implementation organization is indispensable for successful implementation of the Project. In MOWRAM, many projects have been completed and/or are under operation either by RGC force account and/or financial assistance of development partners. In this chapter, the implementation organizations designed in NWISP which is substantially completed as of June 2011, and in WRMSDP and West Tonle Sap Irrigation and Drainage Rehabilitation and Improvement Project (WTSIDRIP) which would launch into implementation shortly, are taken up for review. The review results will be reflected upon the design of more suitable implementation structure for the Project.

AE-4.11.2 Implementation Organization Applied /Proposed in Other Projects

(1) Northwest Irrigation Sector Project

Figure AE-4.11.2.1 shows the implementation organization for NWISP. MOWRAM is the Executing Agency for implementation of the Project. However, successful implementation of the Project requires the cooperation of several ministries. The Project Steering Committee (PSC) was established in 2002 to achieve the inter-ministerial coordination. The Government intended it to continue to function beyond project implementation. It was chaired by a representative (undersecretary of state level) from MEF and comprises a national project coordinator from MOWRAM (undersecretary of state level) as secretary and representatives (undersecretary of state or director levels) of concerned ministries such as MEF, MOWRAM, MAFF, Ministry of Environment (MOE), Ministry of Rural Development (MRD), Ministry of Public Works and Transport (MPWT), and Council for Development of Cambodia. PSC is responsible for overall direction of NWISP and interagency coordination, and meets at least twice a year.

In MOWRAM, a Project Management Office (PMO) was established to manage and implement not only NWISP, but also the other projects. PMO has overall responsibility for implementation of NWISP using the PMO staff and drawing additional specialist staff from relevant MOWRAM departments. PMO is responsible for day-to-day management issues.

In PDOWRAM, a Project Implementation Unit (PIU) is established at each PDOWRAM to be headed by a full-time Provincial Project Manager assisted by seconded staff from each of the relevant agencies such as PDA, Provincial Department of Land Management and Urban Construction (PDLMUPC) and Provincial Department of Environment (PDOE). PIU is responsible for day to day management of project activities at the provincial level. Provincial coordination is achieved through a Provincial Project Coordination Committee (PPCC) chaired by a provincial deputy governor and comprising representatives (director level) of the provincial line departments directly concerned with NWISP.

An Environment Management Unit (EMU) is established within PMO and staffed by one environmental specialist and one sociologist. Similarly, at the provincial level, each PIU has on environmental specialist from PDOE.

A Resettlement Unit (RU) is established in MOWRAM. RU is responsible for (i) supervising the Resettlement Working Group at provincial level in the landholding identification surveys, socioeconomic surveys, detailed measurements for identifying affected people, and land adjustments/consolidations resolution process required for the resettlement plans and (ii) preparing the

resettlement plans and submitting them to Inter-ministerial Resettlement Committee (IRC), ADB and AFD for endorsement and subsequent implementation through MEF. During design preparation, Resettlement Working Groups were established in all target provinces except Siem Reap. Each group consists of representatives from PDOWRAM (3), PDA (2) and PDLMUPC (2).

As for consulting services, NWISP applied the co-finance of ADB (loan) and AFD (grant) to strengthen the inputs of man power toward timely completion of the project works.

As mentioned above, the implementation organization for NWISP was minutely designed for achieving its successful implementation and management of NWISP. According to the interview with ADB, this implementation organization is functioning well although there have been some problems. For example, the implementation organization needs to hold the meeting of PSC, but it has hardly been held so far. It is also reported that technical consultants under cooperation of MOWRAM staff, has highly contributed to successful implementation of NWSIP in the proposed implementation organization. It means that NWISP has been difficult to be implemented as planned without the technical consultants. When having executed the Study on Comprehensive Agricultural Development of Prek Thnot River Basin, then JICA Study Team had a chance to contact with EMU established under NWSIP to discuss the environmental matter. Consequently, then JICA Study Team has found the needs of further training of EMU staff because they have showed so positive attitude toward settlement of environmental matter, but unfortunately they have had less experience and poor knowledge on environmental matter as EMU.

(2) Water Resources Management Sector Development Program

Figure AE-4.11.2.2 shows the implementation organization proposed for WRMSDP which is expected to set out on implementation shortly. The proposed implementation organization is designed based on that for NWISP although some modifications are made because WRMSDP will rather focus on the capacity development of relevant agencies than implementation of infrastructure.

There are two Executing Agencies: MOWRAM and MEF. MOWRAM will be responsible for overall program implementation of WRMSDP and MEF will monitor the use of loan proceeds and counterpart funds to be generated from the program loan.

PSC will be established for the overall program, and will be chaired by the Minister of MOWRAM, with the Secretary of State of MOWRAM assigned as permanent vice chair. PSC will include high level representatives of MAFF, MEF, MOE, MRD, Ministry of Health (MOH), MPWT, Ministry of Mines and Energy (MIME), MLMUPC, MOP, Ministry of Women's Affairs (MOWA) and National Disaster Management Committee (NDMC). PSC will be responsible for overall direction of WRMSDP, inter-agency coordination and program monitoring, and will meet at least twice a year.

PMO for PSC will be established within MOWRAM, for which the Program Director will be appointed as its head. The primary role of PSC will be to coordinate, monitor and report on program activities to PSC and ADB.

MOWRAM will establish four units: Water Resources Program Unit (WRPU), Irrigation Services Program Unit (ISPU), Project Support Unit (PSU), and Project Management and Implementation Monitoring Unit (PMIMU) as shown below:

Table AE-4.11.2.1 Responsible Department and Person and Mission of Unit

Unit	Responsible Department and Person	Mission
WRPU	Established within Department of Water Resources Management and Conservation with Director, Water Resources Management and Conservation appointed as Output A Program Manager	Support WRMSDP Output A (Enhanced Capacity of the Government to Manage Water Resources and the promotion of irrigated water resources management initiatives in Cambodia.
ISPU	Established within Department of Irrigated Agriculture with Director, Irrigated Agriculture appointed as Output B Program Manager	Support WRMSDP Output B (Enhanced Capacity of MOWRAM to Manage and Deliver Irrigation Services) and the promotion of irrigated water resources management initiatives in Cambodia.
PSU	Established within Department of Engineering with Director, Engineering appointed as Project Manager	Support Sector Development Program Output C (Sustainable Rehabilitation of Existing Small- and Medium-scale Irrigation Schemes in the Tonle Sap and manage the day-to-day implementation of the project.
PMIMU	Established within Department of Planning and International Cooperation with Director, Planning and International Cooperation as responsible person	Support WRMSDP management and monitoring.

Source: Memorandum of Understanding between the Government of Cambodia and Asian Development Bank

In NWISP, PPCC was established to achieve provincial coordination, so that this coordination arrangement functioned satisfactorily. Following this arrangement system, PPCC will be organized in WRMSDP, too. It will be chaired by a provincial governor and comprise representatives (director level) of the provincial line departments directly concerned with the project.

PIU was also established within PDOWRAM in each of the relevant province in NWISP. WRMSDP will follow this arrangement. It will be headed by a full-time provincial project manager assisted by staff assigned from each relevant line agencies such as PDA, PDLMUPCC and PDOE. PIU will be responsible for day-to-day management of project activities at the provincial level.

As for agricultural support services, PDA in respective provincials will be engaged through direct contracting with MOWRAM at the central level to provide support services to beneficial farmers in the project-financed sub-projects as is the case under NWISP. PDA will develop the annual work plans to coincide with scheme rehabilitation activities, which will be endorsed by PSU to cover the range of support services to be provided.

As mentioned above, the proposed implementation organization is modified based on the results of implementation of NWISP. And this implementation organization is designed in a concept of effective use of existing organization and in consideration of decentralization.

(3) West Tonle Sap Irrigation and Drainage Rehabilitation and Improvement Project

The proposed implementation organization for WTSIDRIP is illustrated in Figure AE-4.7.2.3. WTSIDRIP will be also expected to launch for implementation soon.

The National Steering Committee will be established for coordinating among relevant ministries and advising PMU Japan Support Fund at the national level. It will be chaired by the Minister of MOWRAM and involve the representatives of MAFF, MEF, MOE and other relevant ministries as members.

PMU Japan Support Fund was established within MOWRAM in October 2008, aiming to take responsibility of implementation and management of all projects by Japan's ODA. A Project Director will be assigned to manage PMU Japan Support Fund. Under the Project Director, a Project Manager will be appointed to make overall control and manage WTSIDRIP through establishment of four Units

of Administration and Finance, Procurement, Resettlement and Environment, Technical and FWUC and Agriculture Support Activities. As for the Agriculture Support Activities Unit, its staff will be dispatched from MAFF under the control of PMU Japan Support Fund.

At the provincial level, PIU will be established within PDOWRAM of each relevant province, to supervise activities of the project. PIU will be headed by Director of PDOWRAM. Agriculture support and FWUC strengthening activities will be jointly executed by PDOWRAM and Commune Councils (CCs) and others. Table AE-4.7.2.2 shows general tasks of these organizations.

Table AE-4.11.2.2 General Tasks of Proposed Organizations

Organizations	Task
Steering Committee	<ul style="list-style-type: none"> - Provision of the necessary political coordination and supports from the relevant Ministries to MOWRAM to carry out the Project in effective and efficient manner - Assisting for the arrangement of necessary technical support and supplemental budget to be required for the Project - Monitoring of Project progress and provision of advices when necessary
PMU Japan Support Fund	<ul style="list-style-type: none"> - Overall management of the Project - Preparation of annual disbursement plan of the Project - Coordination with relevant technical departments within MOWRAM - Procurement of the technical consultant - Procurement of contractors for hardware component - Overall supervision and guidance to the technical consultant and the contractors to be engaged in the Project - Supervision of land acquisition, necessary for the Project, by RU - Monitoring and evaluation as well as reporting of project progress to relevant Ministries and the Steering Committee
MAFF	<ul style="list-style-type: none"> - Dispatch of necessary staff to the PMU Japan Support Fund for the implementation of Agriculture Support Activities - Technical advice to PMU Japan Support Fund in Agriculture Support Activities
Provincial PIU	<ul style="list-style-type: none"> - Supervision of construction works at the field level supported by MOWRAM - Preparation of annual work plan in collaboration with PMU Japan Support Fund - Coordination with relevant rural administration including provincial government and commune councils - Provision of advice to the technical consultant including available data and information related with each sub-project - Provision of supervision and guidance to the local contractors - Progress monitoring and evaluation of the Project and regular report to PMU Japan Support Fund - Performing any other tasks necessary to support PMU Japan Support Fund
CCs	<ul style="list-style-type: none"> - Coordination with MOWRAM, PDOWRAM and farmers for the implementation of the Project at the commune level - Support of FWUC establishment and strengthening - Coordination with FWUC for irrigation system O&M - Internal monitoring at the commune level

Source: Final Report, Special Assistance for Project Formation for West Tonle Sap Irrigation and Drainage Rehabilitation and Improvement Project

In the implementation organization proposed, five units will be newly established under the new Project Manager to be appointed. If considering the implementation of WTSIDRIP only, it is deemed to be applicable. However, in case other projects such as SPPIDRIP and SMSISRIP will enter into implementation under Japan's loan, it seems difficult to apply it because one Project Manager could not manage them, and also establishing five units every sub-projects is difficult or rather impossible judging from available staff of MOWRAM.

AE-4.11.3 Proposed Implementation Organization for Southwest Phnom Penh Irrigation and Drainage Rehabilitation and Improvement Project

As mentioned above, three implementation organizations applied and/or proposed were studied. As the results of the study and also discussion with MOWRAM, the proposed implementation organization

for SPPIDRIP is designed on the basis of that for WTSIDRIP taking into due consideration the following matters:

- The implementation organization for WTSIDRIP has been already accepted by MOWRAM and JICA.
- Major purpose of SPPIDRIP is to increase of agricultural production by applying the integrated approach of hard component (rehabilitation and improvement of existing irrigation and drainage facilities) and software component (strengthening of agricultural support and relevant organizations), which is just the same development concept with WTSIDRIP.
- Implementation organization for WRMSDP is designed focusing on the capacity building of relevant agencies to water resources development, which is rather deviated from the purpose of SPPIDRIP.
- In case of WTSIDRIP, it is possible to use the existing units such as PSC, RU and EMU established in NWISP.
- There is no overlap in PIU at provincial level between WTSIDRIP and SPPIDRIP.
- It was further confirmed that MOWRAM could arrange the implementation organization proposed for WTSIDRIP.

For the implementation organization proposed for WTSIDRIP, however it is proposed to make some modifications as stated below:

- Positioning of JICA will be clarified in the implementation organization.
- Provincial Level Project Manager will be precisely assigned as responsible person for management of PIU, aiming at smooth and efficient implementation of SPPIDRIP.
- Relation between PIU and PDA will be clearly indicated in the implementation organization.
- In case the Sub-project area extends over plural provinces, a PIU Coordination Committee will be established to keep close communication between the relevant PDOWRAMs toward smooth implementation of Sub-project. The key staff of each PDOWRAM concerned will be appointed as members of PIU Coordination Committee.

Figure AE-4.11.3.1 shows the proposed implementation organization for SPPIDRIP. The major tasks of each organization are tabulated below:

Table AE-4.11.3.1 Major Tasks of Each Organization

Organizations	Major Tasks
National Steering Committee	<ul style="list-style-type: none"> - Operation of National Steering Committee chaired by the Minister of MOWRAM with the secretary of State of MOWRAM assigned as permanent vice chair, including high level representatives of MAFF, MEF, MOE,MRD,MOH,MPWT, MIME, MLMUPC, MOP, MOWA and NDMC - Provision of the necessary political coordination and supports from the relevant Ministries to MOWRAM to carry out the Project in effective and efficient manner - Assisting for the arrangement of necessary technical support and supplemental budget to be required for the Project - Advice to Provincial Coordination Committee - Monitoring of Project progress and provision of advices when necessary
PMU Japan Support Fund headed by Project Director subordinating National Level Project Manager	<ul style="list-style-type: none"> - Operation of PMU Japan Support Fund by Project Director - Overall management of the Project - Preparation of annual disbursement plan of the Project - Coordination with four Units within MOWRAM - Procurement of the consultant - Procurement of contractors for hardware component - Overall supervision and guidance to the consultant and the contractors to be engaged in the Project - Supervision of land acquisition, necessary for the Project, by RU - Monitoring and evaluation as well as reporting of project progress to relevant Ministries and the Steering Committee

Organizations	Major Tasks
TSC	- Advice to PMU Japan Support Fund in accordance with TSC's missions
JICA	- Assistance and advice to PMU Japan Support Fund for smooth implementation of the Project under Japan's Loan
Provincial PIU headed by Provincial Level Project Manager	- Supervision of construction works for the Sub-project at the field level supported by MOWRAM - Preparation of annual work plan in collaboration with PMU Japan Support Fund - Coordination with relevant rural administration including provincial government and commune councils - Provision of advice to the technical consultant including available data and information related with each sub-project - Provision of supervision and guidance to the local contractors - Progress monitoring and evaluation of the Project and regular report to PMU Japan Support Fund - Performing any other tasks necessary to support PMU Japan Support Fund
Provincial Coordination Committee	- Assistance and advice to CCs for smooth implementation of Sub-project at provincial level
PIU Coordination Committee	- Coordination of relevant PIUs toward smooth implementation of Sub-project
CCs	- Coordination with MOWRAM, PDOWRAM and farmers for the implementation of the Project at the commune level - Support of FWUC establishment and strengthening - Coordination with FWUC for irrigation system O&M - Internal monitoring at the commune level

Source: JICA Survey Team

AE-4.11.4 Application of Priority Operation Cost

According to the information from ADB, ADB has applied the Priority Operation Cost (POC) to MOWRAM staff in his projects for smooth implementation of the project. It was informed that this POC would be covered with a part of loan or grant. In the said NWISP and WRMSDP, POC has been applied or might be applied respectively which is highly appreciated for MOWRAM staff. It is deemed that POC is one of unignored factors from the viewpoint of whether the project is successfully implemented or not, especially under conditions of the limited budget for outsourcing. In the near future, implementation of the Project and WTSIDRIP under Japan's loan might be started in parallel to WRMSDP by ADB. Even in this case, it is expected that any confusion would not bring about in MOWRAM staff.

As explained in the previous section, during the field survey, shortage of operation cost at the field level was pointed out by relevant PDOWRAM staff as one of the serious constraints in project implementation and O&M of irrigation facilities. In order to minimize such problems, budgetary arrangement for the field works for the staff of MOWRAM and PDOWRAM would be highly required for SPPIDRIP.

AE-4.11.5 Staff Required for Design and Construction Works

Smooth project implementation requires full-time professional staff from MOWRAM and PDOWRAM at the central and the provincial level, which will be directly and indirectly supported by relevant technical department. During design and construction stage of SPPIDRIP, necessary number of staff is tabulated as follows:

Table AE-4.11.5.1 Staff Required for Design and Construction Works for SPPIDRIP

Organizations	Position	Nos.
Central Level PMU Japan Support Fund	Project Director	1
	Project Manager	1
	National Level Project Manager	1
	Administration & Finance	2
	Procurement	2
	Resettlement & Environment	2

Organizations	Position	Nos.
	Technical and FWUC	2
	Agriculture (to be dispatched from MAFF)	2
Sub-total (Central Level) (=1)		13
Provincial Level		
Project Implementation Unit (PIU)		
- Kampong Speu Province <i>Roleang Chrey Irrigation System</i> & <i>Main Canal 35 System</i>	Provincial Level Project Manager/Technical	3
	Agriculture (to be dispatched from PDA)	2
Sub-Total of kampong Speu (=2)		5
- Takeo Province <i>Upper Slakou Irrigation System</i> & <i>Kandal-Stung Bati Irrigation System</i>	Provincial Level Project Manager/Technical	5
	Agriculture (to be dispatched from PDA)	11
Sub-Total of Takeo (=3)		16
- Kandal Province <i>Kandal Stung Extension Irrigation System</i> & <i>Srass Prambai Water Recession System</i>	Provincial Level Project Manager/Technical	2
	Agriculture(to be dispatched from PDA)	4
Sub-Total of Kandal (=4)		6
- Kampong Chhnang Province <i>Daun Pue Irrigation System</i>	Provincial Level Project Manager/Technical	3
	Agriculture (to be dispatched from PDA)	5
Sub-Total of Kampong Chhnang (=5)		8
Sub-total (Provincial Level) (=6=2+3+4+5)		35
Grand Total (=1+6)		48

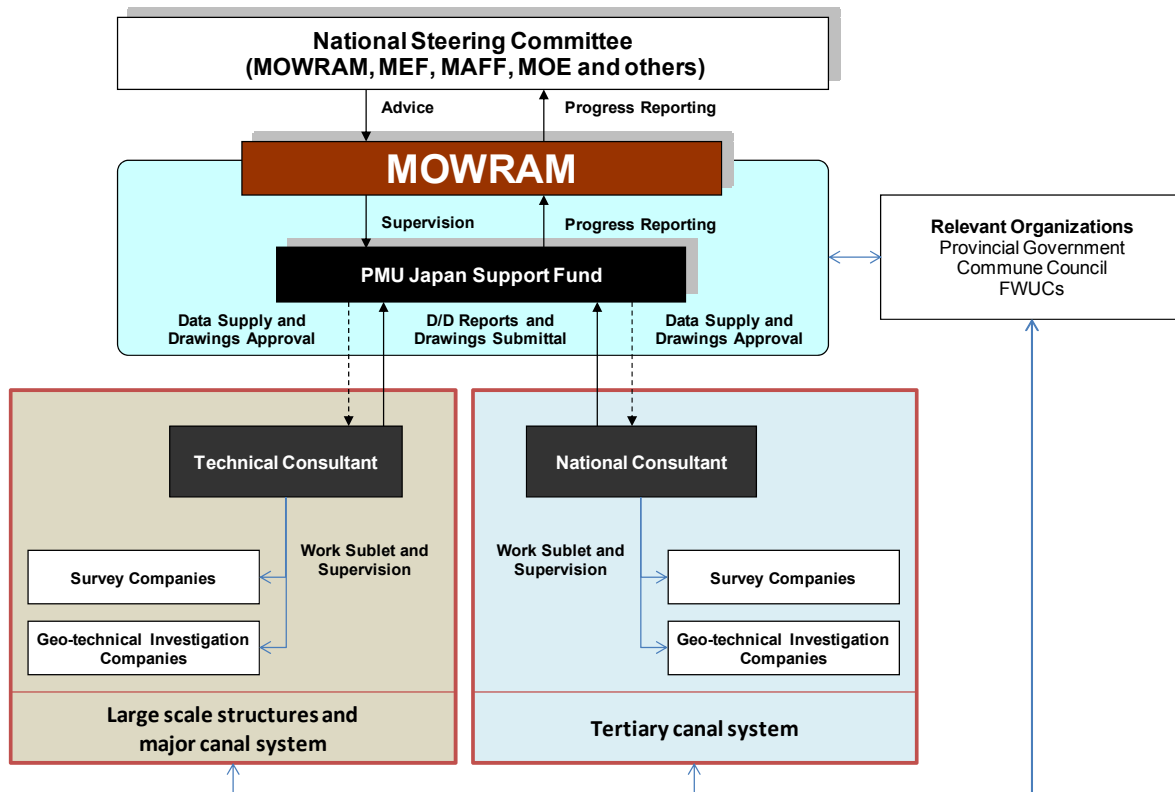
Source: JICA Survey Team

AE-4.11.6 Decision and Instruction Flow

(1) During Detailed Design

In accordance with proposed implementation organization for SPPIDRIP, decision and instruction flow is proposed on the basis of the following conditions in order to smoothly manage the Project.

- Construction works will be carried out through international competitive bidding (ICB) for main and secondary systems, and local competitive bidding (LCB) for tertiary systems.
- MOWRAM and technical consultant are required to perform their services according to the demarcation of services explained in the previous section and also attached in Annex I.
- In general, technical consultant consisting of: (i) foreign consultant and (ii) national consultant is in charge of providing services for detail design, pre-qualification (P/Q) and tender document preparation, P/Q and tender evaluation, construction supervision for **large scale structures and major canal system** under the contract with MOWRAM.
- Under the overall supervision by PMU Japan Support Fund, MOWRAM will take charge of **tertiary canal system** development including plan, survey, design and construction supervision, execution of tendering and evaluation for all the construction works by employing national consultant.
- Land acquisition and/or voluntary donation necessary for the project will be managed by Resettlement and Environment Unit under PMU Japan Support Fund. At the central level, this unit coordinates with Inter-Ministerial Resettlement Committee (IRC) while at the provincial level, PIU communicate with sub-committee of IRC headed by the provincial governor to smoothen the land acquisition and/or voluntary donation.
- Project implementing system during detail design for: (i) large scale structures and major canal system and (ii) tertiary canal system is similar as that proposed in the formulation study of WTSIDRIP as shown in Figure AE-4.11.6.1.



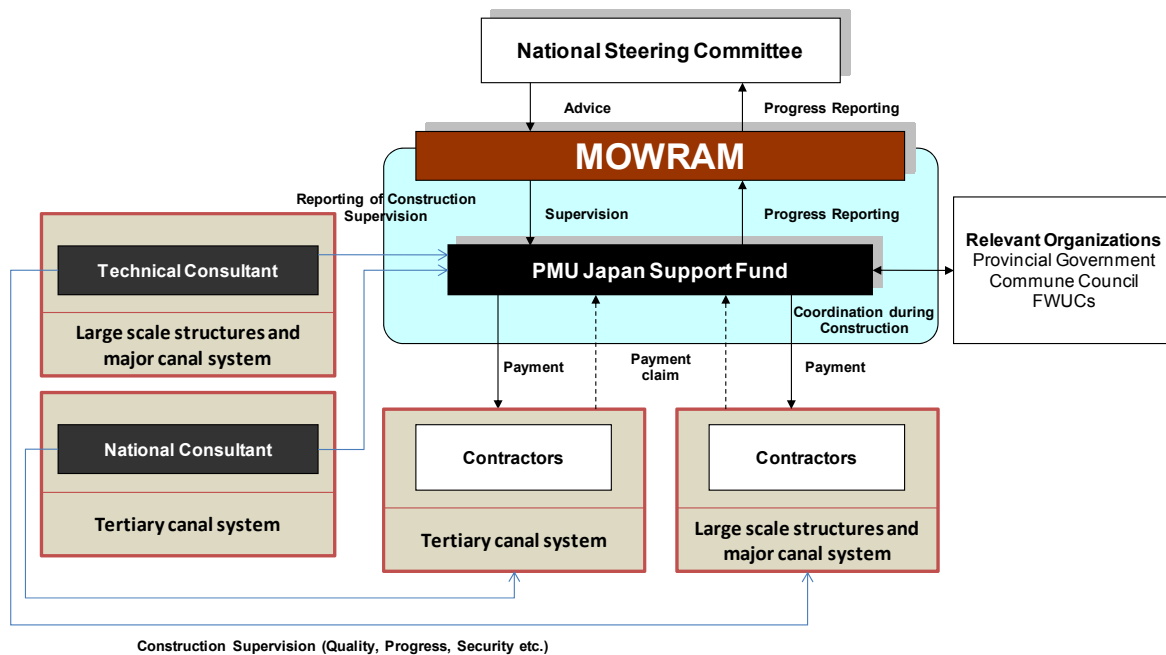
Source: JICA Survey Team

Figure AE-4.11.6.1 Project Implementing System during Detailed Design

As similarly proposed in WTSIDRIP, Technical consultant will make contract with MOWRAM for large scale structures and major canal system. Separately, PMU Japan Support Fund will employ national consultant for Tertiary canal system works. For large scale structures and major canal system, technical consultant prepares design report, drawings, pre-qualification document, tender document and submit to PMU Japan Support Fund. PMU Japan Support Fund will check the document and issue approval. Technical survey such as topographic survey and geotechnical investigation will be sublet to survey companies and/or geo-technical investigation companies, under the supervision of technical consultant. Necessary data during the design will be provided from PMU Japan Support Fund to the technical consultant. Such works for tertiary canal system will be supervised by the national consultant.

(2) During Construction

The implementing system during construction supervision for irrigation facilities are depicted in the following figure.



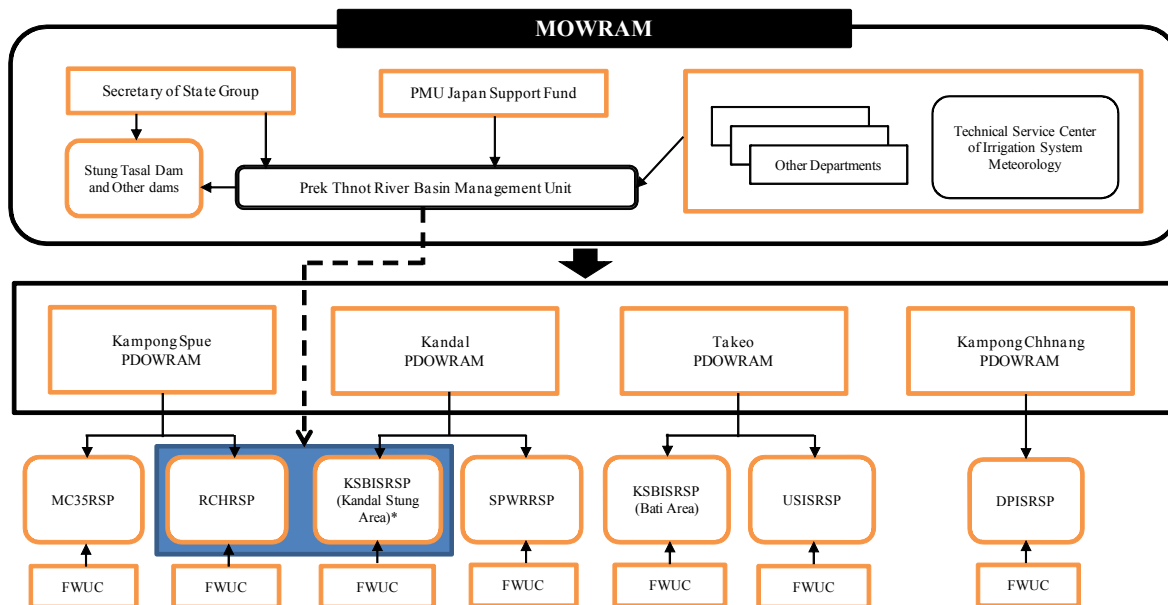
Source: JICA Survey Team

Figure AE-4.11.6.2 Project Implementing System during Construction

The contractor for large scale structures and major canal system, and those of tertiary canal system will make contract with MOWRAM and will be supervised by PMU Japan Support Fund. As same as the system during detail design, the works for large scale structures and major canal system will be technically supervised by the technical consultant while those of tertiary canal system will be managed by the national consultant.

(3) During O&M

After completion of construction works for SPPIDRIP, O&M will be started mainly by relevant PDOWRAMs and FWUCs under support of MOWRAM. The proposed organization of O&M is shown in Figure AE-4.11.6.3.

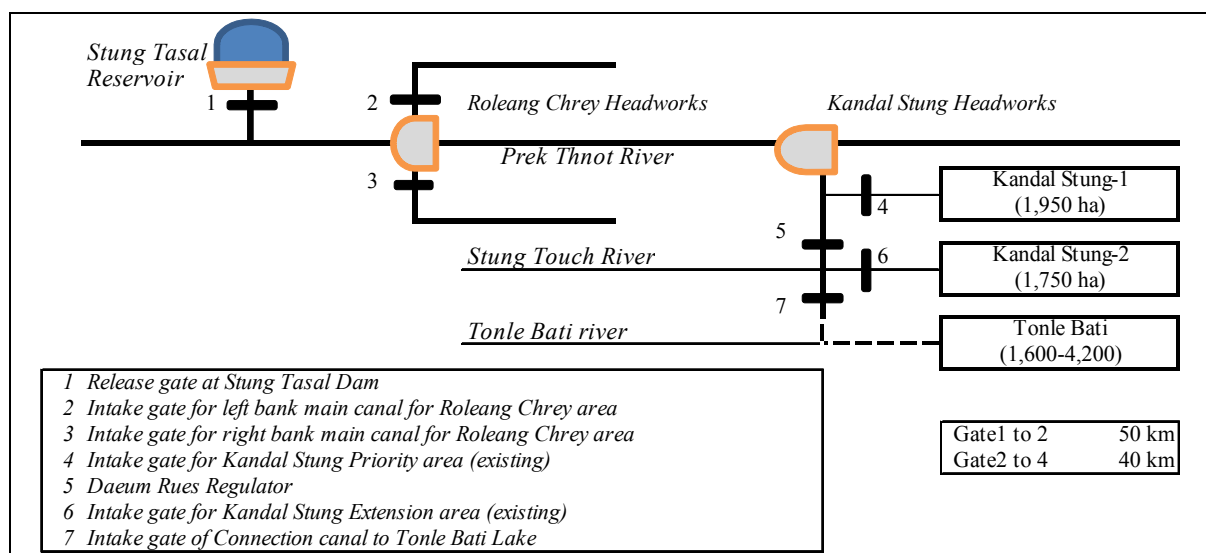


*: including Kandal Stung Area developed under Japanese Grant

Source: JICA Survey Team

Figure AE-4.11.6.3 Organization of O&M

The demarcation of O&M responsibilities between PDOWRAM and FWUC is discussed in Clause II-4.2.2. In O&M for SPPIDRIP, attention should be paid to operation of Stung Tasal dam, RCHRSP and KSBISRSP (Kandal Stung area) including Kandal Stung area developed under Japanese grant since water sources for these Sub-projects are the same, namely the discharge of Prek Thnot river and the released discharge from Stung Tasal dam shown in Figure AE-4.11.6.4.



Source: JICA Survey Team

Figure AE-4.11.6.4 Related Project/Sub-projects located in Prek Thnot River Basin

If the released discharge from Stung Tasal dam is not properly controlled, the planned discharge not be allocated to RCHRSP and KSBISRSP (Kandal Stung Area). In addition, if more water is taken at the Roleang Chrey command area, the expected water could not arrive at KSBISRSP (Kandal Stung Area) located downstream. Thus, it is crucial to make careful operation among Stung Tasal dam, RCHRSP and KSBISRSP (Kandal Stung Area). In order to do so, it is proposed to establish a Prek Thnot River Basin Management Unit. The member of unit will be collected from the relevant department such as Department of Hydrology and River Works and Department of Water Resources Management Conservation. The necessary equipment such as vehicle and communication system will be procured under SPPIDRIP.

AE-4.12 Cost Estimate of Software Component

AE-4.12.1 General

The basic conditions and assumptions employed for cost estimate of software component under SPPIDRIP are as follows:

- Cost estimate refers to the prices as of August 2011.
- Exchange rates applied are as of August 2011 based on general guidelines for 2011 F/F for Japanese ODA Loan Projects (Cambodia) as follows:
1US Dollar (US\$) = 4,109 = 79.5 Yen
- Both foreign consultant and national consultant are employed for capacity development of MOWRAM and PDOWRAM staff on O&M while FWUC strengthening program is carried out by MOWRAM with employing national consultant only.

- Software component costs are divided into foreign currency portion (FC) and local currency portion (LC). FC is the cost related with foreign consultant to be employed for capacity development of MOWRAM and PDOWRAM staff on O&M. On the other hand, LC is associated with national consultant and other direct cost for training and monitoring & evaluation by MOWRAM and PDOWRAM.

AE-4.12.2 Cost Estimate of Software Component

The cost for software component consists of: (i) consultant fee for foreign consultant, (ii) consultant fee for national consultant, (iii) training cost and (iv) monitoring and evaluation by MOWRAM and PDOWRAM staff, which are tabulated as follows:

Table AE-4.12.2.1 Cost for Software Component

(Unit: US\$)

No.	Program	Total Cost	F/C	L/C
(1)	RCHRSP (580ha)			
(a)	Capacity Development of MOWRAM and PDOWRAM Staff on O&M	102,787	54,887	47,900
(b)	FWUC Formation and Strengthening	114,590	0	114,590
	Sub-total (=1)	217,377	54,887	162,490
(2)	USISRSP (3,500ha)			
(a)	Capacity Development of MOWRAM and PDOWRAM Staff on O&M	108,387	54,887	53,500
(b)	FWUC Formation and Strengthening	237,790	0	237,790
	Sub-total (=2)	346,177	54,887	291,290
(3)	KSBSRSP (3,350ha)			
(a)	Capacity Development of MOWRAM and PDOWRAM Staff on O&M	108,387	54,887	53,500
(b)	FWUC Formation and Strengthening	310,450	0	310,450
	Sub-total (=3)	418,837	54,887	363,950
(4)	MC35RSP (850ha)			
(a)	Capacity Development of MOWRAM and PDOWRAM Staff on O&M	102,787	54,887	47,900
(b)	FWUC Formation and Strengthening	176,540	0	176,540
	Sub-total (=4)	279,327	54,887	224,440
(5)	SPWRRSP (1,200ha)			
(a)	Capacity Development of MOWRAM and PDOWRAM Staff on O&M	102,787	54,887	47,900
(b)	FWUC Formation and Strengthening	176,540	0	176,540
	Sub-total (=5)	279,327	54,887	224,440
(6)	DRISRSP (1,150ha)			
(a)	Capacity Development of MOWRAM and PDOWRAM Staff on O&M	102,787	54,887	47,900
(b)	FWUC Formation and Strengthening	176,540	0	176,540
	Sub-total (=6)	279,327	54,887	224,440
(7)	Financial Management (=3)	84,000	0	84,000
	Grand Total (=1+2+3)	1,904,371	329,321	1,575,050

Source: JICA Survey Team

ANNEX E
Tables

Table AE-4.2.3.2 Institutional Overview of FWUC under Roleang Chrey Irrigation System (1/3)

Community Name		N-6	North Roleang Chrey Main Canal	South Roleang Chrey main canal	Beung Arch Ka Ek	Phum Roung	O'veng	Total
Basic Information								
Location	Commune	Tropaeng Kormg	Tang Kroch, Chibar morn, Rokarthom, Vor sor, Tropaeng kormg, Sambo	Karheng, Kandori dom, Svay krovan, Roleang Chek, Rolaeng kreul Sen Dey, Rokar koh, Veal	Rolaeng Chork	Svay Kror Van	Ka Heng	-
	District	Samrong Torng	Chba Morn and Samrongtong	Samrong Torng and Kong Pisey	Samrong Tong	Chibar Morn	Samrong Tong	4 districts
	Nos. of village	8	52	22	12	11	23	128
	Participated Family No.	427	3,222	2,262	570	439	2,432	9,352
	Member	2,259	16,625	10,068	3,015	2,402	7,036	41,405
	Female	1,310	7,305	8,086	2,045	1,329	4,382	24,457
	Irrigated area (ha)	148.29	1,639.00	1,036.51	245.2	211.19	976	4,256.00
	Inauguration Date	20/July/2003	27/April/2003	20/May/2003	12/April/2000	27/May/2002	22/December/2001	-
Remarks		-	-	-	-	Support to FWUC Phum Roung such as group strengthening training was carried out with financial assistance by the World Bank under Flood Emergency Rehabilitation Project (FERP) in 2005.	Irrigated Agriculture On-farm Technology Improvement Pilot Project was implemented as verification study during the Study on Comprehensive Agricultural Development of Prek Thnot River Basin (JICA). In addition, 222 ha located upstream is selected as pilot area under TSC-3 Project.	-
Group Administration, Organization and Bye-laws								
By-law already prepared		Yes	Yes	Yes	Yes	Yes	Yes	-
Organization (Board Members of FWUC)		<ul style="list-style-type: none"> Chief First vice chief Second vice chief Representative of the member 	<ul style="list-style-type: none"> Chief First vice chief Second vice chief Secretary 	<ul style="list-style-type: none"> Chief First vice chief Second vice chief Secretary 	<ul style="list-style-type: none"> Chief First vice chief Second vice chief Secretary Operator 	<ul style="list-style-type: none"> Chief First vice chief Second vice chief Secretary 	<ul style="list-style-type: none"> Chief First vice chief Second vice chief Secretary 	<ul style="list-style-type: none"> Sub-groups are formulated based on administrative boundary.
Document kept by FWUC		<ul style="list-style-type: none"> Group Name List Book 	<ul style="list-style-type: none"> Group Name List Book Water Distribution Record O&M Record 	<ul style="list-style-type: none"> Group Name List Book 	<ul style="list-style-type: none"> Group Name List Book 	<ul style="list-style-type: none"> Group Name List Book 	<ul style="list-style-type: none"> Group Name List Book Accounting Book 	-
Meeting		<ul style="list-style-type: none"> Monthly Meeting 	<ul style="list-style-type: none"> Irregular 	<ul style="list-style-type: none"> Irregular 	<ul style="list-style-type: none"> Irregular 	<ul style="list-style-type: none"> Meeting held twice a year (dry season and wet season) Some other meeting irregularly 	<ul style="list-style-type: none"> Irregularly (when any issues arise) 	-
Participation Rate of the Meeting		80% Participants: Board members (4 board members and 8 village representatives)	40% Participants: Board members of the community	40% Participants: Board members and some key staff in total 23 numbers	90% Participants: Board members	30% Participants: Board members	80% Participants: Board members	-
Subject of the Meeting		<ul style="list-style-type: none"> Water management 	<ul style="list-style-type: none"> Water management O&M of facilities 	<ul style="list-style-type: none"> Water management O&M of facilities 	<ul style="list-style-type: none"> Water management O&M of facilities 	<ul style="list-style-type: none"> O&M of facilities 	<ul style="list-style-type: none"> O&M of facilities ISF collection 	-
Minutes of Meeting		No	No	Yes	Yes	Yes	Yes	-
Resources of the Group								
Total Land Available and Cultivated (ha)		374	1,639	1,038	850	518	91.99	-
- Paddy		4	67	300	10	4	-	-
- Vegetable (in dry season)			(Morning glory, cucumber, cabbage, peas etc. in dry season)	(water melon, cabbage and cucumber in dry season)				
- Livestock		2	4	-	-	1	-	-
Irrigation Rate (%)		100	100	100	100	100	100	-
- Wet								-

Table AE-4.2.3.2 Institutional Overview of FWUC under Roleang Chrey Irrigation System (2/3)

Community Name	N-6	North Roleang Chrey Main Canal	South Roleang Chrey main canal	Beung Arch Ka Ek	Phum Roung	O'veng	Total
- Dry	(Gravity: 95 %, Pump 5%) 45	(Gravity only) 45	40 (some of which are by pump)	70	(Gravity only) 10 (using individual pumps)	40	-
Satisfaction Level of Irrigation Water	(Gravity: 50 %, Pump: 50%) Fair	Satisfied (wet season) Shortage (dry season)	Satisfied (wet season) Shortage (dry season)	Fair	Satisfied (wet season) Shortage (dry season)	Satisfied (wet season) Shortage (dry season)	-
Equipment kept by the Group	None	None	None	None	None	None	-
Group Activities							
Primary Group Activities	♦ Irrigation water management ♦ O&M of facilities	♦ Irrigation water management ♦ O&M of facilities (secondary level)	♦ Irrigation water management ♦ O&M of facilities (secondary and tertiary level)	♦ Irrigation water management (secondary level) ♦ O&M of facilities(secondary level)	♦ O&M of facilities (secondary level)	♦ Irrigation water management (secondary level) ♦ O&M of facilities(secondary level)	-
Water Management							-
- In charge by	♦ Main: PDOWRAM in collaboration with FWUC ♦ Secondary: FWUC	♦ Main: PDOWRAM staff ♦ Secondary: FWUC (sub-group established by village boundary)	♦ Main: PDOWRAM and tertiary: FWUC	♦ PDOWRAM together with community's chief	♦ PDOWRAM staff	♦ Main: PDOWRAM ♦ Secondary: Chief of FWUC	-
- Frequency	♦ Irregular based on farmers' request	♦ Every day based on the request from farmers	♦ Every day based on the request from farmers	♦ Every day based on the request from farmers	♦ Every day based on the request from farmers	♦ Every day based on the request from farmers	-
- Record	No	No record by FWUC but PDOWRAM only	No	No	No record by FWUC but PDOWRAM only	No	-
Irrigation Service Fee	No Collection	No Collection	No Collection	No Collection	No Collection	Collected	-
- Amount	-	-	-	-	-	30,000 (gravity) 10,000 (pump)	-
- Collection Rate	-	-	-	-	-	70 % (gravity) 70 % (pump)	-
O&M of Facilities							-
- MOWRAM / PDOWRAM	Main & secondary canals and those related structures	Main canal and its related structures	South Main Canal and its related structures	Main canal and its related structures	Main canal and its related structures	Main canal & those related structures	-
- FWUC	Tertiary Canals	Secondary canals and those related structures	Secondary and tertiary canals	Secondary canals and those related structures	Secondary canal and its related structures	Secondary & tertiary canals and those related structures	-
Water Management based on Request	Yes	Yes	Yes	Yes	Yes	Yes	-
Manner of Water Management	No permanent device	No permanent device	No permanent device	No permanent device	Use measuring device (staff gauge)	No permanent structures	-
Frequency of Operation	Sometimes	Irregularly	Irregularly	Very often based on farmers' request	Irregularly based on farmers' request	Irregularly	-
Finance-related Activities							-
Group Saving (Financial)	No	No	No	No	No	No	-
Accessibility to Financial Institution	Yes (Individual) ACLEDA PRASAC	Yes (Individual) ACLEDA AMRET PRASAC	Yes (Individual) ACLEDA AMRET PRASAC	Yes (Individual) ACLEDA AMRET	Yes (Individual) ACLEDA AMRET PRASAC	Yes (Individual) ACLEDA PRASAC	-
Name of Institution	Once a year	Irregular	Irregular	Once a year	Irregular	Irregular	-
Frequency	Once a year	Irregular	Irregular	Once a year	Irregular	Irregular	-
Capacity Development Program and Technical Support							
Training Program Availability	Yes	Yes	Yes	Yes	Yes	Yes	-
Variety of Training Program							-
- Year	2003	2008 and 2009	2007	2002	(i) 2007 (ii) 2008	2008	-
- Subject	O&M of facilities	Water Management O&M of facilities	Water Management O&M of facilities	Water Management O&M of facilities	(i) O&M of facilities (ii) Water management and O&M of facilities	O&M of facilities + Administration	-
- Organization	PDOWRAM	PDOWRAM (financed by SEILA Program)	PDOWRAM (financed by SEILA Program)	PDOWRAM (financed by PRASAC)	(i) MOWRAM (ii) PDOWRAM	MOWRAM and PDOWRAM	-
- No. of Participants	1,500 nos. (from 8 villages)	35 nos.	30 nos.	40 nos.	(i) 55 nos. (ii) 35 nos.	18 nos.	-

Table AE-4.2.3.2 Institutional Overview of FWUC under Roleang Chrey Irrigation System (3/3)

Community Name	N-6	North Roleang Chrey Main Canal	South Roleang Chrey main canal	Beung Arch Ka Ek	Phum Roung	O'veng	Total
Frequency of Training Program	Irregular	Irregular	Irregular	Irregular	Once a year	Irregular	-
Variety of Training in which Groups Members interested	<ul style="list-style-type: none"> ◆ Water management ◆ O&M of facilities ◆ Discharge measurement 	<ul style="list-style-type: none"> ◆ O&M of irrigation facilities ◆ Training of key members among community to enhance overall group capability (TOT) ◆ Administrative management for the group ◆ Discharge measurement 	<ul style="list-style-type: none"> ◆ Water management ◆ O&M of facilities ◆ Administrative management for the group ◆ Farming techniques (rice and other crops) 	<ul style="list-style-type: none"> ◆ Water management ◆ O&M of facilities ◆ Conflict among group members ◆ Awareness raising of farmers in the importance of water 	<ul style="list-style-type: none"> ◆ Group collaborative work management ◆ Capacity development FWUC members in O&M of facilities ◆ Leadership training 	<ul style="list-style-type: none"> ◆ Encouragement of farmers to participate in group work ◆ Administrative capability enhancement (group management, accounting etc.) 	-
Intention of Group Members							
Advantage to be a Member	<ul style="list-style-type: none"> ◆ Water allocation based on request 	<ul style="list-style-type: none"> ◆ Water Allocation based on Request ◆ O&M of irrigation facilities ◆ Alleviation of conflict among farmers 	<ul style="list-style-type: none"> ◆ Water Allocation based on Request ◆ O&M of irrigation facilities 	<ul style="list-style-type: none"> ◆ Water allocation based on request ◆ O&M of irrigation facilities ◆ Alleviation of conflict among farmers 	<ul style="list-style-type: none"> ◆ Water Allocation based on Request ◆ O&M of irrigation facilities 	<ul style="list-style-type: none"> ◆ Water allocation based on request ◆ O&M of irrigation facilities ◆ Alleviation of conflict among farmers ◆ Maintain better relationship with MOWRAM, PDOWRAM, NGOs etc. 	-
Current Constraints	<ul style="list-style-type: none"> ◆ Insufficient tertiary canals (currently canal NG-2 already developed) ◆ Difficulty in water management due to conflict among member farmers ◆ Canal NG-2 highly deteriorated and some sections not functioning 	<ul style="list-style-type: none"> ◆ Deterioration of secondary canals causing difficulties in water management ◆ Lack of turnout on secondary canals ◆ Insufficient awareness among farmers for the importance of irrigation water 	<ul style="list-style-type: none"> ◆ Deterioration of some sections of secondary canals ◆ Insufficient number of turnouts on secondary canals 	<ul style="list-style-type: none"> ◆ Insufficient turnout on secondary canals ◆ Deterioration and sediment accumulation in the secondary canals ◆ Insufficient farmers' participation in water management ◆ Insufficient awareness among farmers for importance of irrigation water 	<ul style="list-style-type: none"> ◆ Difficult to organize group activities (some farmers do not follow by-laws) ◆ Difficult to collect ISF (Riel 20,000/ha/cropping season in wet season) ◆ Conflicts among members and non-members ◆ Insufficient turnout on secondary canal 	<ul style="list-style-type: none"> ◆ Insufficient budget for group works ◆ Insufficient number of turnout ◆ Difficult to collect ISF due to insufficient awareness in the importance of ISF among farmers 	-
Future Plans	<ul style="list-style-type: none"> ◆ Rehabilitation of Canal NG-2 ◆ Strengthen organizational capacity as well as individual farmers ◆ Encouragement of farmers to participate in group work 	<ul style="list-style-type: none"> ◆ Rehabilitation of secondary canals ◆ Encouragement of farmers to participate in group works ◆ Construction of FWUC office building in order to keep documents and materials and to organize meeting 	<ul style="list-style-type: none"> ◆ Awareness raising on the importance of irrigation water and O&M of irrigation facilities ◆ Encouragement of farmers to participate in group works 	<ul style="list-style-type: none"> ◆ Establishment of new group by younger generations ◆ Rehabilitation of secondary canals ◆ Enhancement of capability of community members in water management and O&M of facilities 	<ul style="list-style-type: none"> ◆ Encouragement of farmers to participate in group works ◆ Enhancement of members' capacity in O&M of facilities ◆ Improvement of farming techniques for both rice and other crops 	<ul style="list-style-type: none"> ◆ O&M of irrigation facilities through the group work ◆ Improvement of secondary and tertiary canals ◆ Promote farmers' participation in group works 	-

Source: PDOWRAM and JICA Survey Team based on Field Interview

Table AE-4.3.2.1

Institutional Overview of FWUC under Slakou Irrigation System (1/2)

Community Name		Kpob Trobek
Basic Information		
Location	Commune	O Saray (1 commune)
	District	Tramkak (1 district)
Nos. of village		33
Participated Family No.		3,338
Member	Total	2,958
	Female	380
Irrigated area (ha)		3,400
Inauguration Date		24/May/2005
Remarks		The community was established when Kpob Trobek reservoir was constructed in 2005 in order to jointly manage reservoir with PDOWRAM. The community rather focuses on O&M of reservoir at present while O&M of main canals and secondary level facilities are in still challenging.
Group Administration, Organization and Bye-laws		
By-law already prepared		Yes
Organization (Board Members of FWUC)		<ul style="list-style-type: none"> ◆ Chief ◆ Sub-chief ◆ Gate keeper ◆ Cashier (1) and Accountant (1) <p>Under which there are 4 groups in 4 communes: (i) Group-1, Ou Saray Commune, (ii) Group-2, Trapeang Thum Krang Cheung Commune, (iii) Group-3, Cheang Tong Commune and (iv) Group-4, Trapeang Thum Khang Tbound Commune. Since Group-3 and Group-4 is located downstream of the area, water supply is not sufficient and group is comparatively inactive</p>
Document kept by FWUC		<ul style="list-style-type: none"> ◆ Accounting Book ◆ Water Distribution Record ◆ O&M Record
Meeting		◆ Monthly Meeting
Participation Rate of the Meeting		90% Participants: Board members (5 board members and 8 village representatives)
Subject of the Meeting		<ul style="list-style-type: none"> ◆ Monthly work result ◆ Constraints ◆ Future Plan
Minutes of Meeting		Yes
Resources of the Group		
Total Land Available and Cultivated (ha)		
- Paddy		328.95
- Vegetable (in dry season)		-
- Livestock		-
Irrigation Rate (%)		
- Wet		100 (Gravity: 100 %)
- Dry		45 (Gravity: 100 %)
Satisfaction Level of Irrigation Water		Shortage
Equipment kept by the Group		None
Group Activities		
Primary Group Activities		<ul style="list-style-type: none"> ◆ Irrigation water management ◆ O&M of facilities
Water Management		
- In charge by		<ul style="list-style-type: none"> ◆ Main: PDOWRAM in collaboration with FWUC ◆ Secondary: FWUC
- Frequency		◆ Irregular based on farmers' request
- Record		Yes

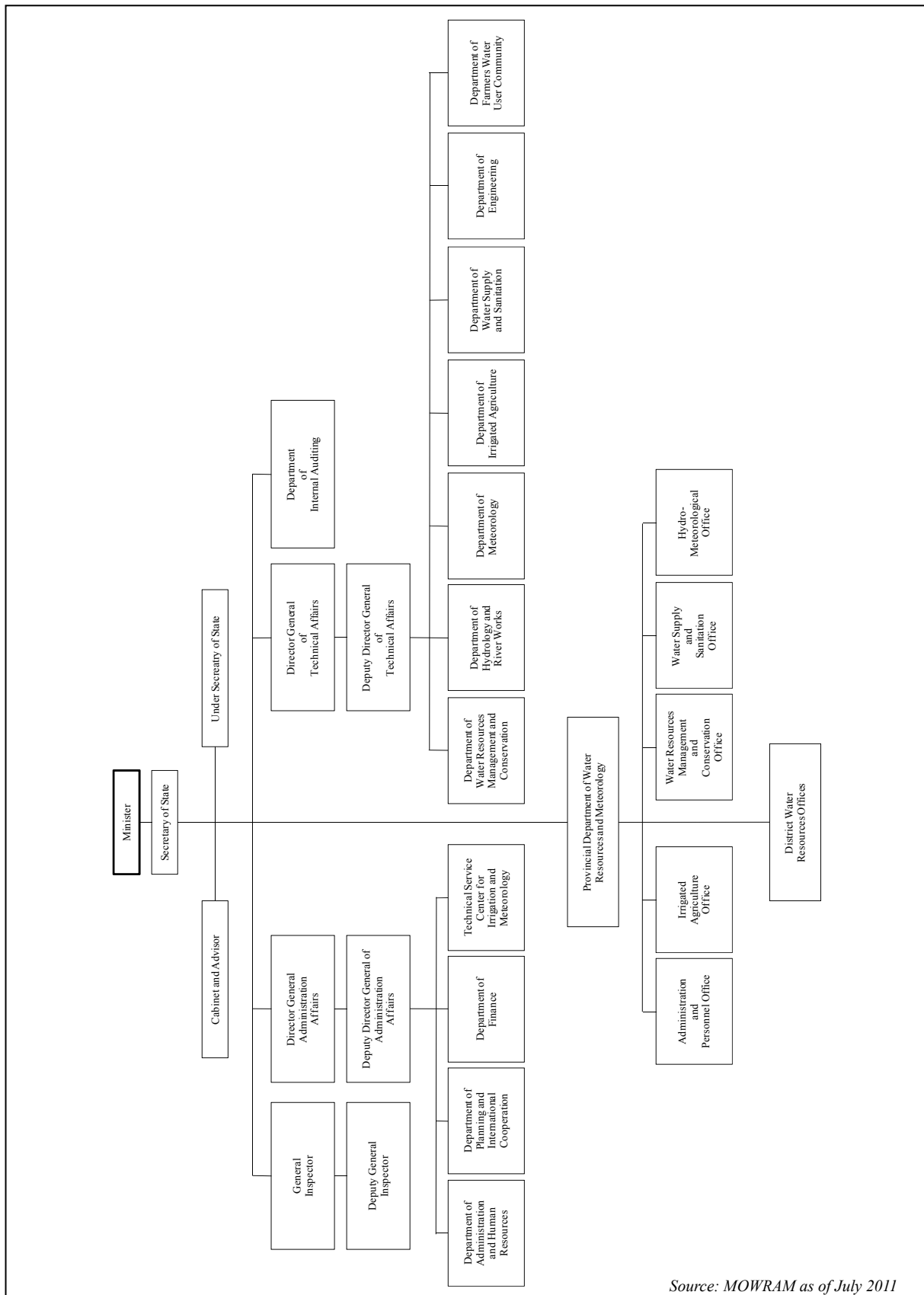
Table AE-4.3.2.1

Institutional Overview of FWUC under Slakou Irrigation System (2/2)

Community Name	Kpob Trobek
Irrigation Service Fee	Yes
- Amount	2009: 20,000 Riel/ha/cropping season, 2010: No, 2011: 30,000 Riel/ha/cropping season (under planning) (Discount of 50% is applied for poor farmers.)
- Collection Rate	80 % in 2009
O&M of Facilities	
- MOWRAM / PDOWRAM	Main and those related structures
- FWUC	Secondary and tertiary Canals
Water Management based on Request	Yes
Manner of Water Management	No permanent device
Frequency of Operation	Every day during wet season and sometimes in dry season
Finance-related Activities	
Group Saving (Financial)	No
Accessibility to Financial Institution	No
Name of Institution	-
Frequency	-
Capacity Development Program and Technical Support	
Training Program Availability	Yes
Variety of Training Program	
- Year	2008
- Subject	(i) Water Management, (ii) O&M of Irrigation Facilities
- Organization	(i) PDOWRAM, (ii) PDOWRAM
- No. of Participants	(i) 5 nos., (ii) 3 nos.
Frequency of Training Program	Irregular
Variety of Training in which Groups Members interested	<ul style="list-style-type: none"> ◆ Water management ◆ Administrative management for the group ◆ Financial management ◆ Conflict management
Intention of Group Members	
Advantage to be a Member	<ul style="list-style-type: none"> ◆ Water allocation based on request ◆ O&M of irrigation facilities ◆ Keep good relation to carry out collaborative works
Current Constraints	<ul style="list-style-type: none"> ◆ Insufficient awareness among farmers for the importance of irrigation water ◆ Difficulty in ISF collection ◆ Automatic regulating gates (4 nos.) on Kpob Trobek Reservoir not functioning properly
Future Plans	<ul style="list-style-type: none"> ◆ Continue to carry out O&M of irrigation facilities ◆ Building of FWUC office to facilitate group works

Source: PDOWRAM and JICA Survey Team based on Field Interview

ANNEX E
Figures

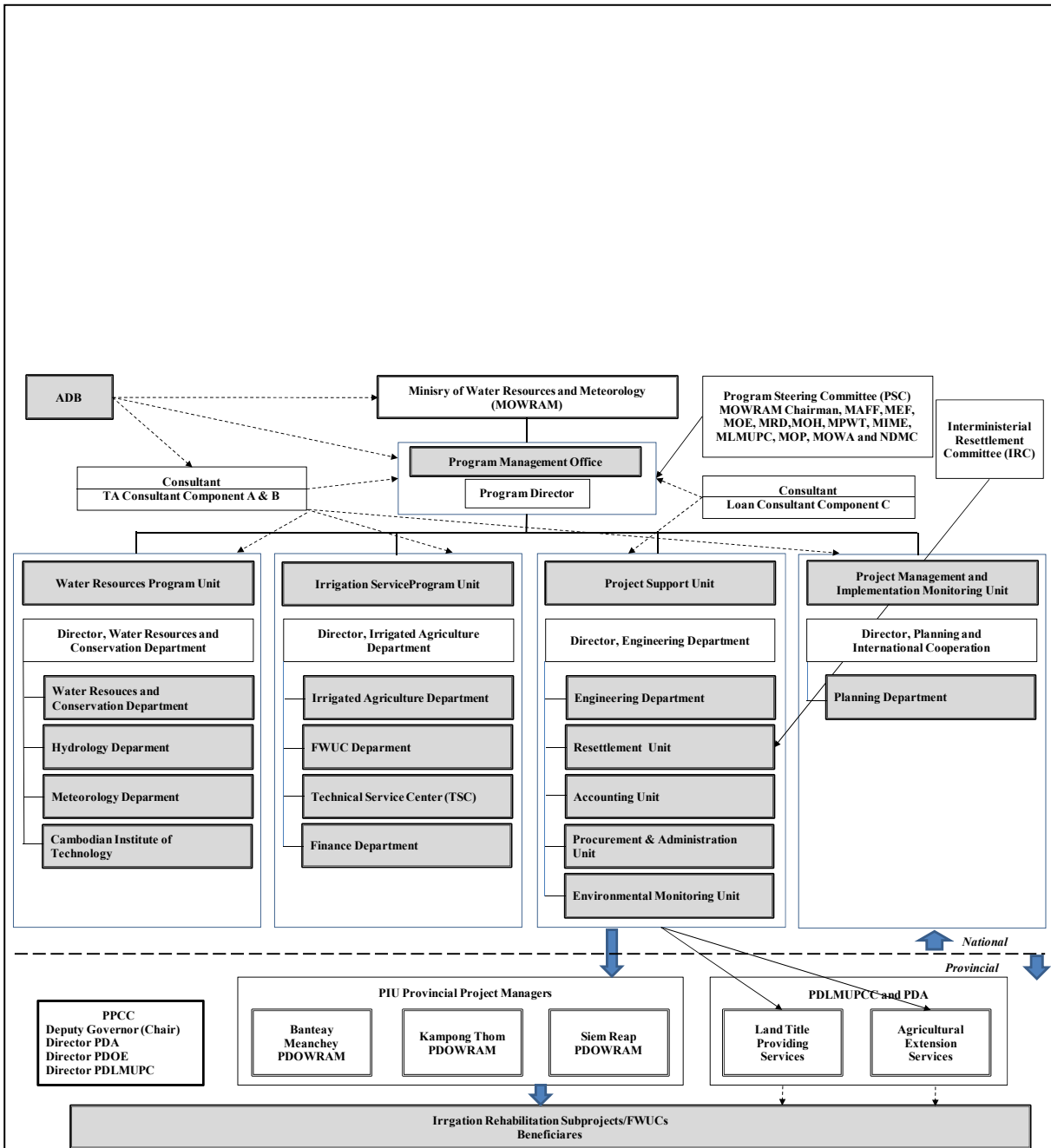


Source: MOWRAM as of July 2011

PREPARATORY SURVEY FOR IRRIGATION AND DRAINAGE SYSTEM REHABILITATION AND IMPROVEMENT PROJECT

Japan International Cooperation Agency

Figure AE-3.1.1
Organization Structure of Ministry of Water Resources and Meteorology (MOWRAM)



Note: FWUC: Farmer Water User Community, MAFF: Ministry of Agriculture, Forestry and Fisheries, MEF: Ministry of Economy and Finance, MLMUPC: Ministry of Land Management, Urban Planning and Construction, PDOWRAM: Provincial Department of Water Resources and Meteorology, PPCC: Provincial Program Coordination Committee

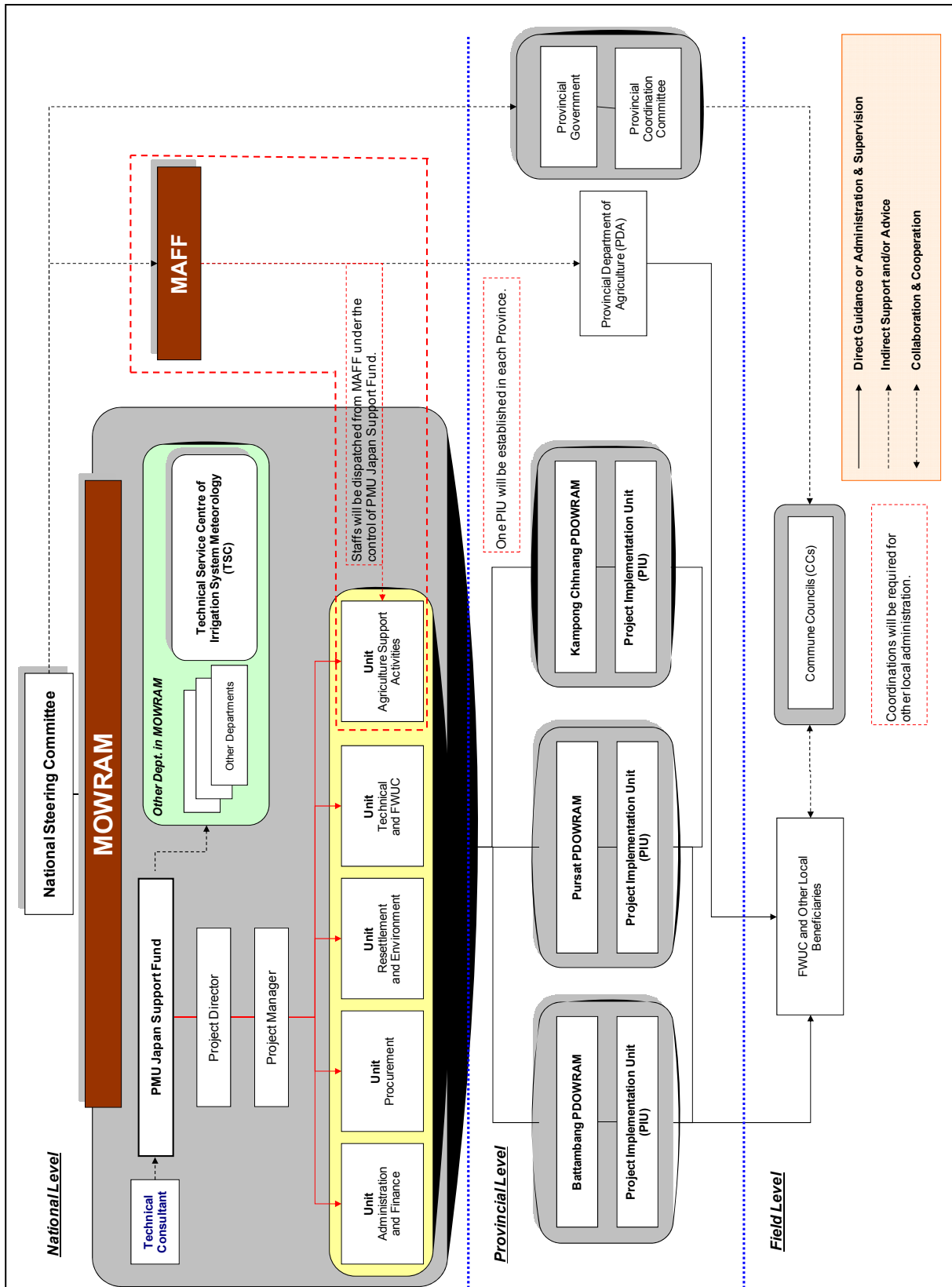
Source: Memorandum of Understanding Between The Government of Cambodia and Asian Development Bank for the Water Resources Management Sector Development Program

PREPARATORY SURVEY FOR IRRIGATION AND DRAINAGE SYSTEM REHABILITATION AND IMPROVEMENT PROJECT

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Figure AE-4.7.2.2

Implementation Organization for WRMSDP



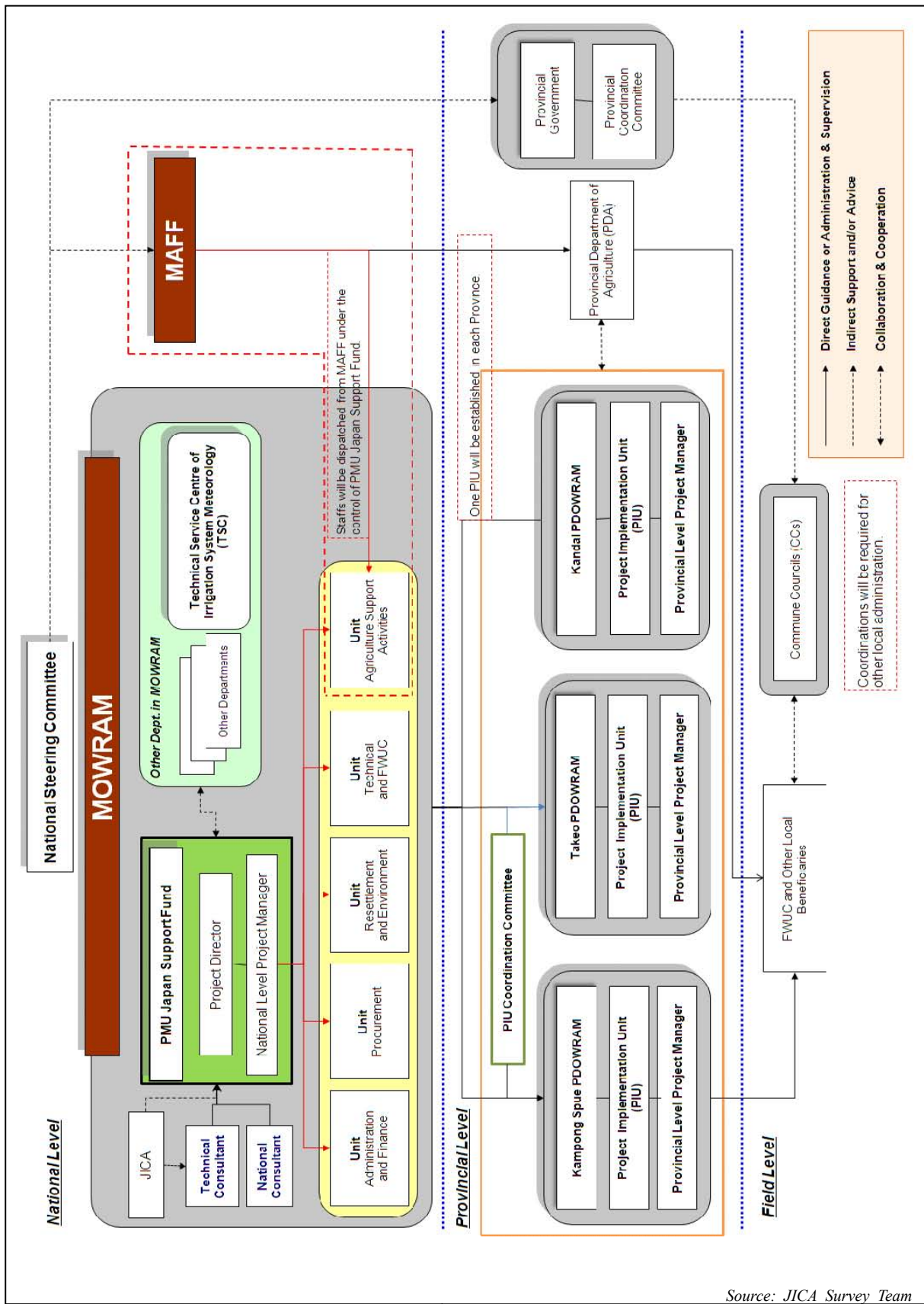
Source: West Tonle Sap Irrigation and Drainage Rehabilitation and Improvement Project

PREPARATORY SURVEY FOR IRRIGATION AND DRAINAGE SYSTEM REHABILITATION AND IMPROVEMENT PROJECT

Japan International Cooperation Agency

Figure AE-4.7.2.3

Proposed Implementing Organization for WTSIDRIP



Source: JICA Survey Team

PREPARATORY SURVEY FOR IRRIGATION AND DRAINAGE SYSTEM REHABILITATION AND IMPROVEMENT PROJECT

Japan International Cooperation Agency

Figure AE-4.7.3.1

Proposed Implementing Organization for SPPIDRIP

ANNEX F

Cost Estimate

PREPARATORY SURVEY
FOR
IRRIGATION AND DRAINAGE SYSTEM
REHABILITATION AND IMPROVEMENT PROJECT
IN
THE KINGDOM OF CAMBODIA

ANNEX F
COST ESTIMATE

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ANNEX F

COST ESTIMATE

CHAPTER AF-1 GENERAL INFORMATION

AF-1.1 Basic Conditions for Cost Estimate

- 1) The basic conditions and assumptions employed for the project cost estimate are as follows:
- 2) Cost estimate refers to the prices as of November 2011.
- 3) The following exchange rates applied for the cost estimate:
 - 1 US Dollar (US\$) = 4,084 Riel
 - = 76.8 Yen
- 4) Unit prices of labor, construction materials, engineering works, etc., were collected from MOWRAM, PDOWRAMs, National Committee for Democracy Development (NCDD) of concerned provinces and markets.
- 5) Project costs are divided into Foreign Currency Portion (F/C) and Local Currency Portion (L/C). Ratios of the F/C and the L/C are estimated based on the each unit price analysis and referring to similar types of the projects in Cambodia.
- 6) Construction cost is estimated using US Dollars according to the Procurement Manual Volume II for externally financed project/program in Cambodia.
- 7) Price escalation rates are assumed to be 1.6 %/annum for F/C and 6.7 %/annum for L/C.
- 8) Physical contingency is 10.0% except for that for consulting services of 5.0%.
- 9) Tax (VAT) is 10% according to the Government regulation.
- 10) Project administration cost is 3.0% of construction cost.
- 11) Interest during construction is 0.01% of accumulated loan portion.

AF-1.2 Base Costs for Labor, Materials and Equipment

The base costs for labor, construction materials and depreciation or lease cost of construction equipment have been surveyed and collected in markets, NCDD, similar construction contract under MOWRAM and PDOWRAM, in order to establish unit price for construction. Since several construction sites of Sub-projects for the Southern Phnom Penh Irrigation and Drainage Rehabilitation and Improvement Project have similar environment, the same unit prices for the construction are applied. By analyzing the several data obtained, the base costs are decided as follows:

Table AF-1.2.1 Base Cost of Labor Wages

No.	Item	Unit	Price (US\$)	Remarks
L-1	Common labor	MD	4.50	
L-2	Skilled labor	MD	10.00	
L-3	Foreman	MD	12.50	
L-4	Heavy equipment operator	MD	14.00	

No.	Item	Unit	Price (US\$)	Remarks
L-5	Light equipment operator	MD	9.00	
L-6	Dump truck driver	MD	6.50	
L-7	Assistant operator	MD	8.00	
L-8	Welder	MD	8.00	
L-9	Electrician	MD	12.00	
L-10	Mechanic	MD	12.00	
L-11	Carpenter	MD	12.00	
L-12	Mason	MD	8.00	
L-13	Concrete worker	MD	5.00	
L-14	Steel worker	MD	5.00	
L-15	Painter	MD	6.00	
L-16	Pipe worker	MD	7.00	
L-17	Junior engineer (5 year experience)	MM	900.00	
L-18	Senior engineer (15 year experience)	MM	1,740.00	
L-19	Surveyor	MM	750.00	
L-20	Assistant surveyor	MM	470.00	
L-21	CAD-operator	MM	630.00	
L-22	Accountant	MM	630.00	
L-23	Office clerk	MM	500.00	
L-24	Secretary	MM	300.00	
L-25	Typist	MM	240.00	

Source: JICA Survey Team

Table AF-1.2.2 Base Cost of Construction Materials

No.	Item	Unit	Price (US\$)	Remarks
M-1	Ordinary portland cement	kg	0.10	for 1,000 ton
M-2	Fine aggregate (sand) for concrete	m ³	10.97	
M-3	Coarse aggregate	m ³	21.42	
M-4	Bolder(300-500 mm) / Crushed stone	m ³	16.20	
M-5	Sand	m ³	8.78	
M-6	Gravel / Crushed stone	m ³	17.14	
M-7	Reinforcement bar (deformed)	kg	0.82	for 100 ton
M-8	Reinforcement bar (round)	kg	0.85	
M-9	Iron wire	kg	0.85	
M-10	Timber	m ³	520.00	
M-11	Reinforced concrete pipe, dia 600 mm	M	20.85	
M-12	Reinforced concrete pipe, dia 800 mm	M	35.76	
M-13	Reinforced concrete pipe, dia 1,000 mm	M	51.05	
M-14	Concrete pile, 0.4 m × 0.4 m	M	98.04	Rectangular shape
M-15	Steel slide gate, 2.0 m × 2.0 m	Unit	2,490.00	
M-16	Steel slide gate, 1.5 m × 1.5 m	Unit	1,780.00	
M-17	Steel slide gate, 1.0 m × 1.0 m	Unit	1,350.00	
M-18	Steel slide gate, 0.8 m × 0.8 m	Unit	1,090.00	
M-19	Steel slide gate, 0.6 m × 0.6 m	Unit	850.00	
M-20	Gasoline	Liter	1.30	
M-21	Diesel oil	Liter	1.10	
M-22	Light oil	Liter	2.33	
M-23	Grass	m ²	2.00	

Source: JICA Survey Team

Table AF-1.2.3 Base Cost of Equipment

No.	Item	Unit	Price (US\$)	Remarks
E-1	Bulldozer 21 ton	MD	150.00	
E-2	Bulldozer 15 ton	MD	120.00	
E-3	Backhoe 0.6 m ³	MD	133.00	
E-4	Wheel loader 2.3 m ³	MD	250.00	
E-5	Wheel loader 1.0 m ³	MD	180.00	
E-6	Tire roller 8 ton	MD	107.00	
E-7	Vibration roller 2.5 ton	MD	75.00	

No.	Item	Unit	Price (US\$)	Remarks
E-8	Water tanker (5000-6000 liter)	MD	111.00	
E-9	Motor grader 3.1 m	MD	135.00	
E-10	Dump truck 8 ton	MD	85.00	
E-11	Cargo truck 6 ton	MD	70.00	
E-12	Truck crane 20 ton	MD	150.00	
E-13	Truck crane 10 ton	MD	128.00	
E-14	Truck crane 6 ton	MD	90.00	
E-15	Trailer 15 ton	MD	97.00	
E-16	Agitator truck 1.6 m ³	MD	192.00	
E-17	Concrete mixer 0.2 m ³	MD	68.00	
E-18	Concrete mixer 0.05 m ³	MD	200.00	
E-19	Hand guide roller 0.5 ton	MD	33.00	
E-20	Tamper 80kg	MD	30.00	
E-21	Batching plant 0.5 m ³ excluding generator	MD	320.00	
E-22	Dragline or clamshell 0.6 m ³	MD	70.00	
E-23	Chain block 10 ton	MD	20.00	
E-24	Welding machine 70-150 A	MD	99.00	
E-25	Air compressor 8.5 kg/cm ²	MD	70.00	
E-26	Submergible drain pump dia 2"	MD	25.00	
E-27	Submersible drain pump dia 3"	MD	25.00	
E-28	Diesel generator (50 kVA)	MD	125.00	

Source: JICA Survey Team

AF-1.3 Unit Prices for Main Work Items

Unit prices of the main work items for construction are estimated using the base costs mentioned above and required work quantity of labor, material and equipment by referring similar projects in Cambodia and other south-east countries. These unit prices comprises of F/C and L/C. Labor costs and local material obtained from sites such as sand, gravel, embankment soil etc. are counted as L/C and cost of imported materials such as equipment depreciation or lease cost, fuel, reinforcement bar, cement are counted as F/C. The estimated unit prices for the main work items are shown in the Tables below and their breakdown are shown in the Attachment 2, *Breakdown of Unit Prices*, of ANNEX F hereafter:

Table AF-1.3.1 Unit Price for Main Work Items, Earth Work

No.	Description	Unit	Unit price (US\$)		
			L/C	F/C	Total
EW-01	Clearing and Grubbing	m ²	0.06	0.19	0.25
EW-02	Stripping of top soil of 0.2 m thickness	m ²	0.08	0.29	0.37
EW-02-1	Excavation by Bulldozer 21 ton	m ³	0.27	1.18	1.45
EW-03	Excavation common by Equipment	m ³	0.42	1.54	1.96
EW-04	Excavation common in water by Equipment	m ³	1.13	4.31	5.44
EW-05	Excavation, loading and transportation of soil with hauling distance less than 500 m	m ³	0.53	2.87	3.40
EW-06	Excavation, loading and transportation of soil with hauling distance more than 500 m & less than 5,000 m	m ³	0.93	4.13	5.06
EW-07	Excavation, loading and transportation of soil with hauling distance more than 5,000 m & less than 10,000 m	m ³	1.63	6.97	8.60
EW-08	Excavation, loading and transportation of soil with hauling distance more than 10,000 m & less than 15,000 m	m ³	2.07	8.51	10.58
EW-09	Excavation, loading and transportation of soil with hauling distance more than 15,000 m & less than 20,000 m	m ³	2.44	10.01	12.45
EW-10	Backfill by manpower by tamper with excavated material	m ³	3.88	0.25	4.13
EW-10-1	Backfill by manpower with tamper (transported material less than 500 m)	m ³	4.43	3.26	7.69
EW-10-2	Backfill by manpower with tamper (transported material 500m < L < 5,000 m)	m ³	4.83	4.58	9.41
EW-11	Backfill by equipment with transported soil material (less than 500 m)	m ³	1.61	8.72	10.33
EW-12	Backfill by equipment with transported soil material (500 m < L < 5,000 m)	m ³	2.01	10.05	12.06
EW-13	Embankment / Backfill by equipment with excavated material	m ³	1.26	5.65	6.91

No.	Description	Unit	Unit price (US\$)		
			L/C	F/C	Total
EW-13-1	Embankment by equipment with soil material with transportation (less than 500 m)	m ³	1.80	8.66	10.46
EW-13-2	Embankment by equipment with soil material with transportation (500 m < L < 5,000 m)	m ³	2.20	9.99	12.19
EW-13-3	Embankment by Bulldozer with excavated soil	m ³	0.31	1.25	1.56
EW-14	Soil cement placing	m ³	3.10	26.65	29.75
EW-15	Sod facing	m ²	2.70	0.00	2.70
EW-16	Foundation gravel	m ³	22.09	3.64	25.73
EW-17	Foundation of sand	m ³	13.05	2.07	15.12
EW-18	Demolishment of small concrete structure without disposal	m ³	0.60	2.68	3.28
EW-19	Demolishment of concrete structure with disposal	m ³	7.02	15.11	22.13
EW-20	Riprap placing with transportation	m ³	19.76	5.70	25.46
EW-21	Sub-base course, well graded sand & gravel of max size 100 mm, hauling from stockpile or r-deposit at any distance	m ³	14.98	1.58	16.56
EW-22	Sub-base course, common soil of max size 100 mm, hauling from stockpile at any distance	m ³	8.11	2.35	10.46
EW-23	Base course, well graded sand & gravel of max size 40 mm, hauling from stockpile or river deposit at any distance	m ³	20.46	7.31	27.77
EW-24	Laterite pavement (t=0.1 m)	m ³	1.78	7.75	9.53
EW-101	Construction of new tertiary canal (Combined unit price)	ha	69.28	206.11	275.39
EW-102	Rehabilitation of tertiary canal (Combined unit price)	ha	38.82	129.54	168.36
EW-103	Construction of new tertiary system including drainage canal (Combined unit price)	ha	89.79	219.14	308.93

Source: JICA Survey Team

Table AF-1.3.2 Unit Price for Main Work Items, Concrete Work

No.	Description	Unit	Unit price (US\$)		
			L/C	F/C	Total
CW-01	Mixing concrete (Reinforced concrete 1:2:4) by concrete plant 0.5 m ³	m ³	31.87	44.38	76.25
CW-02	Mixing concrete (Plain concrete 1:3:6) by concrete plant 0.5 m ³	m ³	30.75	39.08	69.83
CW-03	Mixing concrete (lean concrete) by concrete plant 0.5 m ³	m ³	30.04	35.86	65.90
CW-04	Placing concrete by Chute	m ³	1.70	0.00	1.70
CW-05	Carrying concrete, L=1,000 m	m ³	1.41	10.83	12.24
CW-06	Carrying concrete, L=2,000 m	m ³	2.06	15.82	17.88
CW-07	Mixing concrete by portable concrete mixer 0.25 m ³ for reinforcement concrete (1:2:4)	m ³	41.37	45.03	86.40
CW-08	Mixing concrete by portable concrete mixer 0.25 m ³ for plain concrete (1:3:6)	m ³	40.25	39.88	80.13
CW-09	Mixing concrete by portable concrete mixer 0.25 m ³ for plain concrete (lean concrete)	m ³	39.54	36.75	76.29
CW-10	Reinforcing bar, deformed (Cut and installation)	kg	0.29	0.94	1.23
CW-11	Placement of concrete pipe φ600 mm	m	6.32	38.41	44.73
CW-12	Placement of concrete pipe φ800 mm	m	7.96	48.40	56.36
CW-13	Placement of concrete pipe φ1,000 mm	m	9.61	58.38	67.99
CW-14	Driving of concrete pile (400 x 400mm), rectangular	m	43.67	109.44	153.11
CW-15	Driving of steel sheet pile (U-II type)	m ²	32.76	153.35	186.11
CW-101	Placing concrete (1:2:4) including form, curing & other miscellaneous works using portable mixer	m ³	65.97	45.03	111.00
CW-102	Placing concrete (1:3:6) including form, curing & other miscellaneous works using portable mixer	m ³	63.22	39.88	103.10
CW-103	Placing concrete (lean concrete) including form, curing & other miscellaneous works using portable mixer	m ³	53.33	36.75	90.08

Source: JICA Survey Team

Table AF-1.3.3 Unit Price for Structure Works

No.	Description	Unit	Unit price (US\$)		
			L/C	F/C	Total
Structure works, common					
CW-201	Diversion structure on main canal	no	8,820.26	13,590.91	22,411.17
CW-202	Box culvert (2 m x 1.5 m x 6 m) on main canal	no	6,255.96	7,047.68	13,303.64
CW-203	Diversion structure on secondary canal	no	3,064.01	4,941.94	8,005.95
CW-204	Cross drain on secondary canal	no	2,429.93	2,288.49	4,718.42

No.	Description	Unit	Unit price (US\$)		
			L/C	F/C	Total
CW-205	Pipe culver for road crossing	no	1,087.44	1,337.39	2,424.83
CW-206	Pipe culver for house or farm road	no	730.81	834.70	1,565.51
CW-207	Off-take Type-1 for main canal (Q > 0.2 m ³ /sec)	no	1,493.61	1,403.69	2,897.30
CW-208	Off-take Type-2 for main canal (Q < 0.2 m ³ /sec)	no	936.56	1,033.80	1,970.36
CW-301	Spillway (NMC-22)	no	130,321.39	75,036.73	205,358.12
CW-302	Spillway (SMC-18)	no	35,295.20	23,785.81	59,081.01
CW-303	Spillway (SMC-24)	no	68,936.52	38,510.96	107,447.48
CW-304	Spillway (SMC-25)	no	569.56	3,564.60	4,134.16
CW-305	Check structure on main canal, replacement with new	no	40,203.43	51,703.50	91,906.93
CW-306	Check structure on main canal, new	no	37,907.24	46,762.53	84,669.76
CW-307	Turnout, replacement with new	no	1,306.30	2,738.49	4,044.80
CW-308	Turnout, new	no	1,226.68	2,567.14	3,793.82
CW-309	Construction of bridge with demolition of existing bridge	no	15,969.66	20,664.75	36,634.41
CW-310	Construction of new Bridge	no	13,813.23	19,435.24	33,248.47
CW-311	Construction of foot bridge	no	6,629.89	6,701.83	13,331.72
CW-312	Drainage inlet	no	308.08	596.67	904.75
Structure works, common					
CW-401	Check structure Type A1 (Q > 1 m ³ /sec)	no	2,137.66	4,522.14	6,659.80
CW-402	Check structure Type A2 (0.4 < Q < 1 m ³ /sec)	no	1,066.10	2,255.96	3,322.06
CW-403	Check structure Type A3 (Q < 0.4 m ³ /sec)	no	723.91	1,769.56	2,493.47
CW-404	Check structure with drop Type B1 (Q > 1 m ³ /sec)	no	3,394.41	6,182.93	9,577.34
CW-405	Check structure with drop Type B2 (0.4 < Q < 1 m ³ /sec)	no	1,904.59	3,339.72	5,244.31
CW-406	Check structure with drop Type B3 (Q < 0.4 m ³ /sec)	no	1,360.02	2,577.24	3,937.27
CW-407	Drop	no	1,555.77	2,013.93	3,569.70
CW-408	Turnout, road side without foot bridge Type A1 (0.2 < Q < 0.5 m ³ /sec)	no	1,787.88	3,346.60	5,134.48
CW-409	Turnout, road side without foot bridge Type A2 (Q < 0.2 m ³ /sec)	no	1,002.55	2,361.33	3,363.88
CW-410	Turnout, bank side with foot bridge Type B1 (0.2 < Q < 0.5 m ³ /sec)	no	1,968.25	3,559.62	5,527.88
CW-411	Turnout, bank side with foot bridge Type B2 (Q < 0.2 m ³ /sec)	no	1,125.40	2,450.77	3,576.17
CW-412	Culvert, Type A1 (box Q > 2 m ³ /sec)	no	7,539.66	9,478.33	17,017.98
CW-413	Culvert, Type B1 (pipe Q > 1 m ³ /sec)	no	1,321.48	1,881.35	3,202.83
CW-414	Culvert, Type B2 (pipe Q < 1 m ³ /sec)	no	659.61	865.49	1,525.10
CW-415	Culvert for access to house, Type C (pipe)	no	402.59	529.14	931.73
CW-416	Road bridge (Q > 1 m ³ /sec)	no	12,787.92	19,028.66	31,816.58
CW-417	Foot bridge	no	2,509.78	3,722.80	6,232.58
CW-418	Cross drain on main canal	no	5,649.50	7,680.06	13,329.56

Source: JICA Survey Team

Table AF-1.3.4 Unit Price for Miscellaneous Works

No.	Description	Unit	Unit price (US\$)		
			L/C	F/C	Total
Stone works					
SW-01	Gabion mattress	m ³	54.52	31.06	85.58
SW-02	Stone masonry with 1:3 cement/sand ratio mortar	m ³	39.96	19.31	59.26
SW-03	Riprap placing with transported material	m ³	19.76	5.70	25.47
Mechanical Works					
GW-01	Installation of gate, 2.0 m × 2.0 m	unit	489.08	3,006.45	3,495.53
GW-02	Installation of gate, 1.5 m × 1.5 m	unit	357.84	2,225.38	2,583.21
GW-03	Installation of gate, 1.0 m × 1.0 m	unit	271.22	1,697.43	1,968.65
GW-04	Installation of gate, 0.8 m × 0.8 m	unit	200.25	1,326.05	1,526.30
GW-05	Installation of gate, 0.6 m × 0.6 m	unit	178.29	1,241.66	1,419.95
GW-06	Installation of gate, 2.0 m × 2.4 m	unit	569.38	3,809.48	4,378.85
GW-07	Installation of gate, 1.0 m × 1.4 m	unit	365.48	2,301.83	2,667.31

Source: JICA Survey Team

CHAPTER AF-2 SOUTHWEST PHNOM PENH IRRIGATION AND DRAINAGE REHABILITATION AND IMPROVEMENT PROJECT

AF-2.1 Overall Southwest Phnom Penh Irrigation and Drainage Rehabilitation and Improvement Project

(1) Initial Investment Cost for SPPIDRIP

The overall initial investment cost is shown as follows:

Table AF-2.1.1 Initial Investment Cost for SPPIDRIP

No.	Item	Total Investment Cost (US\$1,000)	JICA Loan Portion			MOWRAM	Remarks
			Total (JPY 1,000)	FC (JPY 1,000)	LC (US\$1,000)	LC (US\$1,000)	
1	Construction of SPPIDRIP	45,936	3,527,959	2,469,501	13,782	0	
	1-1 RCHRSP	15,036	1,154,803	858,201	3,862	0	
	1-2 USISRSP	8,871	681,351	472,762	2,716	0	
	1-3 KSBISRSP	11,203	860,404	548,596	4,060	0	
	1-4 MC3SRSP	2,728	209,468	148,105	799	0	
	1-5 SPWRRSP	2,926	224,742	174,592	653	0	
	1-6 DPISRSP	5,172	397,191	267,245	1,692	0	
2	Procurement Cost	1,603	123,110	105,062	235	0	
3	Price Escalation	13,131	1,008,447	514,546	6,431	0	FC: 1.6%/year, LC: 6.7%/year
4	Physical Contingency	6,067	465,967	308,911	2,045	0	4 = (1+2+3) x 10%
5	Sub-Total (=1 to 4)	66,738	5,125,483	3,398,020	22,493	0	5 = SUM (1 to 4)
6	Tertiary System Development	3,294	252,913	149,465	1,347	0	
	6-1 D/D & C/S for Tertiary System	654	50,227	0	654	0	
	6-2 Construction of RCHRSP Tertiary system	114	8,719	6,185	33	0	
	6-3 Construction of USISRSP Tertiary System	900	69,121	51,995	223	0	
	6-4 Construction of KSBISRSP Tertiary System	1,016	78,064	57,098	273	0	
	6-5 Construction of MC3SRSP Tertiary System	260	19,924	14,548	70	0	
	6-6 Construction of DPISRSP Tertiary System	350	26,858	19,639	94	0	
7	Price Escalation	700	53,791	14,546	511	0	FC: 1.6%/year, LC: 6.7%/year
8	Physical Contingency	399	30,690	16,405	186	0	8 = (6+7) x 10%
9	Sub-Total (=6 to 8)	4,394	337,394	180,416	2,045	0	9 = SUM (6 to 8)
10	Consulting Services	7,068	542,794	200,880	4,452	0	
11	Price Escalation	1,545	118,671	12,303	1,385	0	FC: 1.6%/year, LC: 6.7%/year
12	Physical Contingency	431	33,085	10,659	292	0	12 = (10+11) x 5%
13	Sub-Total (=10 to 12)	9,044	694,550	223,842	6,128	0	13 = SUM (10 to 12)
14	UXO / Mine Survey	1,200	0	0	0	1,200	
15	Price Escalation	0	0	0	0	0	FC: 1.6%/year, LC: 6.7%/year
16	Physical Contingency	120	0	0	0	120	16 = (14+15) x 10%
17	Sub-Total (=14 to 16)	1,320	0	0	0	1,320	17 = SUM (14 to 16)
18	Soft Component Activities	2,712	208,284	31,567	2,301	0	
	18-1 Capacity Development of MOWRAM and PDOWRAM Staff	628	48,255	25,292	299	0	
	18-2 FWUC Strengthening Program	1,192	91,546	0	1,192	0	
	18-3 Agriculture Support Services	724	55,581	6,275	642	0	
	18-4 Financial Management	168	12,902	0	168	0	
19	Price Escalation	879	67,503	2,069	852	0	FC: 1.6%/year, LC: 6.7%/year
20	Physical Contingency	359	27,556	3,364	315	0	20 = (18+19) x 10%
21	Sub-Total (=18 to 20)	3,950	303,343	37,000	3,468	0	21 = SUM (18 to 20)
22	Land Acquisition	942	0	0	0	942	
23	Price Escalation	227	0	0	0	227	FC: 1.6%/year, LC: 6.7%/year
24	Physical Contingency	117	0	0	0	117	24 = (22+23) x 10%
25	Sub-Total (=22 to 24)	1,286	0	0	0	1,286	25 = SUM (22 to 24)
26	Project Administration	1,378	0	0	0	1,378	18 = 3.0 % of (1)
27	Tax & Duty	5,910	0	0	0	5,910	19 = 10 % of (1+2+6+10+14)
28	Interest During Construction	25	0	0	0	25	0.01%/year
29	Total	94,045	6,460,770	3,839,278	34,132	9,917	
	Proportion of F/C and L/C			3,839,278	44,049		

Source: JICA Survey Team

(2) Construction Cost

The construction cost consists of main and secondary irrigation system and tertiary development and is summarized as follows. The detail breakdown of construction cost for each Sub-project is given in the next chapters, AF 2-2 and AF 2-3.

Table AF-2.1.2 Construction Cost for SPPIDRIP

Work Item	Cost (US\$)		
	F/C	L/C	Total
I. RCHRSRSP			
1. Preparatory Works and Temporary Works (General Item)	1,316,917	383,640	1,700,557
1.1 Preparatory Works and Temporary Works (General Item)	104,700	72,600	177,300
1.2 Temporary Works for Roleang Chrey Headworks Improvement	1,212,217	311,040	1,523,257
2. Construction of Major Facility	5,680,341	1,579,872	7,260,213
2.1 Roleang Chrey Headworks Improvement Works	5,680,341	1,579,872	7,260,213
3. Construction of Irrigation and Drainage Canals and related Facilities	4,068,390	1,789,484	5,857,874
3.1 Rehabilitation works for North main and secondary canals (16.9km)	1,923,911	862,236	2,786,147
3.2 Rehabilitation works for South main and secondary canals (18.9km)	1,569,057	724,933	2,293,990
3.3 Construction of drainage canals	575,422	202,315	777,737
4. Construction of Sub-project office and relevant facilities	108,850	108,850	217,700
4.1 Construction of building for Sub-project office	108,850	108,850	217,700
Construction Cost of RCHRSRSP	11,174,498	3,861,846	15,036,344
II. USISRSP			
1. Preparatory Works and Temporary Works (General Item)	182,370	86,700	269,070
1.1 Preparatory Works and Temporary Works (General Item)	182,370	86,700	269,070
2. Construction of Major Facility	2,111,840	1,226,230	3,338,070
2.1 Tumnap Lok Reservoir Rehabilitation	911,800	752,300	1,664,100
2.2 Diversion canal rehabilitation (9.4 km)	1,114,340	357,930	1,472,270
2.3 Kpob Trobek Reservoir rehabilitation	85,700	116,000	201,700
3. Construction of Irrigation and Drainage Canals and related Facilities	3,683,160	1,281,850	4,965,010
3.1 Main Canal 33 rehabilitation (7.3 km)	607,340	224,250	831,590
3.2 Secondary canals (44.7 km) rehabilitation	3,075,820	1,057,600	4,133,420
4. Construction of Sub-project office and relevant facilities	178,380	120,790	299,170
4.1 Construction of building for Sub-project office	178,380	120,790	299,170
Construction Cost of USISRSP	6,155,750	2,715,570	8,871,320
III. KSBISRSP			
1. Preparatory Works and Temporary Works (General Item)	93,819	69,596	163,415
1.1 Preparatory Works and Temporary Works (General Item)	93,819	69,596	163,415
2. Construction of Major Facility	2,808,276	1,657,329	4,465,605
2.1 Main canal in Kandal Stung Area (2 canals for 11.3 km)	1,724,663	1,113,351	2,838,014
2.2 Secondary canal in Kandal Stung Area	304,246	125,161	429,407
2.3 New Diversion Weir and Intake for KC-31 for Kandal Stung Area	150,054	98,784	248,838
2.4 Improvement of the existing Diversion Weir at Thmei Commune	42,534	54,408	96,942
2.5 Replacement of the existing Intakes (for EW-59, EW-60 & EW-61)	18,556	21,927	40,483
2.6 Replacement of the existing Daeum Rues Regulator	53,962	33,935	87,897
2.7 Improvement of Drainage Canal in Kandal Stung Area	514,261	209,763	724,024
3. Construction of Irrigation and Drainage Canals and related Facilities	4,104,166	2,228,039	6,332,205
3.1 Main canal in Bati Area (2 canals for 7.6 km)	983,759	750,889	1,734,648
3.2 Secondary canal in Bati Area	614,410	242,704	857,114
3.3 New Intake for Connection Canal for Bati Area	17,968	12,977	30,945
3.4 Connection Canal by Upgrading of NS-82 (3.5 km long in total)	719,540	480,115	1,199,655
3.5 Intake for Pump Station at Tonle Bati	31,576	17,930	49,506
3.6 Pump Station at Tonle Bati	843,131	309,497	1,152,628
3.7 Flood Protection Dike of Tonle Bati Lake	269,925	121,398	391,323
3.8 Replacement of Kampong Dangkor Spillway	409,327	224,224	633,551
3.9 Improvement of Drainage Canal in Bati Area	214,530	68,305	282,835
4. Construction of Sub-project office and relevant facilities	136,910	104,790	241,700
4.1 Construction of building for Sub-project office	136,910	104,790	241,700
Construction Cost of KSBISRSP	7,143,171	4,059,754	11,202,925
IV. MC35RSP			
1. Preparatory Works and Temporary Works (General Item)	65,885	48,799	114,684
1.1 Preparatory Works and Temporary Works (General Item)	65,885	48,799	114,684
2. Construction of Irrigation & Drainage Canals	1,725,652	645,492	2,371,144
2.1 Main Canal 35 Rehabilitation	862,425	339,065	1,201,490
2.2 Secondary Canal Rehabilitation	856,406	303,716	1,160,122
2.3 Drainage Canal Rehabilitation	6,821	2,711	9,532
3. Construction of Sub-project office and relevant facilities	136,910	104,790	241,700
3.1 Construction of building for Sub-project office	136,910	104,790	241,700
Construction Cost of MC35RSP	1,928,447	799,081	2,727,528
V. SPWRRSP			
1. Preparatory Works and Temporary Works (General Item)	93,639	53,310	146,949
1.1 Preparatory Works and Temporary Works (General Item)	93,639	53,310	146,949
2. Construction of Major Facilities	2,042,788	494,841	2,537,629
2.1 Srrass reservoir rehabilitation	2,042,788	494,841	2,537,629
3. Construction of Sub-project office and relevant facilities	136,910	104,790	241,700
3.1 Construction of building for Sub-project office	136,910	104,790	241,700
Construction Cost of SPWRRSP	2,273,337	652,941	2,926,278
VI. DPISRSP			
1. Preparatory Works and Temporary Works (General Item)	110,913	61,592	172,505
1.1 Preparatory Works and Temporary Works (General Item)	110,913	61,592	172,505

Work Item	Cost (US\$)		
	F/C	L/C	Total
2. Construction of Major Facilities	3,231,926	1,525,364	4,757,290
2.1 Headworks	1,381,676	758,801	2,140,477
2.2 Irrigation and Drainage Canals	1,466,305	566,032	2,032,337
2.3 Secondary Canals	383,945	200,531	584,476
3. Construction of Sub-project office and relevant facilities	136,910	104,790	241,700
3.1 Construction of building for Sub-project office	136,910	104,790	241,700
Construction Cost of DPISRSP	3,479,749	1,691,746	5,171,495
A. Construction Cost of Main System for SPPIDRIP (I. to VI.)	32,154,953	13,780,938	45,935,891
Tertiary System Construction			
1. Tertiary system for model area of RCHRSP (350ha)	80,530	33,000	113,530
2. Tertiary system for USISRSP (3,500 ha)	677,020	222,620	899,640
3. Tertiary system for KSBISRSP (3,350ha)	743,459	272,767	1,016,226
4. Tertiary system for MC35RSP (850 ha)	189,426	70,442	259,868
5. Tertiary system for SPWRRSP (0 ha)	0	0	0
6. Tertiary system for DPISRSP (1,150 ha)	255,722	94,427	350,149
B. Construction Cost of Tertiary System	1,946,157	693,256	2,639,413
Total Construction Cost for SPPIDRIP (A + B)	34,101,110	14,474,194	48,575,304

Source: JICA Survey Team

(3) Consulting Services Cost

The cost for the consulting services covers the detailed design and construction supervision for all Sub-projects and is shown as follows:

Table AF-2.1.3 Consulting Services Cost for SPPIDRIP

Item	Stage	Unit	Qty	F/C (Yen)		L/C (US\$)		Total (US\$)
				Unit rate	Amount	Unit rate	Amount	
RCHRSP and USISRSP								
(1) Remuneration and salary								
Foreign consultants	DD/CS	MM	107	2,000,000	214,000,000			2,786,500
Foreign consultant -Non-Japanese	DD/CS	MM	70			10,000	700,000	700,000
National consultant	DD/CS	MM	409			3,000	1,227,000	1,227,000
Sub professional	DD/CS	MM	223			1,000	223,000	223,000
Supporting staff	DD/CS	MM	625			500	312,500	312,500
Sub total (1) (round)					214,000,000		2,462,500	5,249,000
(2) Direct cost								
International air fare (Japanese)	DD/CS	Trip	18	160,000	2,880,000			37,500
International air fare (Others)	DD/CS	Trip	17			1,000	17,000	17,000
Topographic survey	DD	LS	1			246,000	246,000	246,000
Geo-mecha. investigation	DD	LS	1			101,000	101,000	101,000
Rent-a-car	DD	Month	72			3,000	216,000	216,000
Per diem for Foreign C.	DD/CS	Month	107			3,000	321,000	321,000
Per diem for Foreign Non-Japanese	DD/CS	Month	70			1,500	105,000	105,000
Field allowance for National consultant	DD/CS	Month	409			600	245,400	245,400
Office supply / R. print	DD/CS	Month	78			2,500	195,000	195,000
Office maintenance	DD/CS	Month	78			2,500	195,000	195,000
Others	DD/CS	LS	1			139,600	139,600	139,600
Sub total (2) (round)					2,880,000		1,781,000	1,818,500
Grand Total for the Project					216,880,000		4,243,500	7,067,500

Source: JICA Survey Team

(4) Procurement Cost

The procurement cost is estimated as shown below:

Table AF-2.1.4 Procurement Cost for SPPIDRIP

Item	Unit	Qty	F/C (Yen)		L/C (US\$)		Total (US\$)
			Unit rate	Amount	Unit rate	Amount	
both RCHRSP and USISRSP							
(1) Procurement cost							
4WD Vehicle	No	15	4,040,000	60,600,000			789,063
Motorcycle	no	44	450,000	19,800,000			257,813
Office equipment & furniture	no	11	800,000	8,800,000	5,000	55,000	169,583
Office for FWUC (200 m ²)	no	6	2,500,000	15,000,000	30,000	180,000	375,313
Wireless communication system	set	1	900,000	900,000			11,719
Total (round)				105,100,000		235,000	1,603,000

Source: JICA Survey Team

(5) Software Component Activity Cost

Table AF-2.1.5 Software Component Activity Cost for SPPIDRIP

Item	Unit	Qty	F/C (US\$)		L/C (US\$)		Total (US\$)
			Unit rate	Amount	Unit rate	Amount	
for 6 Sub-project of SPPIDRIP							
(1) Capacity development of MOWRAM and PDOWRAM staff							
(1)-1 Remuneration and salary							
1) Foreign consultant	MM	9	32,591	293,319			293,319
2) National consultant	MM	36			3,000	108,000	108,000
Sub total				<u>293,319</u>		<u>108,000</u>	<u>401,319</u>
(1)-2 Direct cost							
1) Per diem for foreign consul.	day	270	100	27,000			27,000
2) Per diem for national consul.	day	1,080			30	32,400	32,400
3) Mobilization of foreign consul.	no	6	1,500	9,000			9,000
4) Mobilization of national consul.	no	12			50	600	600
Sub total				<u>36,000</u>		<u>33,000</u>	<u>69,000</u>
(1)-3 Training cost							
1) Allowance	day	880			50	44,000	44,000
2) Material	LS	1			17,600	17,600	17,600
Sub total						<u>61,600</u>	<u>61,600</u>
(1)-4 Monitoring and evaluation							
1) MOWRAM	year	7			-	48,000	48,000
2) PDOWRAM	year	7			-	48,000	48,000
Sub total						<u>96,000</u>	<u>96,000</u>
Sub Total (1) (round)				329,319		298,600	628,000
(2) FWUC Formation and Strengthening							
(2)-1 Remuneration and salary							
1) National consultant	MM	136.5			3,000	409,500	409,500
Sub total						<u>409,500</u>	<u>409,500</u>
(2)-2 Direct cost							
1) Per diem for national consul.	day	4,095			30	122,850	122,850
2) Mobilization of national consul	no	42			50	2,100	2,100
Sub total						<u>124,950</u>	<u>124,950</u>
(2)-3 Training cost							
1) Allowance PDOWRAM	day	280			50	14,000	14,000
2) Allowance FWUC	day	8,680			10	86,800	86,800
3) Material & others	LS	1			179,200	179,200	179,200
Sub total						<u>280,000</u>	<u>280,000</u>
(2)-4 Monitoring and evaluation							
1) MOWRAM	year	7			-	154,000	154,000
2) PDOWRAM	year	7			-	224,000	224,000
Sub total						<u>378,000</u>	<u>378,000</u>
Sub Total (2) (round)				0		1,192,450	1,192,000
(3) Agricultural support service							
(3)-1 Trainer's training							
1) Trainer's training	LS	1			14,560	14,560	14,560
Sub total						<u>14,560</u>	<u>14,560</u>

Item	Unit	Qty	F/C (US\$)		L/C (US\$)		Total (US\$)
			Unit rate	Amount	Unit rate	Amount	
(3)-2 Field program							
1) Demonstration plot	LS	1			199,860	199,860	199,860
2) Water management	LS	1			173,880	173,880	173,880
Sub total						<u>373,740</u>	<u>373,740</u>
(3)-3 Farmer group training							
1) FG training program	LS	1			130,680	130,680	130,680
Sub total						<u>130,680</u>	<u>130,680</u>
(3)-4 Mass guideline/workshop							
1) Mass guideline/workshop	LS	1			28,080	28,080	28,080
Sub total						<u>28,080</u>	<u>28,080</u>
(3)-5 Consultant							
1) Foreign consultant	MM	2		81,700			81,700
2) National consultant	MM	24				95,240	95,240
Sub total				<u>81,700</u>		<u>95,240</u>	<u>176,940</u>
Sub Total (3) (round)				81,700		642,300	724,000
(4) Financial Management							
(4)-1 Remuneration and salary							
1) Professional B	MM	56			3,000	168,000	168,000
Sub total						<u>168,000</u>	<u>168,000</u>
Sub Total (4) (round)				0		168,000	168,000
GRAND TOTAL FOR SPPIDRIP				411,019		2,301,350	2,712,000

Source: JICA Survey Team

(6) Annual Disbursement Plan

The breakdown of the annual disbursement schedule based on the implementation schedule of SPPIDRIP is shown in Attachment 1 of ANNEX F and summarized as follows:

Table AF-2.1.6 Annual Disbursement Schedule for SPPIDRIP

Year	Total (US\$ 1,000)	F/C (US\$ 1,000)	L/C (US\$ 1,000)
2013	2,402	752	1,649
2014	1,514	486	1,029
2015	1,697	457	1,240
2016	4,483	1,818	2,665
2017	20,469	10,404	10,064
2018	28,613	15,292	13,321
2019	26,830	16,160	10,671
2020	8,036	4,646	3,390
2021	0	0	0
Total	94,045	50,016	44,029

Source: JICA Survey Team

AF-2.2 Roleang Chrey Headworks Rehabilitation Sub-project (RCHRSP)

The cost estimates for every category concerning to RCHRSP are shown in the following tables.

Table AF-2.2.1 Construction Cost for RCHRSP

Work Item	Cost (US\$)		
	L/C	F/C	Total
1. Preparatory Works and Temporary Works	383,640	1,316,917	1,700,557
1.1 Preparatory Works and Temporary Works (General Item)	72,600	104,700	177,300
(1) Temporary works (General item)	17,600	49,700	67,300
(2) Contractor's site office	55,000	55,000	110,000
1.2 Temporary Works for Roleang Chrey Headworks Improvement	311,040	1,212,217	1,523,257
(1) Temporary spillway	51,171	152,365	203,536
1) Provision	42,346	115,335	157,681
2) Removal	8,825	37,030	45,855

Work Item	Cost (US\$)		
	L/C	F/C	Total
(2) Temporary diversion channel & coffer dams for headworks	143,987	694,575	838,562
1) 1st Provision	55,362	263,508	318,870
2) 1st Removal	19,705	97,894	117,598
3) 2nd Provision	44,290	210,806	255,096
4) 2nd Removal	24,631	122,367	146,998
(3) Temporary coffer dams for intake	107,939	330,309	438,248
Provision	86,039	244,247	330,286
Removal of coffer dams for intake	21,900	86,062	107,962
(4) Temporary diversion channel for Vat Krouch intake	7,943	34,968	42,911
2. Construction of Major Facilities	1,579,872	5,680,341	7,260,213
2.1 Roleang Chrey Headworks Improvement Works	1,579,872	5,680,341	7,260,213
(1) Improvement works for hydro-mechanical works	728,337	4,139,897	4,868,234
1) Regulation gates and hoist, 5 sets (325 ton in total)	654,720	3,710,080	4,364,800
2) Other gates and removal of existing gates	73,617	429,817	503,434
(2) Improvement works for Andong Sla intake of NMC include. approach channel	148,446	433,083	581,529
(3) Improvement works for Vat Krouch intake of SMC include. approach channel	144,066	470,794	614,860
(4) Construction of river outlet structure	102,123	281,460	383,583
(5) Construction of river protection including ground sill	456,900	355,107	812,007
3. Construction of Irrigation and Drainage Canals and Related Structures	1,789,484	4,068,390	5,857,874
3.1 Rehabilitation works for North Main and Secondary canals	862,236	1,923,911	2,786,147
(1) Canal rehabilitation for main canal (9.1 km)	239,565	735,560	975,125
(2) Structures for main canal	368,707	393,270	761,977
(3) Canal rehabilitation for secondary canals (5 canals, 7.8 km in total)	168,632	675,247	843,879
(4) Structures for secondary canals	85,332	119,834	205,166
3.2 Rehabilitation works for South Main and Secondary canals	724,933	1,569,057	2,293,990
(1) Canal rehabilitation for main canal (9.8 km)	172,266	503,512	675,778
(2) Structures for main canal	249,743	199,649	449,392
(3) Canal rehabilitation for secondary canals (7 canals, 9.1 km in total)	165,520	664,135	829,655
(4) Structures for secondary canals	137,404	201,761	339,165
3.3 Drainage canals (3,000m in total)	202,315	575,422	777,737
4. Construction of Sub-project office and relevant facility	108,850	108,850	217,700
(1) Construction of building for Sub-project office	108,850	108,850	217,700
CONSTRUCTION COST FOR MAIN SYSTEM (1+2+3+4)	3,861,846	11,174,498	15,036,344
5. Construction of tertiary system for model area (350 ha)	32,997	80,529	113,526
TOTAL CONSTRUCTION COST (1+2+3+4+5)	3,894,843	11,255,027	15,149,870

Source: JICA Survey Team

Table AF-2.2.2 Software Component Activity Cost for RCHRSP

Item	Unit	Qty	F/C (US\$)		L/C (US\$)		Total (US\$)
			Unit rate	Amount	Unit rate	Amount	
(1) Capacity development of MOWRAM and PDOWRAM staff							
(1)-1 Remuneration and salary							
1) Foreign consultant	MM	1.5	32,591	48,887			48,887
2) National consultant	MM	6			3,000	18,000	18,000
Sub total				<u>48,887</u>		<u>18,000</u>	<u>66,887</u>
(1)-2 Direct cost							
1) Per diem for foreign consul.	day	45	100	4,500			4,500
2) Per diem for national consul.	day	180			30	5,400	5,400
3) Mobilization of foreign consul.	no	1	1,500	1,500			1,500
4) Mobilization of national consul.	no	2			50	100	100
Sub total				<u>6,000</u>		<u>5,500</u>	<u>11,500</u>
(1)-3 Training cost							
1) Allowance	day	120			50	6,000	6,000
2) Material	LS	1			2,400	2,400	2,400
Sub total						<u>8,400</u>	<u>8,400</u>
(1)-4 Monitoring and evaluation							
1) MOWRAM	LS/year	4			2,000	8,000	8,000
2) PDOWRAM	LS/year	4			2,000	8,000	8,000
Sub total						<u>16,000</u>	<u>16,000</u>
Sub Total (1) (round)				54,887		47,900	102,787
(2) FWUC Formation and Strengthening							
(2)-1 Remuneration and salary							
1) National consultant	MM	10.5			3,000	31,500	31,500
Sub total						<u>31,500</u>	<u>31,500</u>

Item	Unit	Qty	F/C (US\$)		L/C (US\$)		Total (US\$)
			Unit rate	Amount	Unit rate	Amount	
(2)-2 Direct cost							
1) Per diem for national consul.	day	315			30	9,450	9,450
2) Mobilization of national consul	no	7			50	350	350
Sub total						<u>9,800</u>	<u>9,800</u>
(2)-3 Training cost							
1) Allowance PDOWRAM	day	35			50	1,750	1,750
2) Allowance FWUC	day	728			10	7,280	7,280
3) Material & others	LS	1			15,260	15,260	15,260
Sub total						<u>24,290</u>	<u>24,290</u>
(2)-4 Monitoring and evaluation							
1) MOWRAM	LS/year	7			3,000	21,000	21,000
2) PDOWRAM	LS/year	7			4,000	28,000	28,000
Sub total						<u>49,000</u>	<u>49,000</u>
Sub Total (2) (round)					0	114,590	114,590
(3) Agricultural support service							
(3)-1 Trainer's training							
1) Trainer's training	LS	1			2,080	2,080	2,080
Sub total						<u>2,080</u>	<u>2,080</u>
(3)-2 Field program							
1) Demonstration plot	LS	1			13,710	13,710	13,710
2) Water management	LS	1			9,660	9,660	9,660
Sub total						<u>23,370</u>	<u>23,370</u>
(3)-3 Farmer group training							
1) FG training program	LS	1			7,260	7,260	7,260
Sub total						<u>7,260</u>	<u>7,260</u>
(3)-4 Mass guideline/workshop							
1) Mass guideline/workshop	LS	1			1,560	1,560	1,560
Sub total						<u>1,560</u>	<u>1,560</u>
(3)-5 Consultant							
1) Foreign consultant	LS	0.3			12,180		12,180
2) National consultant	LS	3.44				13,640	13,640
Sub total					<u>12,180</u>	<u>13,640</u>	<u>25,820</u>
Sub Total (3) (round)					12,180	47,910	60,090
GRAND TOTAL FOR RCHRSP					67,067	210,400	277,467

Source: JICA Survey Team

Table AF-2.2.3 Breakdown of Construction Cost for RCHRSP

Work Item	Unit	Qty	Unit Cost (US\$)			Amount (US\$)			Code of unit price
			L/C	F/C	Total	L/C	F/C	Total	
Main Irrigation and Drainage System						3,861,846	11,174,499	15,036,345	
1. Preparatory Works and Temporary Works (1.1 + 1.2)						383,640	1,316,917	1,700,557	
1.1 Preparatory Works and Temporary Works (General Item)						72,600	104,700	177,300	
(1) Temporary works						<u>17,600</u>	<u>49,700</u>	<u>67,300</u>	
1) Dewatering works						17,600	49,700	67,300	
(2) Contractor's site office						<u>55,000</u>	<u>55,000</u>	<u>110,000</u>	
1) Construction of site office (20 × 30 m)	m ²	600	50.00	50.00	100.00	30,000	30,000	60,000	
2) Desk & furniture and equipment	LS	1	10,000	10,000	20,000	10,000	10,000	20,000	
3) Office supply	year	4	2,500	2,500	5,000	10,000	10,000	20,000	
4) Miscellaneous	LS	1				5,000	5,000	10,000	
1.2 Temporary Works for Roleang Chrey Headworks Improvement						311,040	1,212,217	1,523,257	
(1) Temporary spillway						<u>51,171</u>	<u>152,365</u>	<u>203,536</u>	
(1)-1 Provision						<u>42,346</u>	<u>115,335</u>	<u>157,681</u>	
1) Stripping of top soil	m ³	2,626	0.27	1.18	1.45	709	3,098	3,807	EW-02-1
2) Excavation common	m ³	16,108	0.42	1.54	1.96	6,765	24,806	31,571	EW-03
3) Excavation common in water	m ³	1,790	1.13	4.31	5.44	2,023	7,715	9,738	EW-04
4) Excavation and hauling of soil	m ³	15,542	0.53	2.87	3.40	8,237	44,604	52,841	EW-05
5) Embankment by Bulldozer	m ³	6,568	0.31	1.25	1.56	2,036	8,210	10,246	EW-13-3
6) Reinforced concrete	m ³	99	65.97	45.03	111.00	6,531	4,458	10,989	CW-101
7) Plain concrete	m ³	6	63.22	39.88	103.10	379	239	618	CW-102
8) Reinforcement bar, deformed	kg	6,500	0.29	0.94	1.23	1,885	6,110	7,995	CW-10
9) Foundation gravel	m ³	9	13.05	2.07	15.12	117	19	136	EW-17
10) Gabion mattress	m ³	180	54.52	31.06	85.58	9,814	5,591	15,405	SW-01
11) Miscellaneous	LS	1				3,850	10,485	14,335	

Work Item	Unit	Qty	Unit Cost (US\$)			Amount (US&)			Code of unit price
			L/C	F/C	Total	L/C	F/C	Total	
(1)-2 Removal						<u>8,825</u>	<u>37,030</u>	<u>45,855</u>	
1) Backfill of top soil	m ³	2,188	0.27	1.18	1.45	591	2,582	3,173	EW-02-1
2) Excavation & pushing of soil	m ³	3,460	0.27	1.18	1.45	934	4,083	5,017	EW-02-1
3) Backfilling of soil	m ³	11,932	0.31	1.25	1.56	3,699	14,915	18,614	EW-13-3
4) Excavation, hauling and dumping of soil less than 500 m	m ³	3,288	0.53	2.87	3.40	1,743	9,437	11,180	EW-05
5) Demolition of concrete	m ³	126	7.02	15.11	22.13	885	1,904	2,789	EW-19
6) Laterite pavement	m ³	105	1.78	7.75	9.53	188	817	1,005	EW-24
7) Miscellaneous	LS	1				785	3,292	4,077	
(2) Temporary diversion channel & coffer dams for headworks						143,987	694,575	838,562	
(2)-1 1st Provision						<u>55,362</u>	<u>263,508</u>	<u>318,870</u>	
1) Stripping of top soil	m ³	4,420	0.27	1.18	1.45	1,193	5,216	6,409	EW-02-1
2) Embankment by equipment with transported soil material	m ³	11,422	1.80	8.66	10.46	20,560	98,915	119,475	EW-13-1
3) Embankment by equipment with excavated soil material	m ³	7,522	1.26	5.63	6.89	9,478	42,349	51,827	EW-13
4) Excavation and hauling of soil more than 500 m	m ³	11,422	0.93	4.13	5.06	10,622	47,173	57,795	EW-06
5) Excavation and hauling of soil less than 500 m	m ³	15,993	0.53	2.87	3.40	8,476	45,900	54,376	EW-05
6) Miscellaneous	LS	1				5,033	23,955	28,988	
(2)-2 1st Removal						<u>19,705</u>	<u>97,894</u>	<u>117,598</u>	
(2)-3 2nd Provision						<u>44,290</u>	<u>210,806</u>	<u>255,096</u>	
(2)-4 Final Removal						<u>24,631</u>	<u>122,367</u>	<u>146,998</u>	
1) Backfill of top soil	m ³	4,420	0.27	1.18	1.45	1,193	5,216	6,409	EW-02-1
2) Excavation, hauling and dumping of soil less than 500 m	m ³	23,015	0.53	2.87	3.40	12,198	66,053	78,251	EW-05
3) Excavation, hauling and dumping of soil more than 500 m	m ³	9,679	0.93	4.13	5.06	9,001	39,974	48,975	EW-06
4) Miscellaneous	LS	1				2,239	11,124	13,363	
(3) Temporary coffer dams for intake						107,939	330,309	438,248	
(3)-1 Provision						<u>86,039</u>	<u>244,247</u>	<u>330,286</u>	
1) Stripping of top soil	m ³	7,471	0.27	1.18	1.45	2,017	8,816	10,833	EW-02-1
2) Embankment by equipment, soil without transportation	m ³	18,326	1.26	5.65	6.91	23,091	103,542	126,633	EW-13
3) Excavation, hauling and dumping of soil less than 500 m	m ³	8,647	0.53	2.87	3.40	4,583	24,817	29,400	EW-05
4) Excavation, hauling and dumping of soil more than 500 m	m ³	14,473	0.93	4.13	5.06	13,460	59,773	73,233	EW-06
5) Gabion mattress	m ³	331	54.52	31.06	85.58	18,046	10,281	28,327	SW-01
6) Concrete pipe Dia. 1,000mm	m	204	53.33	36.75	90.08	10,879	7,497	18,376	CW-13
7) Reinforced concrete	m ³	69	65.97	45.03	111.00	4,552	3,107	7,659	CW-101
8) Lean concrete	m ³	4	53.33	36.75	90.08	213	147	360	CW-103
9) Reinforcement bar, deformed bar	kg	4,300	0.29	0.94	1.23	1,247	4,042	5,289	CW-10
10) Foundation gravel	m ³	6	22.09	3.64	25.73	129	21	150	EW-16
11) Miscellaneous	LS	1				7,822	22,204	30,026	
(3)-2 Removal of coffer dams for intake						<u>21,900</u>	<u>86,062</u>	<u>107,962</u>	
1) Backfill of top soil	m ³	7,471	0.27	1.18	1.45	2,017	8,816	10,833	EW-02-1
2) Excavation, hauling and dumping of soil more than 500 m	m ³	14,804	0.93	4.13	5.06	13,768	61,141	74,909	EW-06
3) Backfilling of soil	m ³	3,926	0.31	1.25	1.56	1,217	4,908	6,125	EW-13-3
4) Demolition of concrete	m ³	104	7.02	15.11	22.13	733	1,577	2,310	EW-19
5) Laterite pavement	m ³	189	1.78	7.75	9.53	337	1,467	1,804	EW-24
6) Finishing of slope	m ³	214	0.42	1.54	1.96	90	329	419	EW-03
7) Sod facing	m ²	647	2.70	0.00	2.70	1,747	0	1,747	EW-15
8) Miscellaneous	LS	1				1,991	7,824	9,815	
(4) Temporary diversion channel for Vat Krouch intake						7,943	34,968	42,911	
1) Excavation common	m ³	5,100	0.42	1.54	1.96	2,142	7,854	9,996	EW-03
2) Backfilling of excavated soil	m ³	5,100	0.31	1.25	1.56	1,581	6,375	7,956	EW-13-3
3) Embankment by equipment for coffer dam	m ³	768	1.26	5.65	6.91	968	4,339	5,307	EW-13
4) Removal of coffer dam	m ³	768	0.93	4.13	5.06	714	3,172	3,886	EW-06
5) Concrete pipe	m	88	11.53	70.06	81.59	1,015	6,165	7,180	CW-13*1.2
6) Removal of concrete pipe	LS	1				203	1,233	1,436	
7) Miscellaneous	LS	1				1,320	5,830	7,150	
2. Construction of Major Facilities (2.1)						<u>1,579,872</u>	<u>5,680,341</u>	<u>7,260,213</u>	
2.1 Roleang Chrey Headworks Improvement Works						1,579,872	5,680,341	7,260,213	
(1) Improvement works for hydro-mechanical works						728,337	4,139,897	4,868,234	

Preparatory Survey for Irrigation and Drainage System Rehabilitation and Improvement Project

Work Item	Unit	Qty	Unit Cost (US\$)			Amount (US&)			Code of unit price
			L/C	F/C	Total	L/C	F/C	Total	
1) Regulation gates and hoist, 5 sets (325 ton in total)	LS	1	654,720	3,710,080	4,364,800	654,720	3,710,080	4,364,800	
2) River outlet gates and hoist, 4 sets (8 ton in total)	LS	1	30,657	173,723	204,380	30,657	173,723	204,380	
3) Trash racks for river outlet, 2 sets	LS	1	1,056	5,984	7,040	1,056	5,984	7,040	
4) Safety rack for river out let, 2 sets	LS	1	132	748	880	132	748	880	
5) Removal of existing gates (1st year)	LS	1	3,935	29,453	33,388	3,935	29,453	33,388	
6) Removal of existing gates (2st year)	LS	1	3,157	22,769	25,926	3,157	22,769	25,926	
7) Miscellaneous	LS	1				34,680	197,140	231,820	
(2) Improvement works for Andong Sla intake of NMC including approach channel						148,446	433,083	581,529	
1) Embankment by equipment, soil without transportation	m ³	769	1.26	5.65	6.91	969	4,346	5,315	EW-13
2) Embankment by equipment, soil with transportation more than 500m	m ³	4,200	2.20	9.99	12.19	9,240	41,958	51,198	EW-13-2
3) Excavation, hauling and dumping of soil more than 500 m	m ³	2,161	0.93	4.13	5.06	2,010	8,926	10,936	EW-06
4) Finishing of slope	m ³	173	0.42	1.54	1.96	73	267	340	EW-03
5) Backfill by equipment with excavated soil	m ³	79	1.26	5.65	6.91	100	447	547	EW-13
6) Reinforced concrete	m ³	540	65.97	45.03	111.00	35,624	24,316	59,940	CW-101
7) Lean concrete	m ³	30	53.33	36.75	90.08	1,600	1,103	2,703	CW-103
8) Reinforcement bar, deformed	kg	32,535	0.29	0.94	1.23	9,435	30,583	40,018	CW-10
9) Demolition of concrete	m ³	217	7.02	15.11	22.13	1,523	3,278	4,801	EW-19
10) Foundation gravel	m ³	122	22.09	3.64	25.73	2,696	444	3,140	EW-16
11) Laterite pavement	m ³	1,150	1.78	7.75	9.53	2,047	8,913	10,960	EW-24
12) Stone masonry	m ³	262	39.96	19.31	59.27	10,454	5,051	15,505	SW-02
13) Gabion mattress	m ³	280	54.52	31.06	85.58	15,244	8,684	23,928	SW-01
14) Turnout structure, replacement	no	2	1,306	2,738	4,045	2,613	2,740	5,353	CW-307
15) Andong Sla intake gates and hoist, 2 sets	LS	1	47,520	269,280	316,800	47,520	269,280	316,800	
16) Removal of existing gates	LS	1	228	2,127	2,355	228	2,127	2,355	
17) Miscellaneous	LS	1				7,070	20,620	27,690	
(3) Improvement works for Vat Krouch intake of SMC including approach channel						144,066	470,794	614,860	
1) Excavation common (for structure)	m ³	474	0.42	1.54	1.96	199	730	929	EW-03
2) Backfill by manpower with transported soil <200m	m ³	379	4.43	3.26	7.69	1,680	1,236	2,916	EW-10-1
3) Reinforced concrete	m ³	404	65.97	45.03	111.00	26,652	18,192	44,844	CW-101
4) Plain concrete for canal lining	m ³	36	63.22	39.88	103.10	2,276	1,436	3,712	CW-102
5) Lean concrete	m ³	16	53.33	36.75	90.08	853	588	1,441	CW-103
6) Reinforcement bar, deformed	kg	41,760	0.29	0.94	1.23	12,110	39,254	51,364	CW-10
7) Gravel foundation	m ³	24	22.09	3.64	25.73	530	87	617	EW-16
8) Riprap protection	m ³	84	5.70	25.46	31.16	479	2,139	2,618	EW-20
9) Gabion mattress	m ³	144	54.52	31.06	85.58	7,851	4,473	12,324	SW-01
10) Vat krough intake gates and hoist, 2 sets	LS	1	49,995	283,305	333,300	49,995	283,305	333,300	
11) Removal of existing gates	LS	1	118	1,310	1,428	118	1,310	1,428	
12) Embankment for approach channel	m ³	5,700	1.80	8.66	10.46	10,260	49,362	59,622	EW-13-1
13) Laterite pavement	m ³	475	1.78	7.75	9.53	846	3,681	4,527	EW-24
14) Excavation common (additional)	m ³	9,900	0.42	1.54	1.96	4,158	15,246	19,404	EW-03
15) Replacement of turnout	no	2	1,306	2,738	4,045	2,613	5,477	8,090	CW-307
16) Replacement of bridge	no	1	15,970	20,665	36,634	15,970	20,665	36,635	CW-309
17) Drainage inlet	no	2	308	597	905	616	1,193	1,809	CW-312
18) Miscellaneous	LS	1				6,860	22,420	29,280	
(4) Construction of river outlet structure						102,123	281,460	383,583	
1) Stripping of top soil	m ²	3,955	0.08	0.29	0.37	316	1,147	1,463	EW-02
2) Backfilling of top soil	m ³	368	0.31	1.25	1.56	114	460	574	EW-13-3
3) Excavation, hauling and dumping of soil more than 500 m	m ³	30,197	0.93	4.13	5.06	28,083	124,714	152,797	EW-06
4) Embankment by Bulldozer	m ³	3,198	0.31	1.25	1.56	991	3,998	4,989	EW-13-3
5) Embankment by equipment with transported soil material	m ³	656	1.80	8.66	10.46	1,181	5,681	6,862	EW-13-1
6) Finishing slope	m ³	299	0.42	1.54	1.96	126	460	586	EW-03
7) Backfill by equipment with excavated material	m ³	9,164	1.26	5.65	6.91	11,547	51,777	63,324	EW-13
8) Reinforced concrete	m ³	500	65.97	45.03	111.00	32,985	22,515	55,500	CW-101
9) Lean concrete	m ³	41	53.33	36.75	90.08	2,187	1,507	3,694	CW-103
10) Reinforcement bar, deformed	kg	31,223	0.29	0.94	1.23	9,055	29,350	38,405	CW-10
11) Concrete pipe Dia. 1,000 mm	m	167	9.49	56.75	66.24	1,585	9,477	11,062	CW-13
12) Concrete pile driving, 0.4 x 0.4 x 6 m	no	12	56.94	340.50	397.44	683	4,086	4,769	
13) Foundation gravel	m ³	62	22.09	3.64	25.73	1,365	225	1,590	EW-16
14) Laterite pavement	m ³	61	1.78	7.75	9.53	109	473	582	EW-24

Work Item	Unit	Qty	Unit Cost (US\$)			Amount (US\$)			Code of unit price
			L/C	F/C	Total	L/C	F/C	Total	
15) Sod facing	m ²	932	2.70	0.00	2.70	2,516	0	2,516	EW-15
16) Miscellaneous	LS	1				9,280	25,590	34,870	
(5) Construction of river protection including ground sill						456,900	355,107	812,007	
1) Stripping of top soil	m ²	265	0.08	0.29	0.37	21	77	98	EW-02
2) Excavation of soil	m ³	94	0.42	1.54	1.96	39	145	184	EW-03
3) Excavation of soft rock	m ³	94	3.36	12.32	15.68	316	1,158	1,474	
4) Excavation, hauling and dumping of soil less than 500 m	m ³	904	0.53	2.87	3.40	479	2,594	3,073	EW-05
5) Excavation, hauling and dumping of soil more than 500 m	m ³	10,954	0.93	4.13	5.06	10,187	45,240	55,427	EW-06
6) Embankment by equipment with excavated material	m ³	7,174	1.26	5.65	6.91	9,039	40,533	49,572	EW-13
7) Finishing slope	m ³	787	0.42	1.54	1.96	331	1,212	1,543	EW-03
8) Backfill by equipment with excavated material	m ³	755	1.26	5.65	6.91	951	4,266	5,217	EW-13
9) Reinforced concrete	m ³	1,016	65.97	45.03	111.00	67,052	45,768	112,820	CW-101
10) Plain concrete	m ³	844	63.22	39.88	103.10	53,358	33,659	87,017	CW-102
11) Reinforcement bar, deformed	kg	16,500	0.27	0.94	1.21	4,455	15,510	19,965	CW-10
12) Foundation gravel	m ³	9	22.09	3.64	25.73	190	31	221	EW-16
13) Stone masonry	m ³	5,969	39.96	19.31	59.27	238,533	115,267	353,800	SW-02
14) Gabion mattress	m ³	559	54.52	31.06	85.58	30,449	17,347	47,796	SW-01
15) Miscellaneous	LS	1				41,500	32,300	73,800	
3. Construction of Irrigation and Drainage Canals and Related Structures (3.1 + 3.2 + 3.3)						1,789,484	4,068,390	5,857,875	
3.1 Rehabilitation works for North Main and Secondary canals						862,236	1,923,911	2,786,147	
1) Canal rehabilitation for main canal (9.1 km)						<u>239,565</u>	<u>735,560</u>	<u>975,125</u>	
- Stripping of top soil	m ²	43,390	0.08	0.29	0.37	3,471	12,583	16,054	EW-02
- Excavation common by equipment	m ³	52,573	0.42	1.54	1.96	22,081	80,962	103,043	EW-03
- Embankment by equipment with soil material less than 5 km	m ³	58,494	2.20	9.99	12.19	128,687	584,355	713,042	EW-13-2
- Laterite pavement	m ³	1,485	1.78	7.75	9.53	2,643	11,509	14,152	EW-24
- Sod facing	m ²	12,119	2.70	0.00	2.70	32,721	0	32,721	EW-15
- Riprap (t = 0.3 m)	m ³	1,951	19.76	5.70	25.46	38,552	11,121	49,673	EW-20
- Miscellaneous	LS	1				11,410	35,030	46,440	
2) Structures for main canal						<u>368,707</u>	<u>393,270</u>	<u>761,977</u>	
- Turnout, replacement	no	15	1,306	2,738	4,045	19,595	41,077	60,672	CW-307
- Check structure (approach channel)	no	4	40,203	51,704	91,907	160,814	206,814	367,628	CW-305
- Bridge, replacement	no	2	15,970	20,665	36,634	31,939	41,330	73,269	CW-309
- Foot bridge, new	no	1	6,630	6,702	13,332	6,630	6,702	13,332	CW-311
- Spillway (NMC-22)	no	1	130,321	75,037	205,358	130,321	75,037	205,358	CW-301
- Drainage inlet	no	6	308	597	905	1,848	3,580	5,428	CW-312
- Miscellaneous	LS	1				17,560	18,730	36,290	
3) Canal rehabilitation for secondary canals (5 canals, 7.8 km in total)						<u>168,632</u>	<u>675,247</u>	<u>843,879</u>	
- Stripping of top soil	m ²	92,160	0.08	0.29	0.37	7,373	26,726	34,099	EW-02
- Excavation common by equipment	m ³	5,000	0.42	1.54	1.96	2,100	7,700	9,800	EW-03
- Embankment by equipment with soil material less than 5 km	m ³	60,537	2.20	9.99	12.19	133,181	604,765	737,946	EW-13-2
- Sod facing	m ²	6,315	2.70	0.00	2.70	17,051	0	17,051	EW-15
- Laterite pavement	m ³	504	1.78	7.75	9.53	897	3,906	4,803	EW-24
- Miscellaneous	LS	1				8,030	32,150	40,180	
4) Structures for secondary canals						<u>85,332</u>	<u>119,834</u>	<u>205,166</u>	
- Check structure	no	15	3,064	4,942	8,006	45,960	74,129	120,089	CW-203
- Turnout	no	23	937	1,034	1,970	21,541	23,777	45,318	CW-208
- Drainage inlet	no	2	308	597	905	616	1,193	1,809	CW-312
- Pipe culvert	no	18	731	835	1,566	13,155	15,025	28,180	CW-206
- Miscellaneous	LS	1				4,060	5,710	9,770	
3.2 Rehabilitation works for South Main and Secondary canals						724,933	1,569,057	2,293,991	
1) Canal rehabilitation for main canal (9.8 km)						<u>172,266</u>	<u>503,512</u>	<u>675,778</u>	
- Stripping of top soil	m ²	25,995	0.08	0.29	0.37	2,080	7,539	9,619	EW-02
- Excavation common by equipment	m ³	58,133	0.42	1.54	1.96	24,416	89,525	113,941	EW-03
- Embankment by equipment with soil material less than 5 km	m ³	36,114	2.20	9.99	12.19	79,451	360,779	440,230	EW-13-2
- Laterite pavement	m ³	1,485	1.78	7.75	9.53	2,643	11,509	14,152	EW-24
- Sod facing	m ²	7,476	2.70	0.00	2.70	20,185	0	20,185	EW-15
- Riprap (t = 0.3 m)	m ³	1,786	19.76	5.70	25.46	35,291	10,180	45,471	EW-20
- Miscellaneous	LS	1				8,200	23,980	32,180	

Work Item	Unit	Qty	Unit Cost (US\$)			Amount (US\$)			Code of unit price
			L/C	F/C	Total	L/C	F/C	Total	
2) Structures for main canal						<u>249,743</u>	<u>199,649</u>	<u>449,393</u>	
- Check structure, new	no	1	37,907	46,763	84,670	37,907	46,764	84,671	CW-306
- Check structure, replacement with new	no	1	40,203	51,704	91,907	40,203	51,705	91,908	CW-305
- Demolition of check structure	m ³	327	7	15	22	2,296	342	2,638	EW-19
- Turnout, new	no	2	1,227	2,567	3,794	2,453	2,569	5,023	CW-308
- Turnout, replacement	no	5	1,306	2,738	4,045	6,532	2,743	9,275	CW-307
- Bridge, new	no	3	13,813	19,435	33,248	41,440	19,438	60,878	CW-310
- Bridge, demolition	m ³	97	7.02	15.11	22	681	112	793	EW-19
- Spillway (SMC-18)	no	1	35,295	23,786	59,081	35,295	23,787	59,082	CW-302
- Spillway (SMC-24)	no	1	68,937	38,511	107,447	68,937	38,512	107,448	CW-303
- Spillway (SMC-25)	no	1	570	3,565	4,134	570	3,566	4,135	CW-304
- Drainage inlet	no	5	308	597	905	1,540	602	2,142	CW-312
- Miscellaneous	LS	1				11,890	9,510	21,400	
3) Canal rehabilitation for secondary canals (7 canals, 9.1 km in total)						<u>165,520</u>	<u>664,135</u>	<u>829,655</u>	
- Stripping of top soil	m ²	88,285	0.08	0.29	0.37	7,063	25,603	32,666	EW-02
- Excavation common by equipment	m ³	5,000	0.42	1.54	1.96	2,100	7,700	9,800	EW-03
- Embankment by equipment with soil material less than 5 km	m ³	57,988	2.20	9.99	12.19	127,574	579,300	706,874	EW-13-2
- Sod facing	m ²	6,049	2.70	0.00	2.70	16,332	0	16,332	EW-15
- Laterite pavement	m ³	2,697	1.78	7.75	9.53	4,801	20,902	25,703	EW-24
- Miscellaneous	LS	1				7,650	30,630	38,280	
4) Structures for secondary canals						<u>137,404</u>	<u>201,761</u>	<u>339,165</u>	
- Check structure	no	30	3,064	4,942	8,006	91,920	148,258	240,178	CW-203
- Turnout	no	30	937	1,034	1,970	28,097	31,014	59,111	CW-208
- Drainage inlet	no	2	308	597	905	616	1,193	1,809	CW-312
- Pipe culvert	no	14	731	835	1,566	10,231	11,686	21,917	CW-206
- Miscellaneous	LS	1				6,540	9,610	16,150	
3.3 Drainage canals (3,000m in total)						202,315	575,422	777,737	
- Excavation common	m ³	188,000	0.42	1.54	1.96	78,960	289,520	368,480	EW-03
- Excavation common in water	m ³	47,000	1.13	4.31	5.44	53,110	202,570	255,680	EW-04
- Excavation for structure	m ³	3,520	0.42	1.54	1.96	1,478	5,421	6,899	EW-03
- Backfill for structure	m ³	1,507	3.88	0.25	4.13	5,847	377	6,224	EW-10
- Reinforced concrete	m ³	362	65.97	45.03	111.00	23,881	16,301	40,182	CW-101
- Lean concrete	m ³	28	53.33	36.75	90.08	1,493	1,029	2,522	CW-103
- Reinforcement bar, deformed	kg	21,813	0.29	0.94	1.23	6,326	20,504	26,830	CW-10
- Gabion mattress	m ³	396	54.52	31.06	85.58	21,590	12,300	33,890	SW-01
- Miscellaneous	LS	1				9,630	27,400	37,030	
4. Construction of Sub-project office and relevant facility						108,850	108,850	217,700	
4.1 Construction of building for Sub-project office						108,850	108,850	217,700	
1) Office building	m ²	300	292.50	292.50	585.00	87,750	87,750	175,500	OW-01
2) Parking shed	m ²	100	150.00	150.00	300.00	15,000	15,000	30,000	
3) Electric work	LS	1				5,000	5,000	10,000	
4) Miscellaneous	LS	1				1,100	1,100	2,200	
<i>Construction of tertiary system for model area</i>						<u>32,997</u>	<u>80,529</u>	<u>113,526</u>	
(1) Construction of tertiary system						<u>32,997</u>	<u>80,529</u>	<u>113,526</u>	
1) Construction of tertiary and drainage canals	ha	350	89.79	219.14	308.93	31,427	76,699	108,126	EW-103
2) Miscellaneous						1,570	3,830	5,400	
TOTAL CONSTRUCTION COST including Tertiary system Model area						3,894,843	11,255,028	15,149,871	

Source: JICA Survey Team

Table AF-2.2.4 Breakdown of Cost for Gates for RCHRSP

No.	Item	Numbers	Unit	Qty	Unit Price	Amount (US\$)			
					(US\$/ton) or (US\$/set)	F/C	L/C	Total	
1	Regulator Gates and Hoists								
1.1	Gate leaf	5	sets	ton	200	10,000	1,700,000	300,000	2,000,000
1.2	Track rail	5	sets	ton	15	18,000	229,500	40,500	270,000
1.3	Hoist	5	sets	ton	65	20,000	1,105,000	195,000	1,300,000
1.4	Hoist deck	5	sets	ton	45	8,000	306,000	54,000	360,000
1.5	Remote control system	1	lot	-	-	Lump Sum	32,300	5,700	38,000
	Sub total 1				325		3,372,800	595,200	3,968,000
2	River Outlet Gates and Hoists								
2.1	Gate leaf	4	sets	ton	2.4	8,000	16,320	2,880	19,200
2.2	Guide frame	4	sets	ton	1.6	11,000	14,960	2,640	17,600
2.3	Hoist	4	sets	set	4	31,000	105,400	18,600	124,000
2.4	Remote control system	1	lot	-	-	Lump Sum	21,250	3,750	25,000
	Sub total 2						157,930	27,870	185,800

No.	Item	Numbers		Unit	Qty	Unit Price	Amount (US\$)		
						(US\$/ton) or (US\$/set)	F/C	L/C	Total
3	Trash racks for River Outlet								
3.1	Trash rack	4	sets		1.6	4,000	5,440	960	6,400
4	Trash racks for River Outlet								
4.1	Trash rack	2	sets		0.2	4,000	680	120	800
5	Andong Sla Intake Gates and Hoists								
5.1	Gate leaf	2	sets	ton	8	10,000	68,000	12,000	80,000
5.2	Guide frame	2	sets	ton	5	11,000	46,750	8,250	55,000
5.3	Anchorage	2	sets	ton	3	10,000	25,500	4,500	30,000
5.4	Hoist	2	sets	set	2	46,000	78,200	13,800	92,000
5.5	Remote control system	1	lot	-	-	Lump Sum	26,350	4,650	31,000
	Subtotal 5						244,800	43,200	288,000
6	Vat Krogh Intake Gates and Hoists								
6.1	Gate leaf	2	sets	ton	8	10,000	68,000	12,000	80,000
6.2	Guide frame	2	sets	ton	5	11,000	46,750	8,250	55,000
6.3	Anchorage	2	sets	ton	3	10,000	25,500	4,500	30,000
6.4	Hoist	2	sets	set	2	46,000	78,200	13,800	92,000
6.5	Remote control system	1	lot	-	-	Lump Sum	39,100	6,900	46,000
	Subtotal 6						257,550	45,450	303,000
	Ground Total				327		4,039,200	712,800	4,752,000

Source: JICA Survey Team

AF-2.3 Upper Slakou Irrigation System Rehabilitation Sub-project (USISRSP)

The cost estimates for every category concerning to USISRSP are shown in the following tables.

Table AF-2.3.1 Construction Cost for USISRSP

Work Item	Cost (US\$)		
	F/C	L/C	Total
Construction of Main Irrigation & Drainage System			
1. Preparatory Works and Temporary Works (General Item)	182,370	86,700	269,070
1.1 Cofferdam for spillway construction	88,074	19,614	107,688
1.2 Temporary works	33,253	14,258	47,511
1.3 Construction Site Development	61,043	52,828	113,871
2. Construction of Major Facility	2,111,840	1,226,230	3,338,070
2.1 Tumnap Lok Reservoir Rehabilitation	911,800	752,300	1,664,100
(1) Dike Rehabilitation	496,331	259,743	756,074
(2) Spillway	299,932	415,711	715,642
(3) Maintenance of Gate	25,708	18,464	44,171
(4) Intake Structure for Diversion Canal	29,293	13,588	42,882
(5) Intake Gate to Tertiary Block (1 no.)	11,632	6,414	18,046
(6) Demolition of existing structure	5,440	2,527	7,967
(7) Miscellanies	43,465	35,900	79,365
2.2 Diversion canal rehabilitation (9.4 km)	1,114,340	357,930	1,472,270
(1) Canal Rehabilitation	989,277	284,760	1,274,037
(2) Structures	71,963	56,173	128,136
(3) Miscellaneous	53,100	16,997	70,097
2.3 Kpob Trobek Reservoir rehabilitation	85,700	116,000	201,700
(1) Dike Rehabilitation	28,712	101,168	129,880
(2) Spillway	52,855	9,327	62,183
(3) Miscellanies	4,133	5,505	9,638
3. Construction of Irrigation and Drainage Canals	3,683,160	1,281,850	4,965,010
3.1 Main Canal 33 rehabilitation (7.3 km)	607,340	224,250	831,589
(1) Canal Rehabilitation	428,768	127,104	555,872
(2) Structures	145,337	84,441	229,777
(3) Demolition of existing structures	4,533	2,106	6,639
(4) Miscellaneous	28,702	10,599	39,301
3.2 Secondary canals (44.7 km) rehabilitation	3,075,820	1,057,600	4,133,420
(1) Canal Rehabilitation	2,111,261	544,560	2,655,821
(2) Structures	810,806	459,329	1,270,136
(3) Demolition of existing structures	7,555	3,510	11,065
(4) Miscellaneous	146,198	50,201	196,399
4. Construction of Sub-project office and relevant facilities	178,380	120,790	299,170

Work Item	Cost (US\$)		
	F/C	L/C	Total
4.1 Construction of building for Sub-project office	178,380	120,790	299,170
Construction Cost Main System of USISRSP	6,155,750	2,715,570	8,871,320
Tertiary System Construction (3,500 ha)			
(1) New Tertiary Canal Construction	515,275	173,200	688,475
(2) Existing Tertiary Canal Rehabilitation	129,540	38,820	168,360
(3) Miscellaneous (5 % of sub-total)	32,200	10,600	42,800
Construction Cost of Tertiary System	677,015	222,620	899,635
Total Construction Cost for USISRSP	6,832,765	2,938,190	9,770,955

Source: JICA Survey Team

Table AF-2.3.2 Software Component Activity Cost for USISRSP

Item	Unit	Qty	F/C (US\$)		L/C (US\$)		Total (US\$)
			Unit rate	Amount	Unit rate	Amount	
(1) Capacity development of MOWRAM and PDOWRAM staff							
(1)-1 Remuneration and salary							
1) Foreign consultant	MM	1.5	32,591	48,887			48,887
2) National consultant	MM	6			3,000	18,000	18,000
Sub total				<u>48,887</u>		<u>18,000</u>	<u>66,887</u>
(1)-2 Direct cost							
1) Per diem for foreign consul.	day	45	100	4,500			4,500
2) Per diem for national consul.	day	180			30	5,400	5,400
3) Mobilization of foreign consul.	no	1	1,500	1,500			1,500
4) Mobilization of national consul.	no	2			50	100	100
Sub total				<u>6,000</u>		<u>5,500</u>	<u>11,500</u>
(1)-3 Training cost							
1) Allowance	day	200			50	10,000	10,000
2) Material	LS	1			4,000	4,000	4,000
Sub total						<u>14,000</u>	<u>14,000</u>
(1)-4 Monitoring and evaluation							
1) MOWRAM	LS/year	4			2,000	8,000	8,000
2) PDOWRAM	LS/year	4			2,000	8,000	8,000
Sub total						<u>16,000</u>	<u>16,000</u>
Sub Total (1) (round)				54,887		53,500	108,387
(2) FWUC Formation and Strengthening							
(2)-1 Remuneration and salary							
1) National consultant	MM	21			3,000	63,000	63,000
Sub total						<u>63,000</u>	<u>63,000</u>
(2)-2 Direct cost							
1) Per diem for national consul.	day	630			30	18,900	18,900
2) Mobilization of national consul	no	7			50	350	350
Sub total						<u>19,250</u>	<u>19,250</u>
(2)-3 Training cost							
1) Allowance PDOWRAM	day	70			50	3,500	3,500
2) Allowance FWUC	day	3388			10	33,880	33,880
3) Material & others	LS	1			69,160	69,160	69,160
Sub total						<u>106,540</u>	<u>106,540</u>
(2)-4 Monitoring and evaluation							
1) MOWRAM	LS/year	7			3,000	21,000	21,000
2) PDOWRAM	LS/year	7			4,000	28,000	28,000
Sub total						<u>49,000</u>	<u>49,000</u>
Sub Total (2) (round)				0		237,790	237,790
(3) Agricultural support service							
(3)-1 Trainer's training							
1) Trainer's training	LS	1			2,080	2,080	2,080
Sub total						<u>2,080</u>	<u>2,080</u>
(3)-2 Field program							
1) Demonstration plot	LS	1			65,700	65,700	65,700
2) Water management	LS	1			57,960	57,960	57,960
Sub total						<u>123,660</u>	<u>123,660</u>
(3)-3 Farmer group training							
1) FG training program	LS	1			43,560	43,560	43,560
Sub total						<u>43,560</u>	<u>43,560</u>

Item	Unit	Qty	F/C (US\$)		L/C (US\$)		Total (US\$)
			Unit rate	Amount	Unit rate	Amount	
(3)-4 Mass guideline/workshop	LS	1			9,360	9,360	9,360
1) Mass guideline/workshop							
Sub total						<u>9,360</u>	<u>9,360</u>
(3)-5 Consultant	LS	0.3		12,180			12,180
1) Foreign consultant							
2) National consultant	LS	3.44				13,640	13,640
Sub total				<u>12,180</u>		<u>13,640</u>	<u>25,820</u>
Sub Total (3) (round)				12,180		192,300	204,480
GRAND TOTAL FOR USISRSP				67,067		483,590	550,657

Source: JICA Survey Team

Table AF-2.3.3 Breakdown of Construction Cost for USISRSP

Item	Unit	Qty	Unit cost (US\$)			Amount (US\$)			Code of Unit Price
			L/C	F/C	Total	L/C	F/C	Total	
1. Preparatory works and temporary works (General Item)						86,700	182,369	269,069	
1.1 Cofferdam for spillway construction						19,614	88,074	107,688	
(1) Excavation (Tumnup Lok)	m ³	2,700	0.42	1.54	1.96	1,134	4,158	5,292	EW-03
(2) Embankment (Tumnup Lok)	m ³	8,400	2.20	9.99	12.19	18,480	83,916	102,396	EW-13-2
(3) Excavation (Kpob Trobek)	m ³	0	0.42	1.54	1.96	0	0	0	
(4) Embankment (Kpob Trobek)	m ³	0	2.20	9.99	12.19	0	0	0	
1.2 Temporary works						14,258	33,252	47,510	
(1) Dewatering work	LS	1				14,258	33,252	47,510	
1.3 Construction Site Development						52,828	61,043	113,871	
(1) Contractor's site office (20 x 30 m)	m ²	600	50.00	50.00	100.00	30,000	30,000	60,000	
(2) Desk and furniture and equipment	LS	1	10,000.0	10,000.0	20,000.0	10,000	10,000	20,000	
(3) Office supply	year	2	2,500.00	2,500.00	5,000.00	5,000	5,000	10,000	
(4) Rental cost of land (100 x 100 m)	m ²	0	0.30	0.00	0.30	0	0	0	
(5) Embankment of site	m ³	2,000	1.26	5.65	6.91	2,520	11,300	13,820	EW-13
(6) Access road (100 m)	m	100	20.46	7.31	27.77	2,046	731	2,777	EW-23
(7) Pipe culvert (D=1 m, L=8 m)	nos.	3	1,087.44	1,337.39	2,424.83	3,262	4,012	7,274	CW-205
2. Construction of Major Facilities						1,226,275	2,111,842	3,338,118	
2.1 Tumnup Lok Reservoir Rehabilitation						752,346	911,835	1,664,182	
(1) Dike Rehabilitation						259,743	496,331	756,074	
1) Stripping (t=0.2 m)	m ²	47,700	0.08	0.29	0.37	3,816	13,833	17,649	EW-02
2) Excavation (Common)	m ³	19,400	0.42	1.54	1.96	8,148	29,876	38,024	EW-03
3) Embankment (Zone-I, Impervious zone)	m ³	6,300	2.20	9.99	12.19	13,860	62,937	76,797	EW-13-2
4) Embankment (Zone-II, Shell zone)	m ³	27,000	1.80	8.66	10.46	48,600	233,820	282,420	EW-13-1
5) Upstream surface protection	m ³	10,400	2.20	9.99	12.19	22,880	103,896	126,776	EW-13-2
6) Riprap (Rock, t=0.3 m)	m ³	1,210	19.76	5.70	25.46	23,910	6,897	30,807	EW-20
7) Riprap (Rock, t=0.5 m)	m ³	230	19.76	5.70	25.46	4,545	1,311	5,856	EW-20
8) Riprap (Sand and gravel, t=0.2 m)	m ³	870	22.09	3.64	25.73	19,218	3,167	22,385	EW-16
9) Filter (sand sand and gravel)	m ³	790	22.09	3.64	25.73	17,451	2,876	20,327	EW-16
10) Filter (random materials)	m ³	1,030	13.05	2.07	15.12	13,442	2,132	15,574	EW-17
11) Pavement (sub-base course, t=0.2 m)	m ³	3,010	20.46	7.31	27.77	61,585	22,003	83,588	EW-23
12) Pavement (Laterite, t=0.1 m)	m ³	1,290	1.78	7.75	9.53	2,296	9,998	12,294	EW-24
13) Back fill	m ³	1,100	4.43	3.26	7.69	4,873	3,586	8,459	EW-10-1
14) Sod facing	m ²	5,600	2.70	0.00	2.70	15,120	0	15,120	EW-15
(2) Spillway						415,711	299,932	715,642	
1) Clearing (30% of strip area)	m ²	2,400	0.06	0.19	0.25	144	456	600	EW-01
2) Stripping (t=0.2 m)	m ²	8,000	0.08	0.29	0.37	640	2,320	2,960	EW-02
3) Excavation (Common)	m ³	23,300	0.42	1.54	1.96	9,786	35,882	45,668	EW-03
4) Embankment (common soil)	m ³	2,100	1.80	8.66	10.46	3,780	18,186	21,966	EW-13-1
5) Back fill	m ³	400	3.88	0.25	4.13	1,552	100	1,652	EW-10
6) Reinforced concrete	m ³	1,810	65.97	45.03	111.00	119,406	81,504	200,910	CW-101
7) Re-bar	kg	80,000	0.29	0.94	1.23	23,200	75,200	98,400	CW-10
8) Plain (non-RF) concrete	m ³	590	63.22	39.88	103.10	37,300	23,529	60,829	CW-102
9) Lean concrete	m ³	160	53.33	36.75	90.08	8,533	5,880	14,413	CW-103
10) Anchor rock (0.2-0.6 m dia)	m ³	1,280	19.76	5.70	25.46	25,293	7,296	32,589	EW-20
11) Anchor rock (t=1.0 m, 0.3-0.8 m dia)	m ³	4,000	19.76	5.70	25.46	79,040	22,800	101,840	- do -
12) Small stone (t=0.3 m)	m ³	1,990	19.76	5.70	25.46	39,322	11,343	50,665	- do -
13) Small stone (t=0.5 m)	m ³	1,750	19.76	5.70	25.46	34,580	9,975	44,555	- do -
14) Sand and gravel	m ³	1,500	22.09	3.64	25.73	33,135	5,460	38,595	EW-16
(3) Maintenance of Gate						18,464	25,708	44,171	
1) Excavation (Common)	m ³	400	0.42	1.54	1.96	168	616	784	EW-03
2) Embankment (common soil)	m ³	800	1.80	8.66	10.46	1,440	6,928	8,368	EW-13-1
3) Reinforced concrete	m ³	170	65.97	45.03	111.00	11,215	7,655	18,870	CW-101

Preparatory Survey for Irrigation and Drainage System Rehabilitation and Improvement Project

Item	Unit	Qty	Unit cost (US\$)			Amount (US\$)			Code of Unit Price
			L/C	F/C	Total	L/C	F/C	Total	
4) Re-bar	kg	10,000	0.29	0.94	1.23	2,900	9,400	12,300	CW-10
5) Lean concrete	m ³	20	53.33	36.75	90.08	1,067	735	1,802	CW-103
6) Riprap (Rock, t=0.3 m)	m ³	40	19.76	5.70	25.46	790	228	1,018	EW-20
7) Filter (sand sand and gravel)	m ³	40	22.09	3.64	25.73	884	146	1,029	EW-16
(4) Intake Structure for Diversion Canal						13,588	29,293	42,882	
1) Excavation (Common)	m ³	100	0.42	1.54	1.96	42	154	196	EW-03
2) Embankment (common soil)	m ³	1,200	1.80	8.66	10.46	2,160	10,392	12,552	EW-13-1
3) Reinforced concrete	m ³	90	65.97	45.03	111.00	5,937	4,053	9,990	CW-101
4) Re-bar	kg	10,000	0.29	0.94	1.23	2,900	9,400	12,300	CW-10
5) Lean concrete	m ³	10	53.33	36.75	90.08	533	368	901	CW-103
6) Riprap (Rock, t=0.4 m)	m ³	40	19.76	5.70	25.46	790	228	1,018	EW-20
7) Filter (sand sand and gravel, t=0.2 m)	m ³	20	22.09	3.64	25.73	442	73	515	EW-16
8) Slide gate (1.2 m × 1.2m)	nos.	2	325.46	2,036.92	2,362.38	651	4,074	4,725	GW-03 *1.2
9) Screen (1.2 m × 3.3 m)	nos.	2	45.00	255.00	300.00	90	510	600	
10) Air vent pipe (0.1 m dia)	m	5	8.50	8.50	17.00	43	43	85	
(5) Intake Gate to Tertiary Block (1 no.)						6,414	11,632	18,046	
1) Excavation (Common)	m ³	100	0.42	1.54	1.96	42	154	196	EW-03
2) Embankment (common soil)	m ³	500	1.80	8.66	10.46	900	4,330	5,230	EW-13-1
3) Reinforced concrete	m ³	50	65.97	45.03	111.00	3,299	2,252	5,550	CW-101
4) Re-bar	kg	2,290	0.29	0.94	1.23	664	2,153	2,817	CW-10
5) Lean concrete	m ³	10	53.33	36.75	90.08	533	368	901	CW-103
6) Riprap (Rock, t=0.4 m)	m ³	20	19.76	5.70	25.46	395	114	509	EW-20
7) Filter (sand sand and gravel, t=0.2 m)	m ³	10	22.09	3.64	25.73	221	36	257	EW-16
8) Concrete pipe (0.5 m dia)	m	10	6.32	38.41	44.73	63	384	447	CW-11
9) Slide gate (0.6 m × 0.6m)	nos.	1	271.22	1,697.43	1,968.65	271	1,697	1,969	GW-03
10) Screen (0.6 m × 2.3 m)	nos.	1	22.50	127.50	150.00	23	128	150	
11) Air vent pipe (0.1 m dia)	m	2	1.50	8.50	10.00	3	17	20	
(6) Demolition of existing structure	m ³	360	7.02	15.11	22.13	2,527	5,440	7,967	EW-19
Sub total ((1) to (6))						716,446	868,335	1,584,782	
						35,900	43,500	79,400	
2.2 Diversion canal rehabilitation (9.4 km)						357,933	1,114,340	1,472,273	
(1) Canal Rehabilitation						284,760	989,277	1,274,037	
1) Stripping (t=0.2 m)	m ²	27,300	0.08	0.29	0.37	2,184	7,917	10,101	EW-02
2) Excavation (Common)	m ³	114,700	0.42	1.54	1.96	48,174	176,638	224,812	EW-03
3) Embankment (Common)	m ³	33,600	1.80	8.66	10.46	60,480	290,976	351,456	EW-13-1
4) Earth lining (t=0.5 m)	m ³	49,100	2.20	9.99	12.19	108,020	490,509	598,529	EW-13-2
5) Pavement (Laterite, t=0.15 m)	m ³	2,500	1.78	7.75	9.53	4,450	19,375	23,825	EW-24
6) Wet stone masonry at outer bend	m ³	200	39.96	19.31	59.27	7,992	3,862	11,854	SW-02
7) Sod facing for upper slopes	m ²	19,800	2.70	0.00	2.70	53,460	0	53,460	EW-15
(2) Structures						56,173	71,963	128,136	
Krouch Syvon						31,150	43,772	74,922	
1) Excavation (Common)	m ³	2,300	0.42	1.54	1.96	966	3,542	4,508	EW-03
2) Embankment (Common)	m ³	0	1.82	8.66	10.48	0	0	0	EW-13-1
3) Backfilling	m ³	1,400	4.43	3.26	7.69	6,202	4,564	10,766	EW-10-1
4) Reinforced concrete	m ³	210	65.97	45.03	111.00	13,854	9,456	23,310	CW-101
5) Re-bar	kg	20,000	0.29	0.94	1.23	5,800	18,800	24,600	CW-10
6) Plain (non-RF) concrete	m ³	30	63.22	39.88	103.10	1,897	1,196	3,093	CW-102
7) Lean concrete (t=0.1 m)	m ²	30	53.33	36.75	90.08	1,600	1,103	2,702	CW-103
8) Slide gate (2.0m × 1.7m)	nos.	2	415.72	2,555.48	2,971.20	831	5,111	5,942	GW-01x0.85
Road Bridge/ Culvert (2 nos.)						25,024	28,191	53,215	
1) Bridge	no	2	12,511.92	14,095.36	26,607.28	25,024	28,191	53,215	
Sub total ((1)+(2))						340,933	1,061,240	1,402,173	
						17,000	53,100	70,100	
2.3 Kpob Trobek Reservoir rehabilitation						115,995	85,667	201,663	
(1) Dike Rehabilitation						101,168	28,712	129,880	
1) Stripping (t=0.2 m)	m ²	5,000	0.08	0.29	0.37	400	1,450	1,850	EW-02
2) Excavation (Common)	m ³	540	0.42	1.54	1.96	227	832	1,058	EW-03
3) Embankment (Common)	m ³	540	1.80	8.66	10.46	972	4,676	5,648	EW-13-1
4) Riprap (Rock, t = 0.5 m)	m ³	160	19.76	5.70	25.46	3,162	912	4,074	EW-20
5) Riprap (Rock, t = 0.3 m)	m ³	3,240	19.76	5.70	25.46	64,022	18,468	82,490	EW-20
6) Filter (sand sand and gravel)	m ³	220	13.05	2.07	15.12	2,871	455	3,326	EW-17
7) Filter (random materials)	m ³	220	1.61	8.72	10.33	354	1,918	2,273	EW-11
8) Sod facing	m ²	10,800	2.70	0.00	2.70	29,160	0	29,160	EW-15
(2) Spillway						9,327	52,855	62,183	
1) Improvement of spillway gates	LS								
- Hoisting system	set	6	1,117.80	6,334.20	7,452.00	6,707	38,005	44,712	
- Painting for gate leaves	set	6	234.00	1,326.00	1,560.00	1,404	7,956	9,360	

Item	Unit	Qty	Unit cost (US\$)			Amount (US\$)			Code of Unit Price
			L/C	F/C	Total	L/C	F/C	Total	
- Miscellaneous	LS					1,217	6,894	8,111	
Sub total ((1)+(2))						110,495	81,567	192,063	
(3) Miscellanies (5% of sub-total above)						5,500	4,100	9,600	
3.1 Main Canal 33 rehabilitation (7.3 km)						1,281,850	3,683,159	4,965,010	
(1) Canal Rehabilitation						224,251	607,338	831,588	
(1) Canal Rehabilitation						127,104	428,768	555,872	
1) Stripping (t = 0.2 m)	m ²	24,000	0.08	0.29	0.37	1,920	6,960	8,880	EW-02
2) Excavation (Common)	m ³	14,000	0.42	1.54	1.96	5,880	21,560	27,440	EW-03
3) Embankment (Common)	m ³	30,000	1.80	8.66	10.46	54,000	259,800	313,800	EW-13-1
4) Slope finishing (excavation)	m ²	32,000	0.50	1.85	2.35	16,128	59,136	75,264	EW-03*1.2
5) Slope finishing (embankment)	m ²	44,000	0.50	1.85	2.35	22,176	81,312	103,488	EW-03*1.2
6) Sod facing	m ²	10,000	2.70	0.00	2.70	27,000	0	27,000	EW-15
(2) Structures						84,441	145,337	229,777	
1) Division structure	nos.	5	8,820.26	13,590.9	22,411.2	44,101	67,955	112,056	CW-201
2) Off-take-1	nos.	5	3,064.01	4,941.94	8,005.95	15,320	24,710	40,030	CW-203
3) Off-take-2	nos.	1	1,493.61	1,403.69	2,897.30	1,494	1,404	2,897	CW-207
4) Box culvert (Replacement)	nos.	3	6,255.96	7,047.68	13,303.6	18,768	21,143	39,911	CW-202
5) Slide gate (1.5 m × 1.5 m)	set	10	357.84	2,225.38	2,583.22	3,578	22,254	25,832	GW-02
6) Slide gate (0.8 m × 0.8 m)	set	5	200.25	1,326.05	1,526.30	1,001	6,630	7,632	GW-04
7) Slide gate (0.6 m × 0.6 m)	set	1	178.29	1,241.66	1,419.95	178	1,242	1,420	GW-05
Sub total ((1)+(2))						211,545	574,105	785,649	
(3) Demolition of existing structures	m ³	300	7.02	15.11	22.13	2,106	4,533	6,639	EW-19
(4) Miscellaneous						10,600	28,700	39,300	
3.2 Secondary canals (44.7 km) rehabilitation						1,057,599	3,075,822	4,133,421	
(1) Canal Rehabilitation						544,560	2,111,261	2,655,821	
1) Stripping (t = 0.2 m)	m ²	357,800	0.08	0.29	0.37	28,624	103,762	132,386	EW-02
2) Excavation (Common)	m ³	22,100	0.42	1.54	1.96	9,282	34,034	43,316	EW-03
3) Embankment (Common)	m ³	171,500	2.20	9.99	12.19	377,300	1,713,285	2,090,585	EW-13-2
4) Slope finishing (excavation)	m ²	0	0.50	1.85	2.35	0	0	0	EW-03*1.2
5) Slope finishing (embankment)	m ²	0	0.50	1.85	2.35	0	0	0	EW-03*1.2
6) Sod facing	m ²	27,850	2.70	0.00	2.70	75,195	0	75,195	EW-15
7) Earth lining	m ³	3,300	2.20	9.99	12.19	7,260	32,967	40,227	EW-13-2
8) Soil cement lining	m ³	1,750	3.10	26.65	29.75	5,425	46,638	52,063	EW-14
9) Laterite pavement	m ³	23,300	1.78	7.75	9.53	41,474	180,575	222,049	EW-24
(2) Structures						459,329	810,806	1,270,136	
1) Diversion structure	nos.	66	3,064.01	4,941.94	8,005.95	202,225	326,168	528,393	CW-203
2) Off-take-2	nos.	96	936.56	1,033.80	1,970.36	89,910	99,245	189,155	CW-208
3) Pipe culvert for road crossing	nos.	23	1,087.44	1,337.39	2,424.83	25,011	30,760	55,771	CW-205
4) Pipe culvert for house/ farm access	nos.	73	730.81	834.70	1,565.51	53,349	60,933	114,282	CW-206
5) Cross drain	nos.	22	2,429.93	2,288.49	4,718.42	53,458	50,347	103,805	CW-204
6) Slide gate (0.8 m x 0.8 m)	set	44	200.25	1,326.05	1,526.30	8,811	58,346	67,157	GW-04
7) Slide gate (0.6 m x 0.6 m)	set	149	178.29	1,241.66	1,419.95	26,565	185,007	211,573	GW-05
Sub total						1,003,889	2,922,067	3,925,956	
(3) Demolition of existing structures	m ³	500	7.02	15.11	22.13	3,510	7,555	11,065	EW-19
(4) Miscellaneous	LS					50,200	146,200	196,400	
4. Construction of Sub-project office and relevant office						120,790	178,375	299,165	
4.1 Building works for Project office						120,790	178,375	299,165	
(1) Project office						114,990	169,875	284,865	
1) Land	m ²	0	2.00	0.00	2.00	0	0	0	
2) Embankment for land	m ³	1,500	1.26	5.65	6.91	1,890	8,475	10,365	EW-13
3) Office building	m ²	450	292.50	292.50	585.00	87,750	87,750	175,500	OW-01
4) Parking shed	m ²	100	150.00	150.00	300.00	15,000	15,000	30,000	
5) Gate and fencing	m	300	4.50	25.50	30.00	1,350	7,650	9,000	
6) Well drilling	m	300	30.00	170.00	200.00	9,000	51,000	60,000	
7) Electric work	LS	1				5,000	5,000	10,000	
(2) Miscellaneous						5,800	8,500	14,300	
Construction Cost of Main system for USISRSP (1+2+3+4)						2,715,615	6,155,746	8,871,361	
Tertiary system construction (3,500 ha)									
(1) New Tertiary Canal Construction						173,200	515,275	688,475	
1) Tertiary canal and related structures	ha	2,500	69.28	206.11	275.39	173,200	515,275	688,475	EW-101

Item	Unit	Qty	Unit cost (US\$)			Amount (US\$)			Code of Unit Price
			L/C	F/C	Total	L/C	F/C	Total	
(2) Existing Tertiary Canal Rehabilitation						38,820	129,540	168,360	
1) Tertiary canal and related structures	ha	1,000	38.82	129.54	168.36	38,820	129,540	168,360	EW-102
Sub total						212,020	644,815	856,835	
(3) Miscellaneous						10,600	32,200	42,800	
Construction Cost of Tertiary system						222,620	677,015	899,636	
Total Construction Cost of USISRSP						2,938,235	6,832,761	9,770,996	

Source: JICA Survey Team

Table AF-2.3.4 Breakdown of Cost for Gates for USISRSP

No.	Item	Quantity	Unit Price(US\$)			Amount (US\$)		
			F/C	L/C	Total	F/C	L/C	Total
1	Improvement of existing hoisting system	6 sets	5,279	932	6,210	31,671	5,589	37,260
2	Repair painting for gate leaf	6 sets	1,105	195	1,300	6,630	1,170	7,800
	Total							

Source: JICA Survey Team

Table AF-2.3.5 Breakdown of Improvement Cost for Gates for USISRSP

Breakdown of Improvement Cost per Unit							
No.	Item	Quantity	Unit Price (US\$/set)		Amount (US\$)		
			F/C	L/C	F/C	L/C	Total
1	Design , manufacturing and transport						
1	Improvement of existing hoisting system						
	Bearing unit	4 sets		300	1020	180	1,200
	Counter weight (3.5 ton × 2 units)	2 sets		2,100	3570	630	4,200
	Sub total 1.1				4590	810	5,400
1	Installation (15% of Sub total 1.1)				688.5	122	810
	Total 1 set (1.1+1.2)				5,279	932	6,210
2	Repair painting work	1 lot			1,105	195	1,300
	1.8 m × 8 m × both sides of gate + one side × US\$ 30 /m ²						

Source: JICA Survey Team

AF-2.4 Kandal-Stung-Bati Irrigation System Rehabilitation Sub-project (KSISRSP)

The cost estimates for every category concerning to KSISRSP are shown in the following tables.

Table AF-2.4.1 Construction Cost for KSISRSP

Work Item	Cost (US\$)		
	L/C	F/C	Total
Main Irrigation and Drainage System			
1. Preparatory Works and Temporary Works	69,596	93,819	163,415
2. Kandal Stung Area of 1,750 ha	1,657,329	2,808,276	4,465,605
2.1 Main canal in Kandal Stung Area (2 canals for 11.3 km)	1,113,351	1,724,663	2,838,014
2.2 Secondary canal in Kandal Stung Area	125,161	304,246	429,407
2.3 New Diversion Weir and Intake for KC-31for Kandal Stung Area	98,784	150,054	248,838
2.4 Improvement of the existing Diversion Weir at Thmei Commune	54,408	42,534	96,942
2.5 Replacement of the existing Intakes (3 nos. for EW-59, EW-60 & EW-61)	21,927	18,556	40,483
2.6 Replacement of the existing Daeum Rues Regulator	33,935	53,962	87,897
2.7 Improvement of Drainage Canal in Kandal Stung Area (2 canals for 12.1 km in total)	209,763	514,261	724,024
3. Bati Area of 1,600 ha	2,228,039	4,104,166	6,332,205
3.1 Main canal in Kandal Stung Area (2 canals for 7.6 km)	750,889	983,759	1,734,648
3.2 Secondary canal in Bati Area	242,704	614,410	857,114
3.3 New Intake for Connection Canal for Bati Area	12,977	17,968	30,945
3.4 Connection Canal by Upgrading of NS-82 (3.5 km long in total)	480,115	719,540	1,199,655
3.5 Intake for Pump Station at Tonle Bati	17,930	31,576	49,506
3.6 Pump Station at Tonle Bati	309,497	843,131	1,152,628
3.7 Flood Protection Dike of Tonle Bati Lake	121,398	269,925	391,323
3.8 Replacement of Kampong Dangkor Spillway	224,224	409,327	633,551
3.9 Improvement of Drainage Canal in Bati Area (2 canals for 6.7 km in total)	68,305	214,530	282,835
4. Construction of Sub-project Office	104,790	136,910	241,700
Construction Cost Main System of KSISRSP	4,059,754	7,143,171	11,202,925
Tertiary System Construction (3,350 ha)			
1. Tertiary System for Kandal Stung Area of 1,750 ha	143,453	388,985	532,438
2. Tertiary System for Bati Area of 1,600 ha	129,314	354,474	483,788
Construction Cost of Tertiary System	272,767	743,459	1,016,226

Work Item	Cost (US\$)		
	L/C	F/C	Total
Total Construction Cost for KSBISRSP	4,332,521	7,886,630	12,219,151

Source: JICA Survey Team

Table AF-2.4.2 Software Component Activity Cost for KSBISRSP

Item	Unit	Qty	F/C (US\$)		L/C (US\$)		Total (US\$)
			Unit rate	Amount	Unit rate	Amount	
(1) Capacity development of MOWRAM and PDOWRAM staff							
(1)-1 Remuneration and salary							
1) Foreign consultant	MM	1.5	32,591	48,887			48,887
2) National consultant	MM	6			3,000	18,000	18,000
Sub total				<u>48,887</u>		<u>18,000</u>	<u>66,887</u>
(1)-2 Direct cost							
1) Per diem for foreign consul.	day	45	100	4,500			4,500
2) Per diem for national consul.	day	180			30	5,400	5,400
3) Mobilization of foreign consul.	no	1	1,500	1,500			1,500
4) Mobilization of national consul.	no	2			50	100	100
Sub total				<u>6,000</u>		<u>5,500</u>	<u>11,500</u>
(1)-3 Training cost							
1) Allowance	day	200			50	10,000	10,000
2) Material	LS	1			4,000	4,000	4,000
Sub total						<u>14,000</u>	<u>14,000</u>
(1)-4 Monitoring and evaluation							
1) MOWRAM	LS//year	4			2,000	8,000	8,000
2) PDOWRAM	LS//year	4			2,000	8,000	8,000
Sub total						<u>16,000</u>	<u>16,000</u>
Sub Total (1) (round)				54,887		53,500	108,387
(2) FWUC Formation and Strengthening							
(2)-1 Remuneration and salary							
1) National consultant	MM	42			3,000	126,000	126,000
Sub total						<u>126,000</u>	<u>126,000</u>
(2)-2 Direct cost							
1) Per diem for national consul.	day	1260			30	37,800	37,800
2) Mobilization of national consul	no	7			50	350	350
Sub total						<u>38,150</u>	<u>38,150</u>
(2)-3 Training cost							
1) Allowance PDOWRAM	day	70			50	3,500	3,500
2) Allowance FWUC	day	2380			10	23,800	23,800
3) Material & others	LS	1			49,000	49,000	49,000
Sub total						<u>76,300</u>	<u>76,300</u>
(2)-4 Monitoring and evaluation							
1) MOWRAM	LS/year	7			4,000	28,000	28,000
2) PDOWRAM	LS/year	7			6,000	42,000	42,000
Sub total						<u>70,000</u>	<u>70,000</u>
Sub Total (2) (round)				0		310,450	310,450
(3) Agricultural support service							
(3)-1 Trainer's training							
1) Trainer's training	LS	2			2,080	4,160	4,160
Sub total						<u>4,160</u>	<u>4,160</u>
(3)-2 Field program							
1) Demonstration plot	LS	1			62,050	62,050	62,050
2) Water management	LS	1			54,740	54,740	54,740
Sub total						<u>116,790</u>	<u>116,790</u>
(3)-3 Farmer group training							
1) FG training program	LS	1			41,140	41,140	41,140
Sub total						<u>41,140</u>	<u>41,140</u>
(3)-4 Mass guideline/workshop							
1) Mass guideline/workshop	LS	1			8,840	8,840	8,840
Sub total						<u>8,840</u>	<u>8,840</u>
(3)-5 Consultant							
1) Foreign consultant	LS	0.5		20,800			20,800
2) National consultant	LS	6.8				27,040	27,040
Sub total				<u>20,800</u>		<u>27,040</u>	<u>47,840</u>
Sub Total (3) (round)				20,800		197,970	218,770
GRAND TOTAL FOR KSBISRSP				75,687		561,920	637,607

Source: JICA Survey Team

Table AF-2.4.3 Breakdown of Construction Cost for KSBISRSP

Work Item	Unit	Qty	Unit Cost (US\$)			Amount (US\$)			Code of unit price
			L/C	F/C	Total	L/C	F/C	Total	
Main Irrigation and Drainage System									
1. Preparatory Works and Temporary Works									
(1) Cofferdam for spillway construction on Tonle Bati lake	(1)					<u>69,596</u>	<u>93,819</u>	<u>163,415</u>	
						693	3,108	3,801	

Preparatory Survey for Irrigation and Drainage System Rehabilitation and Improvement Project

Work Item	Unit	Qty	Unit Cost (US\$)			Amount (US\$)			Code of unit price
			L/C	F/C	Total	L/C	F/C	Total	
1) Embankment common by equipment with excavated material	m ³	500	1.26	5.65	6.91	630	2,825	3,455	EW-13
2) Miscellaneous	LS	1				63	283	346	10% of sum
(2) Temporary Diversion canal and dewatering work						<u>21,430</u>	<u>44,560</u>	<u>65,990</u>	
1) Temporary diversion canal	place	4	500	2,500	3,000	2,000	10,000	12,000	
2) Dewatering work	LS	1				19,430	34,560	53,990	
(3) Contractor's site office						<u>47,473</u>	<u>46,151</u>	<u>93,624</u>	
1) Construction of site office	m ²	600	50.00	50.00	100.00	30,000	30,000	60,000	
2) Rental cost for land (100 m x 100 m)	m ²	10,000	0.30	0.00	0.30	3,000	0	3,000	
3) Embankment of site	m ³	360	1.26	5.65	6.91	454	2,034	2,488	EW-13
4) Access road	m	100	15	15	30	1,500	1,500	3,000	
5) Desk & furniture and equipment	LS	1	5,000	5,000	10,000	5,000	5,000	10,000	
6) Office supply	year	3	2,500	2,500	5,000	7,500	7,500	15,000	
7) Temporary pipe culvert (D = 1.0 m, L = 8.0 m)	nos.	2	9.61	58.38	67.99	19	117	136	CW-13
2. Construction of Kandal Stung Area of 1,750 ha						<u>1,657,329</u>	<u>2,808,276</u>	<u>4,465,605</u>	
2.1 Main canal in Kandal Stung Area (2 canals for 11.3 km)						<u>1,113,351</u>	<u>1,724,663</u>	<u>2,838,014</u>	
(1) Canal rehabilitation (2 canal for 11.3 km in total)						<u>849,837</u>	<u>1,271,468</u>	<u>2,121,305</u>	
1) Stripping of top soil (t=0.2 m)	m ²	17,930	0.08	0.29	0.37	1,434	5,200	6,634	EW-02
2) Excavation common by equipment	m ³	20,360	0.42	1.54	1.96	8,551	31,354	39,905	EW-03
3) Embankment common by equipment with soil material less than 5 km	m ³	47,350	2.20	9.99	12.19	104,170	473,027	577,197	EW-13-2
4) Concrete lining with mesh-bar (t=7.5 cm)	m ³	9,490	63.22	39.88	103.10	599,958	378,461	978,419	CW-102
5) Mesh-bar (D=10 mm)	kg	284,700	0.29	0.94	1.23	82,563	267,618	350,181	CW-10
6) Laterite pavement (t = 0.15 m)	m ³	7,130	1.78	7.75	9.53	12,691	55,258	67,949	EW-24
7) Miscellaneous	LS	1				40,470	60,550	101,020	5% of sum
(2) Structures						<u>250,966</u>	<u>431,614</u>	<u>682,580</u>	
1) Division structure	nos.	11	8,820	13,591	22,411	97,023	149,500	246,523	CW-201
2) Off-take type-1 (Q>0.2 m ³ /sec)	nos.	2	1,494	1,404	2,897	2,987	2,807	5,794	CW-207
3) Off-take type-2 (Q<0.2 m ³ /sec)	nos.	48	937	1,034	1,970	44,955	49,622	94,577	CW-208
4) Box culvert replacement (2 m x 1.5 m x 2 nos.)	nos.	12	6,256	7,048	13,304	75,072	84,572	159,644	CW-202
5) Slide gate (1.5 m x 1.5 m)	set	28	358	2,225	2,583	10,020	62,311	72,331	GW-02
6) Slide gate (0.8 m x 0.8 m)	set	2	200	1,326	1,526	401	2,652	3,053	GW-03
7) Slide gate (0.6 m x 0.6 m)	set	48	178	1,242	1,420	8,558	59,600	68,158	GW-04
8) Miscellaneous	LS	1				11,950	20,550	32,500	
(3) Demolition of the existing structure						<u>12,548</u>	<u>21,581</u>	<u>34,129</u>	
Demolition of structure	LS	1				12,548	21,581	34,129	5% of (2)
2.2 Secondary canal in Kandal Stung Area						<u>125,161</u>	<u>304,246</u>	<u>429,407</u>	
(1) Canal rehabilitation (2 canals of 5.0 km in total)						<u>87,925</u>	<u>235,594</u>	<u>323,519</u>	
1) Stripping of top soil (t = 0.2 m)	m ²	15,370	0.08	0.29	0.37	1,230	4,457	5,687	EW-02
2) Excavation common by equipment	m ³	2,480	0.42	1.54	1.96	1,042	3,819	4,861	EW-03
3) Embankment common by equipment with soil material less than 5 km	m ³	19,180	2.20	9.99	12.19	42,196	191,608	233,804	EW-13-2
4) Sodding	m ²	12,460	2.70	0.00	2.70	33,642	0	33,642	EW-15
5) Laterite pavement (t = 0.15 m)	m ³	3,160	1.78	7.75	9.53	5,625	24,490	30,115	EW-24
6) Miscellaneous	LS	1				4,190	11,220	15,410	
(2) Structures						<u>35,463</u>	<u>65,383</u>	<u>100,846</u>	
1) Division structure	nos.	3	3,064	4,942	8,006	9,192	14,826	24,018	CW-203
2) Off-take type-2 (Q < 0.2 m ³ /sec)	nos.	9	937	1,034	1,970	8,429	9,304	17,733	CW-208
3) Pipe culvert for road crossing	nos.	5	1,087	1,337	2,425	5,437	6,687	12,124	CW-205
4) Pipe culvert for house/farm access	nos.	10	731	835	1,566	7,308	8,347	15,655	CW-206
5) Slide gate (0.8 m x 0.8 m)	set	9	200	1,326	1,526	1,802	11,934	13,736	GW-03
6) Slide gate (0.6 m x 0.6 m)	set	9	178	1,242	1,420	1,605	11,175	12,780	GW-04
7) Miscellaneous	LS	1				1,690	3,110	4,800	
(3) Demolition of the existing structure						<u>1,773</u>	<u>3,269</u>	<u>5,042</u>	
Demolition of structure	LS	1				1,773	3,269	5,042	
2.3 New Diversion Weir and Intake for KC-31 for Kandal Stung Area						<u>98,784</u>	<u>150,054</u>	<u>248,838</u>	
(1) Overflow spillway (fixed weir) and scouring sluice						<u>90,084</u>	<u>134,251</u>	<u>224,335</u>	
1) Clearing & grubbing	m ²	900	0.06	0.19	0.25	54	171	225	EW-01
2) Stripping of top soil (t = 0.2 m)	m ²	3,000	0.08	0.29	0.37	240	870	1,110	EW-02
3) Excavation common by equipment	m ³	3,010	0.42	1.54	1.96	1,264	4,635	5,899	EW-03
4) Embankment common by equipment with soil material less than 5 km	m ³	1,810	2.20	9.99	12.19	3,982	18,082	22,064	EW-13-2
5) Backfilling by equipment	m ³	1,060	2.01	10.05	12.06	2,131	10,653	12,784	EW-12
6) Re-inforced concrete	m ³	670	65.97	45.03	111.00	44,200	30,170	74,370	CW-101
7) Plain concrete	m ³	210	63.22	39.88	103.10	13,276	8,375	21,651	CW-102
8) Lean concrete	m ³	70	53.33	36.75	90.08	3,733	2,573	6,306	CW-103
9) Reinforcement bar	kg	46,900.0	0.29	0.94	1.23	13,601	44,086	57,687	CW-10
10) Riprap by gabion (t = 0.4m)	m ³	110	19.76	5.70	25.46	2,174	627	2,801	EW-20
11) Slide gate (W2.0m x H2.4m)	set	2	569	3,809	4,379	1,139	7,619	8,758	GW-05
12) Miscellaneous	LS	1				4,290	6,390	10,680	
(2) Intake structure for KC-31 canal						<u>8,700</u>	<u>15,803</u>	<u>24,503</u>	
1) Excavation common by equipment	m ³	90	0.42	1.54	1.96	38	139	177	EW-03
2) Embankment common by equipment with soil material less than 5 km	m ³	60	2.20	9.99	12.19	132	599	731	EW-13-2
3) Backfilling by equipment	m ³	40	2.01	10.05	12.06	80	402	482	EW-12
4) Re-inforced concrete	m ³	80	65.97	45.03	111.00	5,278	3,602	8,880	CW-101
5) Lean concrete	m ³	10	53.33	36.75	90.08	533	368	901	CW-103
6) Re-inforcement bar	kg	600.0	0.29	0.94	1.23	174	564	738	CW-10
7) Riprap by gabion (t=0.4m)	m ³	30	19.76	5.70	25.46	593	171	764	EW-20
8) Slide gate (W0.8m x H1.4m)	set	2	365	2,302	2,667	731	4,604	5,335	GW-06
9) Slide gate (W1.0m x H1.4m)	set	2	365	2,302	2,667	731	4,604	5,335	GW-06
10) Miscellaneous	LS	1				410	750	1,160	
2.4 Improvement of the existing Diversion Weir at Thmei Commune						<u>54,408</u>	<u>42,534</u>	<u>96,942</u>	
(1) Additional fixed weir (overflow type spillway)						<u>54,408</u>	<u>42,534</u>	<u>96,942</u>	
1) Excavation common by equipment	m ³	1,500	0.42	1.54	1.96	630	2,310	2,940	EW-03
2) Embankment common by equipment with soil material less than 5 km	m ³	250	2.20	9.99	12.19	550	2,498	3,048	EW-13-2
3) Backfilling by equipment	m ³	440	2.01	10.05	12.06	884	4,422	5,306	EW-12
4) Reinforced concrete	m ³	50	65.97	45.03	111.00	3,299	2,252	5,551	CW-101
5) Plain concrete	m ³	700	63.22	39.88	103.10	44,254	27,916	72,170	CW-102
6) Lean concrete	m ³	10	53.33	36.75	90.08	533	368	901	CW-103
7) Reinforcement bar	kg	300.0	0.29	0.94	1.23	87	282	369	CW-10
8) Riprap by gabion (t=0.4m)	m ³	80	19.76	5.70	25.46	1,581	456	2,037	EW-20
9) Miscellaneous	LS	1				2,590	2,030	4,620	

Work Item	Unit	Qty	Unit Cost (US\$)			Amount (US\$)			Code of unit price
			L/C	F/C	Total	L/C	F/C	Total	
2.5 Replacement of the existing Intakes (3 nos. for EW-59, EW-60 & EW-61)						21,927	18,556	40,483	
(1) Intake structure for 3 canals						<u>21,927</u>	<u>18,556</u>	<u>40,483</u>	
1) Excavation common by equipment	m ³	270	0.42	1.54	1.96	113	416	529	EW-03
2) Embankment common by equipment with soil material less than 5 km	m ³	180	2.20	9.99	12.19	396	1,798	2,194	EW-13-2
3) Backfilling by equipment	m ³	120	2.01	10.05	12.06	241	1,206	1,447	EW-12
4) Re-inforced concrete	m ³	240	65.97	45.03	111.00	15,833	10,807	26,640	CW-101
5) Lean concrete	m ³	36	53.33	36.75	90.08	1,920	1,323	3,243	CW-103
6) Reinforcement bar	kg	1,680.0	0.29	0.94	1.23	487	1,579	2,066	CW-10
7) Riprap by gabion (t = 0.4 m)	m ³	90	19.76	5.70	25.46	1,778	513	2,291	EW-20
8) Slide gate (W 1.0 m x H 1.4 m)	set	6	19.76	5.70	25.46	119	34	153	GW-06
9) Miscellaneous	LS	1				1,040	880	1,920	
2.6 Replacement of the existing Daeum Rues Regulator						33,935	53,962	87,897	
(1) Regulator						<u>31,829</u>	<u>49,429</u>	<u>81,258</u>	
1) Excavation common by equipment	m ³	670	0.42	1.54	1.96	281	1,032	1,313	EW-03
2) Embankment common by equipment with soil material less than 5 km	m ³	290	2.20	9.99	12.19	638	2,897	3,535	EW-13-2
3) Backfilling by equipment	m ³	480	2.01	10.05	12.06	965	4,824	5,789	EW-12
4) Reinforced concrete	m ³	300	65.97	45.03	111.00	19,791	13,509	33,300	CW-101
5) Lean concrete	m ³	20	53.33	36.75	90.08	1,067	735	1,802	CW-103
6) Reinforcement bar	kg	17,400.0	0.29	0.94	1.23	5,046	16,356	21,402	CW-10
7) Riprap by gabion (t = 0.4 m)	m ³	50	19.76	5.70	25.46	988	285	1,273	EW-20
8) Sodding	m ²	120	2.70	0.00	2.70	324	0	324	EW-15
9) Slide gate (W 1.2 m x H 1.2 m)	set	3	357.84	2,225.3	2,583.2	1,074	6,676	7,750	GW-02
10) Screen (W 1.2 m x H 3.3m)	set	3	45.00	255.00	300.00	135	765	900	
11) Miscellaneous	LS	1				1,520	2,350	3,870	
(2) Demolition of the existing structure						<u>2,106</u>	<u>4,533</u>	<u>6,639</u>	
1) Demolition of structure	m ³	300	7.02	15.11	22.13	2,106	4,533	6,639	EW-19
2.7 Improvement of Drainage Canal in Kandal Stung Area (2 canals for 12.1 km in total)						209,763	514,261	724,024	
(1) Main drainage canal						<u>76,857</u>	<u>332,308</u>	<u>409,165</u>	
1) Stripping of top soil (t = 0.2 m)	m ²	53,240	0.08	0.29	0.37	4,259	15,440	19,699	EW-02
2) Excavation common by equipment	m ³	25,740	0.42	1.54	1.96	10,811	39,640	50,451	EW-03
3) Embankment common by equipment with soil material less than 5 km	m ³	20,240	2.20	9.99	12.19	44,528	202,198	246,726	EW-13-2
4) Laterite pavement (t = 0.15 m)	m ³	7,640	1.78	7.75	9.53	13,599	59,210	72,809	EW-24
5) Miscellaneous	LS	1				3,660	15,820	19,480	
(2) Related structures						<u>132,906</u>	<u>181,953</u>	<u>314,859</u>	
1) Bridge/culvert	nos.	7	15,970	20,665	36,634	111,788	144,653	256,441	CW-309
2) Drain outlet	nos.	48	308	597	905	14,788	28,640	43,428	CW-312
3) Miscellaneous	LS	1				6,330	8,660	14,990	
3. Construction of Bati Area of 1,600 ha						2,228,039	4,104,166	6,332,205	
3.1 Main canal in Bati Area (2 canals for 7.6 km)						<u>750,889</u>	<u>983,759</u>	<u>1,734,648</u>	
(1) Canal rehabilitation (2 canal for 11.3 km in total)						<u>539,209</u>	<u>705,191</u>	<u>1,244,400</u>	
1) Stripping of top soil (t = 0.2 m)	m ²	6,690	0.08	0.29	0.37	535	1,940	2,475	EW-02
2) Excavation common by equipment	m ³	17,330	0.42	1.54	1.96	7,279	26,688	33,967	EW-03
3) Embankment common by equipment with soil material less than 5 km	m ³	17,100	2.20	9.99	12.19	37,620	170,829	208,449	EW-13-2
4) Concrete lining with mesh-bar (t = 7.5 cm)	m ³	6,390	63.22	39.88	103.10	403,976	254,833	658,809	CW-102
5) Mesh-bar (D = 10 mm)	kg	91,700.0	0.29	0.94	1.23	55,593	180,198	235,791	CW-10
6) Laterite pavement (t = 0.15 m)	m ³	4,790	1.78	7.75	9.53	8,526	37,123	45,649	EW-24
7) Miscellaneous	LS	1				25,680	33,580	59,260	
(2) Structures						<u>201,600</u>	<u>265,303</u>	<u>466,903</u>	
1) Division structure	nos.	6	8,820	13,591	22,411	52,922	81,545	134,467	CW-201
2) Off-take type-1 (Q > 0.2 m ³ /sec)	nos.	17	1,494	1,404	2,897	25,391	23,863	49,254	CW-207
3) Off-take type-2 (Q < 0.2 m ³ /sec)	nos.	4	937	1,034	1,970	3,746	4,135	7,881	CW-208
4) Box culvert replacement (2 m x 1.5 m x 2 nos.)	nos.	17	6,256	7,048	13,304	106,351	119,811	226,162	CW-202
5) Slide gate (1.5 m x 1.5 m)	set	4	358	2,225	2,583	1,431	8,902	10,333	GW-01
6) Slide gate (0.8 m x 0.8 m)	set	9	200	1,326	1,526	1,802	11,934	13,736	GW-03
7) Slide gate (0.6 m x 0.6 m)	set	2	178	1,242	1,420	357	2,483	2,840	GW-04
8) Miscellaneous	LS	1				9,600	12,630	22,230	
(3) Demolition of the existing structures						<u>10,080</u>	<u>13,265</u>	<u>23,345</u>	
Demolition of structures	LS	1				10,080	13,265	23,345	
3.2 Secondary canal in Bati Area						242,704	614,410	857,114	
(1) Canal rehabilitation (6 canals of 13.6 km in total)						<u>151,187</u>	<u>405,078</u>	<u>556,265</u>	
1) Stripping of top soil (t = 0.2 m)	m ²	26,440	0.08	0.29	0.37	2,115	7,668	9,783	EW-02
2) Excavation common by equipment	m ³	4,250	0.42	1.54	1.96	1,785	6,545	8,330	EW-03
3) Embankment common by equipment with soil material less than 5 km	m ³	32,990	2.20	9.99	12.19	72,578	329,570	402,148	EW-13-2
4) Sodding	m ²	21,430	2.70	0.00	2.70	57,861	0	57,861	EW-15
5) Laterite pavement (t = 0.15 m)	m ³	5,420	1.78	7.75	9.53	9,648	42,005	51,653	EW-24
6) Miscellaneous	LS	1				7,200	19,290	26,490	
(2) Structures						<u>91,517</u>	<u>209,332</u>	<u>300,849</u>	
1) Division structure	nos.	6	3,064	4,942	8,006	18,384	29,652	48,036	CW-203
2) Off-take type-2 (Q < 0.2 m ³ /sec)	nos.	37	937	1,034	1,970	34,653	38,251	72,904	CW-208
3) Pipe culvert for road crossing	nos.	7	1,087	1,337	2,425	7,612	9,362	16,974	CW-205
4) Pipe culvert for house/farm access	nos.	14	731	835	1,566	10,231	11,686	21,917	CW-206
5) Slide gate (0.8 m x 0.8 m)	set	43	200	1,326	1,526	8,611	57,020	65,631	GW-03
6) Slide gate (0.6 m x 0.6 m)	set	43	178	1,242	1,420	7,666	53,391	61,057	GW-04
7) Miscellaneous	LS	1				4,360	9,970	14,330	
3.3 New Intake for Connection Canal for Bati Area						12,977	17,968	30,935	
(1) Intake structure for connecting canal						<u>12,977</u>	<u>17,968</u>	<u>30,935</u>	
1) Excavation common by equipment	m ²	150	0.42	1.54	1.96	63	231	294	EW-03
2) Embankment common by equipment with soil material less than 5 km	m ³	150	2.20	9.99	12.19	330	1,499	1,829	EW-13-2
3) Backfilling by equipment	m ³	50	2.01	10.05	12.06	101	503	604	EW-12
4) Reinforced concrete	m ³	130	65.97	45.03	111.00	8,576	5,854	14,430	CW-101
5) Lean concrete	m ³	20	53.33	36.75	90.08	1,067	735	1,802	CW-103
6) Reinforcement bar	ton	900.0	0.29	0.94	1.23	261	846	1,107	CW-10
7) Riprap by gabion (t = 0.4 m)	m ³	40	19.76	5.70	25.46	790	228	1,018	EW-20
8) Slide gate (W 1.5 m x H 1.4 m)	nos.	3	358	2,225	2,583	1,074	6,676	7,750	GW-01
9) Screen (W 1.6 m x H 1.4 m)	nos.	3	31.50	178.50	210.00	95	536	631	
10) Miscellaneous	LS	1				620	860	1,470	
3.4 Connection Canal by Upgrading of NS-82 (3.5 km long in total)						480,115	719,540	1,199,655	
(1) Canal rehabilitation of NS-82						<u>429,806</u>	<u>654,446</u>	<u>1,084,252</u>	

Preparatory Survey for Irrigation and Drainage System Rehabilitation and Improvement Project

Work Item	Unit	Qty	Unit Cost (US\$)			Amount (US\$)			Code of unit price
			L/C	F/C	Total	L/C	F/C	Total	
1) Stripping of top soil (t = 0.2 m)	m ³	7,550	0.08	0.29	0.37	604	2,190	2,794	EW-02
2) Excavation common by equipment	m ³	192,840	0.42	1.54	1.96	80,993	296,974	377,967	EW-03
3) Embankment common by equipment with soil material less than 5 km	m ³	13,790	2.20	9.99	12.19	30,338	137,762	168,100	EW-13-2
4) Concrete lining with mesh-bar (t = 7.5 cm)	m ³	3,280	63.22	39.88	103.10	207,362	130,806	338,168	CW-102
5) Mesh-bar (D = 10 mm)	kg	59,100.0	0.29	0.94	1.23	17,139	55,554	72,693	CW-10
6) Sodding	m ²	27,000	2.70	0.00	2.70	72,900	0	72,900	EW-15
7) Miscellaneous	LS	1				20,470	31,160	51,630	
(2) Related structures						<u>50,309</u>	<u>65,094</u>	<u>115,403</u>	
1) Bridge	nos.	3	15,970	20,665	36,634	47,909	61,994	109,903	CW-309
2) Miscellaneous	LS	1				2,400	3,100	5,500	
3.5 Intake for Pump Station at Tonle Bati						17,930	31,576	49,078	
(1) Intake structure						<u>17,509</u>	<u>30,669</u>	<u>48,178</u>	
1) Excavation common by equipment	m ³	100	0.42	1.54	1.96	42	154	196	EW-03
2) Embankment common by equipment with soil material less than 5 km	m ³	20	2.20	9.99	12.19	44	200	244	EW-13-2
3) Backfilling by equipment	m ³	60	2.01	10.05	12.06	121	603	724	EW-12
4) Reinforced concrete	m ³	160	65.97	45.03	111.00	10,555	7,205	17,760	CW-101
5) Lean concrete	m ³	20	53.33	36.75	90.08	1,067	735	1,802	CW-103
6) Reinforcement bar	kg	11,200.0	0.29	0.94	1.23	3,248	10,528	13,776	CW-10
7) Riprap by gabion (t = 0.4 m)	m ³	0	19.76	5.70	25.46	0	0	0	EW-20
8) Slide gate (W 2.0 m x H 1.8 m)	nos.	3	489	3,006	3,496	1,467	9,019	10,486	GW-00
9) Screen (W 2.0 m x H 2.0 m)	nos.	3	45.00	255.00	300.00	135	765	900	
10) Miscellaneous	LS	1				830	1,460	2,290	
(2) Demolition of the existing structures						<u>421</u>	<u>907</u>	<u>1,328</u>	
1) Demolition of structures	m ³	60	7.02	15.11	22.13	421	907	1,328	EW-19
3.6 Pump Station at Tonle Bati						309,497	843,131	1,152,628	
(1) Civil works						<u>64,562</u>	<u>98,036</u>	<u>162,598</u>	
1) Excavation common by equipment	m ³	1,270	0.42	1.54	1.96	533	1,956	2,489	EW-03
2) Embankment common by equipment with soil material less than 5 km	m ³	930	2.20	9.99	12.19	2,046	9,291	11,337	EW-13-2
3) Backfilling by equipment	m ³	350	2.01	10.05	12.06	704	3,518	4,222	EW-12
4) Reinforced concrete	m ³	290	65.97	45.03	111.00	19,131	13,059	32,190	CW-101
5) Lean concrete	m ³	45	53.33	36.75	90.08	2,400	1,654	4,054	CW-103
6) Reinforcement bar	kg	20,300.0	0.29	0.94	1.23	5,887	19,082	24,969	CW-10
7) Riprap by gabion (t = 0.4 m)	m ³	80	19.76	5.70	25.46	1,581	456	2,037	EW-20
8) Miscellaneous	LS	1				32,280	49,020	81,300	
(2) Building works						<u>77,220</u>	<u>77,220</u>	<u>154,440</u>	
1) Pump house	m ²	160	438.75	438.75	878	70,200	70,200	140,400	OW-01x1.5
2) Miscellaneous	LS	1				7,020	7,020	14,040	
(3) Pump equipment and installation						<u>166,100</u>	<u>664,400</u>	<u>830,500</u>	
1) Pump set (45 m ³ /min)	set	4	34,000	136,000	170,000	136,000	544,000	680,000	
2) Generator (90 kVA)	set	1	15,000	60,000	75,000	15,000	60,000	75,000	
3) Ancillary works	LS	1				15,100	60,400	75,500	
(4) Demolition of the existing structures						<u>1,615</u>	<u>3,475</u>	<u>5,090</u>	
1) Demolition of building	m ²	60	3.51	7.555	11.07	211	453	664	EW-19x0.5
2) Demolition of concrete structure	m ³	200	7.02	15.11	22.13	1,404	3,022	4,426	EW-19
3.7 Flood Protection Dike of Tonle Bati Lake						121,398	269,925	391,323	
(1) Flood dike						<u>104,628</u>	<u>248,230</u>	<u>352,858</u>	
1) Stripping of top soil (t = 0.2 m)	m ²	5,350	0.08	0.29	0.37	428	1,552	1,980	EW-02
2) Excavation common by equipment	m ³	4,800	0.42	1.54	1.96	2,016	7,392	9,408	EW-03
3) Embankment common by equipment with soil material less than 5 km	m ³	21,400	2.20	9.99	12.19	47,080	213,786	260,866	EW-13-2
4) Riprap by gabion (t = 0.4 m)	m ³	2,400	19.76	5.70	25.46	47,424	13,680	61,104	EW-20
5) Sodding	m ²	1,000	2.70	0.00	2.70	2,700	0	2,700	EW-15
6) Miscellaneous	LS	1				4,980	11,820	16,800	
(2) Related structures						<u>16,770</u>	<u>21,695</u>	<u>38,465</u>	
1) Bridge (W 5.0 m x L 20.0 m)	nos.	1	15,970	20,665	36,634	15,970	20,665	36,635	CW-309
2) Miscellaneous	LS	1				800	1,030	1,830	
3.8 Replacement of Kampong Dangkor Spillway						224,224	409,327	633,551	
(1) Civil works						<u>207,454</u>	<u>387,632</u>	<u>595,086</u>	
1) Excavation common by equipment	m ³	6,100	0.42	1.54	1.96	2,562	9,394	11,956	EW-03
2) Embankment common by equipment with soil material less than 5 km	m ³	1,300	2.20	9.99	12.19	2,860	12,987	15,847	EW-13-2
3) Backfilling by equipment	m ³	1,800	2.01	10.05	12.06	3,618	18,090	21,708	EW-12
4) Reinforced concrete	m ³	1,700	65.97	45.03	111.00	112,149	76,551	188,700	CW-101
5) Lean concrete	m ³	130	53.33	36.75	90.08	6,933	4,778	11,711	CW-103
6) Reinforcement bar	kg	85,000.0	0.29	0.94	1.23	24,650	79,900	104,550	CW-10
7) Riprap by gabion (t = 0.4 m)	m ³	160	19.76	5.70	25	3,162	912	4,074	EW-20
8) Slide gate (W 4.0 m x H 2.5 m) (12 ton in total)	set	4	9,960	39,840	49,800	39,840	159,360	199,200	
9) DGset(7.5 KVA)	set	1	1,800	7,200	9,000	1,800	7,200	9,000	
10) Miscellaneous	LS	1				9,880	18,460	28,340	
(2) Related structures						<u>16,770</u>	<u>21,695</u>	<u>38,465</u>	
1) Bridge on NR-2 (W 5.0 m x L 20.0 m)	nos.	1	15,970	20,665	36,634	15,970	20,665	36,635	CW-309
2) Miscellaneous	LS	1				800	1,030	1,830	
3.9 Improvement of Drainage Canal in Bati Area (2 canals for 6.7 km in total)						68,305	214,530	282,835	
(1) Main drainage canal						<u>42,564</u>	<u>184,025</u>	<u>226,589</u>	
1) Stripping (t = 0.2 m)	m ²	29,480	0.08	0.29	0.37	2,358	8,549	10,907	EW-02
2) Excavation common by equipment	m ³	14,250	0.42	1.54	1.96	5,985	21,945	27,930	EW-03
3) Embankment common by equipment with soil material less than 5 km	m ³	11,210	2.20	9.99	12.19	24,662	111,988	136,650	EW-13-2
4) Laterite pavement (t = 0.15 m)	m ³	4,230	1.78	7.75	9.53	7,529	32,783	40,312	EW-24
5) Miscellaneous	LS	1				2,030	8,760	10,790	
(2) Related structures						<u>25,741</u>	<u>30,505</u>	<u>56,246</u>	
1) Bridge/culvert	nos.	3	6,630	6,702	13,332	19,890	20,105	39,995	CW-311
2) Drain outlet	nos.	15	308	597	905	4,621	8,950	13,571	CW-312
3) Miscellaneous	LS	1				1,230	1,450	2,680	
4. Construction of Sub-project Office						104,790	136,910	241,700	
1) Embankment common by equipment with soil material less than 500 m	m ³	1,500	1.80	8.66	10.46	2,700	12,990	15,690	EW-13-1
2) Office building	m ²	300	292.50	292.50	585.00	87,750	87,750	175,500	OW-01
3) Parking shed	m ²	0	150.00	150.00	300.00	0	0	0	
4) Gate and fencing	m	300	4.50	25.50	30.00	1,350	7,650	9,000	
5) Well drilling	m	100	30.00	170.00	200.00	3,000	17,000	20,000	
6) Electric work	LS	1				5,000	5,000	10,000	

Work Item	Unit	Qty	Unit Cost (US\$)			Amount (US\$)			Code of unit price
			L/C	F/C	Total	L/C	F/C	Total	
7) Miscellaneous	LS	1				4,990	6,520	11,510	
Construction Cost of Main system for KSBISRSP (1+2+3+4)						4,059,754	7,143,171	11,202,925	
Construction of Tertiary system									
1. Tertiary System for Kandal Stung Area of 1,750 ha						143,453	388,985	532,438	
(1) Construction of tertiary system						143,453	388,985	532,438	
1) Tertiary irrigation and drainage canals incl. structure	ha	750	89.79	219.14	308.93	67,343	164,355	231,698	EW-103
2) Tertiary irrigation canals incl. structure	ha	1,000	69.28	206.11	275.39	69,280	206,110	275,390	EW-101
3) Miscellaneous	LS	1				6,830	18,520	25,350	
2. Tertiary System for Bati Area of 1,600 ha						129,314	354,474	483,788	
(1) Construction of tertiary system						129,314	354,474	483,788	
1) Tertiary irrigation and drainage canals	ha	600	89.79	219.14	308.93	53,874	131,484	185,358	EW-103
2) Tertiary irrigation canals incl. structure	ha	1,000	69.28	206.11	275.39	69,280	206,110	275,390	EW-101
3) Miscellaneous	LS	1				6,160	16,880	23,040	
Total Construction Cost of Tertiary System for KSBISRSP						272,767	743,459	1,016,226	
Construction Cost of KSBISRSP including Tertiary System						4,332,521	7,886,630	12,219,151	

Source: JICA Survey Team

AF-2.5 Main Canal 35 Rehabilitation Sub-project (MC35RSP)

The cost estimates for every category concerning to MC35RSP are shown in the following tables.

Table AF-2.5.1 Construction Cost for MC35RSP

Work Item	Cost (US\$)		
	L/C	F/C	Total
Main Irrigation and Drainage System			
1. Preparatory Works and Temporary Works	48,799	65,885	114,684
2. Irrigation & Drainage Canals and related Structures	645,492	1,725,652	2,371,144
2.1 Main Canal 35 Rehabilitation	339,065	862,425	1,201,490
2.2 Secondary Canal Rehabilitation	303,716	856,406	1,160,122
2.3 Drainage Canal Rehabilitation	2,711	6,821	9,532
3. Construction of Sub-project Office	104,790	136,910	241,700
Construction Cost Main System of MC35RSP			
	799,081	1,928,447	2,727,528
Tertiary System Construction (850 ha)			
1. Tertiary System for 850 ha	70,442	189,426	259,868
Construction Cost of Tertiary System			
	70,442	189,426	259,868
Total Construction Cost for MC35RSP			
	869,523	2,117,873	2,987,396

Source: JICA Survey Team

Table AF-2.5.2 Software Component Activity Cost for MC35RSP

Item	Unit	Qty	F/C (US\$)		L/C (US\$)		Total (US\$)
			Unit rate	Amount	Unit rate	Amount	
(1) Capacity development of MOWRAM and PDOWRAM staff							
(1)-1 Remuneration and salary							
1) Foreign consultant	MM	1.5	32,591	48,887			48,887
2) National consultant	MM	6			3,000	18,000	18,000
Sub total				<u>48,887</u>		<u>18,000</u>	<u>66,887</u>
(1)-2 Direct cost							
1) Per diem for foreign consul.	Day	45	100	4,500			4,500
2) Per diem for national consul.	Day	180			30	5,400	5,400
3) Mobilization of foreign consul.	nos.	1	1,500	1,500			1,500
4) Mobilization of national consul.	nos.	2			50	100	100
Sub total				<u>6,000</u>		<u>5,500</u>	<u>11,500</u>
(1)-3 Training cost							
1) Allowance	Day	120			50	6,000	6,000
2) Material	LS	1			2,400	2,400	2,400
Sub total						<u>8,400</u>	<u>8,400</u>
(1)-4 Monitoring and evaluation							
1) MOWRAM	LS/year	4			2,000	8,000	8,000
2) PDOWRAM	LS/year	4			2,000	8,000	8,000
Sub total						<u>16,000</u>	<u>16,000</u>
Sub Total (1) (round)				54,887		47,900	102,787
(2) FWUC Formation and Strengthening							
(2)-1 Remuneration and salary							
1) National consultant	MM	21			3,000	63,000	63,000
Sub total						<u>63,000</u>	<u>63,000</u>
(2)-2 Direct cost							
1) Per diem for national consul.	Day	630			30	18,900	18,900
2) Mobilization of national consul.	nos.	7			50	350	350
Sub total						<u>19,250</u>	<u>19,250</u>
(2)-3 Training cost							
1) Allowance PDOWRAM	Day	35			50	1,750	1,750

Item	Unit	Qty	F/C (US\$)		L/C (US\$)		Total (US\$)
			Unit rate	Amount	Unit rate	Amount	
2) Allowance FWUC	Day	728			10	7,280	7,280
3) Material & others	LS	1			15,260	15,260	15,260
Sub total						<u>24,290</u>	<u>24,290</u>
(2)-4 Monitoring and evaluation							
1) MOWRAM	LS/year	7			4,000	28,000	28,000
2) PDOWRAM	LS/year	7			6,000	42,000	42,000
Sub total						<u>70,000</u>	<u>70,000</u>
Sub Total (2) (round)					0	176,540	176,540
(3) Agricultural support service							
(3)-1 Trainer's training							
1) Trainer's training	LS	1			2,080	2,080	2,080
Sub total						<u>2,080</u>	<u>2,080</u>
(3)-2 Field program							
1) Demonstration plot	LS	1			14,600	14,600	14,600
2) Water management	LS	1			12,880	12,880	12,880
Sub total						<u>27,480</u>	<u>27,480</u>
(3)-3 Farmer group training							
1) FG training program	LS	1			9,680	9,680	9,680
Sub total						<u>9,680</u>	<u>9,680</u>
(3)-4 Mass guideline/workshop							
1) Mass guideline/workshop	LS	1			2,080	2,080	2,080
Sub total						<u>2,080</u>	<u>2,080</u>
(3)-5 Consultant							
1) Foreign consultant	LS	0.3		12,180			12,180
2) National consultant	LS	3.44				13,640	13,640
Sub total					<u>12,180</u>	<u>13,640</u>	<u>25,820</u>
Sub Total (3) (round)					12,180	54,960	67,140
GRAND TOTAL FOR MC35RSP					67,067	279,400	346,467

Source: JICA Survey Team

Table AF-2.5.3 Breakdown of Construction Cost for MC35RSP

Work Item	Unit	Qty	Unit Cost (US\$)			Amount (US\$)			Code of unit price
			L/C	F/C	Total	L/C	F/C	Total	
Main Irrigation and Drainage System						48,779	65,855	114,634	
1. Preparatory Works and Temporary Works									
(1) Temporary Diversion canal and dewatering work	LS	1				4,730	12,880	17,610	
1) Dewatering work						4,730	12,880	17,610	
(2) Contractor's site office						44,049	52,975	97,024	
1) Construction of site office	m ²	600	50.00	50.00	100.00	30,000	30,000	60,000	EW-13
2) Rental cost for land (100 m x 100 m)	m ²	0	0.30	0.00	0.30	0	0	0	
3) Embankment of site	m ³	2,000	1.26	5.65	6.91	2,520	11,300	13,820	
4) Access road	m	100	15	15	30	1,500	1,500	3,000	
5) Desk & furniture and equipment	LS	1	5,000	5,000	10,000	5,000	5,000	10,000	
6) Office supply	year	2	2,500	2,500	5,000	5,000	5,000	10,000	
7) Temporary pipe culvert (D = 1.0 m, L = 8.0 m)	nos.	3	9.61	58.38	67.99	29	175	204	CW-13
2. Construction of Irrigation & Drainage Canals and related Structures						644,299	1,723,083	2,367,382	
2.1 Main Canal 35 Rehabilitation						339,065	862,425	1,201,490	
(1) Canal rehabilitation 13.7 km in total						225,412	672,600	898,012	
1) Stripping of top soil (t = 0.2 m)	m ²	67,300	0.08	0.29	0.37	5,384	19,517	24,901	EW-02
2) Excavation common by equipment	m ³	66,100	0.42	1.54	1.96	27,762	101,794	129,556	EW-03
Embankment common by equipment with soil material less than 500 m	m ³	36,890	1.80	8.66	10.46	66,402	319,467	385,869	EW-13-1
3) Embankment common by equipment with soil material less than 5 km	m ³	15,810	2.20	9.99	12.19	34,782	157,942	192,724	EW-13-2
4) Sodding	m ²	26,200	2.70	0.00	2.70	70,740	0	70,740	EW-15
5) Laterite pavement (t = 0.15 m)	m ³	5,400	1.78	7.75	9.53	9,612	41,850	51,462	EW-24
6) Miscellaneous	LS	1				10,730	32,030	42,760	
(2) Structures						111,547	185,292	296,839	
1) Check structure, Type A1	nos.	5	2,138	4,522	6,660	10,688	22,611	33,299	CW-401
2) Check structure, Type A2	nos.	1	1,066	2,256	3,322	1,066	2,256	3,322	CW-402
3) Check structure, Type A3	nos.	0	724	1,770	2,493	0	0	0	CW-403
4) Check structure, Type B1	nos.	0	3,394	6,183	9,577	0	0	0	CW-404
5) Check structure, Type B2	nos.	0	1,905	3,340	5,244	0	0	0	GW-405
6) Check structure, Type B3	nos.	3	1,360	2,577	3,937	4,080	7,732	11,812	GW-406
7) Turnout, Type A1	nos.	2	1,788	3,347	5,134	3,576	6,693	10,269	GW-408
8) Turnout, Type A2	nos.	12	1,003	2,361	3,364	12,031	28,336	40,367	GW-409
9) Turnout, Type B1	nos.	1	1,968	3,560	5,528	1,968	3,560	5,528	GW-410
10) Turnout, Type B2	nos.	1	1,125	2,451	3,576	1,125	2,451	3,576	GW-411
11) Culvert, Type A, box type	nos.	1	7,340	9,478	16,818	7,340	9,478	16,818	GW-412
12) Culvert, Type B1, pipe	nos.	2	1,321	1,881	3,203	2,643	3,763	6,406	GW-413
13) Culvert, Type B2, pipe	nos.	5	660	865	1,525	3,298	4,327	7,625	GW-414
14) Culvert, Type C for house access	nos.	10	403	529	932	4,026	5,291	9,317	GW-415
15) Road bridge	nos.	1	12,788	19,029	31,817	12,788	19,029	31,817	GW-416
16) Footpath bridge	nos.	10	2,510	3,723	6,233	25,098	37,228	62,326	GW-417
17) Drop	nos.	5	1,556	2,014	3,570	7,779	10,070	17,849	GW-407
18) Drain inlet	nos.	10	308	597	905	3,081	5,967	9,048	GW-312
19) Cross drain	nos.	1	5,650	7,680	13,330	5,650	7,680	13,330	GW-418
20) Miscellaneous	LS	1				5,310	8,820	14,130	
(3) Demolition of the existing structure						2,106	4,533	6,639	
Demolition of structure	m ³	300	7.02	15.11	22.13	2,106	4,533	6,639	EW-19
2.2 Secondary Canal Rehabilitation						302,523	853,837	1,156,360	
(1) Canal rehabilitation (6 canals of 11.2 km in total)						225,710	698,905	924,615	
1) Stripping of top soil (t = 0.2 m)	m ²	90,900	0.08	0.29	0.37	7,272	26,361	33,633	EW-02
2) Excavation common by equipment	m ³	6,400	0.42	1.54	1.96	2,688	9,856	12,544	EW-03
3) Embankment common by equipment with soil material less	m ³	46,060	1.80	8.66	10.46	82,908	398,880	481,788	EW-13-1

Work Item	Unit	Qty	Unit Cost (US\$)			Amount (US\$)			Code of unit price
			L/C	F/C	Total	L/C	F/C	Total	
than 500 m									
4) Embankment common by equipment with soil material less than 5 km	m ³	19,740	2.20	9.99	12.19	43,428	197,203	240,631	EW-13-2
5) Sodding	m ²	26,300	2.70	0.00	2.70	71,010	0	71,010	EW-15
6) Laterite pavement (t = 0.15 m)	m ³	4,300	1.78	7.75	9.53	7,654	33,325	40,979	EW-24
7) Miscellaneous	LS	1				10,750	33,280	44,030	
(2) Structures						<u>76,813</u>	<u>154,932</u>	<u>231,745</u>	
1) Check structure, Type A1	nos.	0	2,138	4,522	6,660	0	0	0	CW-401
2) Check structure, Type A2	nos.	2	1,066	2,256	3,322	2,132	4,512	6,644	CW-402
3) Check structure, Type A3	nos.	2	724	1,770	2,493	1,448	3,539	4,987	CW-403
4) Check structure, Type B1	nos.	0	3,394	6,183	9,577	0	0	0	CW-404
5) Check structure, Type B2	nos.	1	1,905	3,340	5,244	1,905	3,340	5,245	GW-405
6) Check structure, Type B3	nos.	15	1,360	2,577	3,937	20,400	38,659	59,059	GW-406
7) Turnout, Type A1	nos.	0	1,788	3,347	5,134	0	0	0	GW-408
8) Turnout, Type A2	nos.	16	1,003	2,361	3,364	16,041	37,781	53,822	GW-409
9) Turnout, Type B1	nos.	0	1,968	3,560	5,528	0	0	0	GW-410
10) Turnout, Type B2	nos.	19	1,125	2,451	3,576	21,383	46,565	67,948	GW-411
11) Culvert, Type A, box type	nos.	0	7,340	9,478	16,818	0	0	0	GW-412
12) Culvert, Type B1, pipe	nos.	0	1,321	1,881	3,203	0	0	0	GW-413
13) Culvert, Type B2, pipe	nos.	4	660	865	1,525	2,638	3,462	6,100	GW-414
14) Culvert, Type C for house access	nos.	0	403	529	932	0	0	0	GW-415
15) Road bridge	nos.	0	12,788	19,029	31,817	0	0	0	GW-416
16) Footpath bridge	nos.	0	2,510	3,723	6,233	0	0	0	GW-417
17) Drop	nos.	1	1,556	2,014	3,570	1,556	2,014	3,570	GW-407
18) Drain inlet	nos.	0	308	597	905	0	0	0	GW-312
19) Cross drain	nos.	1	5,650	7,680	13,330	5,650	7,680	13,330	GW-418
20) Miscellaneous	LS	1				3,660	7,380	11,040	
(3) Demolition of the existing structure						<u>1,193</u>	<u>2,569</u>	<u>3,762</u>	
1) Demolition of structure	m ³	170	7.02	15.11	22.13	1,193	2,569	3,762	EW-19
2.3 Drainage Canal Rehabilitation						2,711	6,821	9,532	
(1) Canal rehabilitation						<u>1,320</u>	<u>4,850</u>	<u>6,170</u>	
1) Stripping of top soil (t = 0.2 m)	m ²	0	0.08	0.29	0.37	0	0	0	EW-02
2) Excavation common by equipment	m ³	3,000	0.42	1.54	1.96	1,260	4,620	5,880	EW-03
3) Embankment common by equipment with soil material less than 5 km	m ³	0	2.20	9.99	12.19	0	0	0	EW-13-2
4) Sodding	m ²	0	2.70	0.00	2.70	0	0	0	EW-15
5) Laterite pavement (t = 0.15 m)	m ³	0	1.78	7.75	9.53	0	0	0	EW-24
6) Miscellaneous	LS	1				60	230	290	
(2) Structures						<u>1,391</u>	<u>1,971</u>	<u>3,362</u>	
1) Culvert, Type B1, pipe	nos.	1	1,321.48	1,881.35	3,202.83	1,321	1,881	3,202	GW-413
2) Miscellaneous	LS	1				70	90	160	
3. Construction of Sub-project Office						104,790	136,910	241,700	
1) Embankment common by equipment with soil material less than 500 m	m ³	1,500	1.80	8.66	10.46	2,700	12,990	15,690	EW-13-1
2) Office building	m ²	300	292.50	292.50	585.00	87,750	87,750	175,500	OW-01
3) Parking shed	m ²	0	150.00	150.00	300.00	0	0	0	
4) Gate and fencing	m	300	4.50	25.50	30.00	1,350	7,650	9,000	
5) Well drilling	m	100	30.00	170.00	200.00	3,000	17,000	20,000	
6) Electric work	LS	1				5,000	5,000	10,000	
7) Miscellaneous	LS	1				4,990	6,520	11,510	
Construction Cost of Main system for MC35RSP (1+2+3)						797,868	1,925,848	2,723,716	
Construction of Tertiary system									
1. Tertiary System for 850 ha						70,442	189,426	259,868	
(1) Construction of tertiary system						<u>70,442</u>	<u>189,426</u>	<u>259,868</u>	
1) Tertiary irrigation and drainage canals incl. structure	ha	400	89.79	219.14	308.93	35,916	87,656	123,572	EW-103
2) Tertiary irrigation canals incl. structure	ha	450	69.28	206.11	275.39	31,176	92,750	123,926	EW-101
3) Miscellaneous	LS	1				3,350	9,020	12,370	
Total Construction Cost of Tertiary System for MC35RSP						70,442	189,426	259,868	
Construction Cost of MC35RSP including Tertiary System						868,310	2,115,274	2,983,584	

Source: JICA Survey Team

AF-2.6 Sras Prambai Water Recession Rehabilitation Sub-project (SPWRRSP)

The cost estimates for every category concerning to SPWRRSP are shown in the following tables.

Table AF-2.6.1 Construction Cost for SPWRRSP

Work Item	Cost (US\$)		
	L/C	F/C	Total
<i>Main Irrigation and Drainage System</i>			
1. Preparatory Works and Temporary Works	53,310	93,639	146,949
2. Construction of Major Facilities	494,841	2,042,788	2,537,629
2.1 Sras reservoir rehabilitation	494,841	2,042,788	2,537,629
3. Construction of Sub-project Office	104,790	136,910	241,700
Total Construction Cost for SPWRRSP	652,941	2,273,337	2,926,278

Source: JICA Survey Team

Table AF-2.6.2 Software Component Activity Cost for SPWRRSP

Item	Unit	Qty	F/C (US\$)		L/C (US\$)		Total (US\$)
			Unit rate	Amount	Unit rate	Amount	
(1) Capacity development of MOWRAM and PDOWRAM staff							
(1)-1 Remuneration and salary							
1) Foreign consultant	MM	1.5	32,591	48,887			48,887
2) National consultant	MM	6			3,000	18,000	18,000
Sub total				<u>48,887</u>		<u>18,000</u>	<u>66,887</u>
(1)-2 Direct cost							
1) Per diem for foreign consul.	day	45	100	4,500			4,500
2) Per diem for national consul.	day	180			30	5,400	5,400
3) Mobilization of foreign consul.	nos.	1	1,500	1,500			1,500
4) Mobilization of national consul.	nos.	2			50	100	100
Sub total				<u>6,000</u>		<u>5,500</u>	<u>11,500</u>
(1)-3 Training cost							
1) Allowance	day	120			50	6,000	6,000
2) Material	LS	1			2,400	2,400	2,400
Sub total						<u>8,400</u>	<u>8,400</u>
(1)-4 Monitoring and evaluation							
1) MOWRAM	LS/year	4			2,000	8,000	8,000
2) PDOWRAM	LS/year	4			2,000	8,000	8,000
Sub total						<u>16,000</u>	<u>16,000</u>
Sub Total (1) (round)				54,887		47,900	102,787
(2) FWUC Formation and Strengthening							
(2)-1 Remuneration and salary							
1) National consultant	MM	21			3,000	63,000	63,000
Sub total						<u>63,000</u>	<u>63,000</u>
(2)-2 Direct cost							
1) Per diem for national consul.	day	630			30	18,900	18,900
2) Mobilization of national consul	nos.	7			50	350	350
Sub total						<u>19,250</u>	<u>19,250</u>
(2)-3 Training cost							
1) Allowance PDOWRAM	day	35			50	1,750	1,750
2) Allowance FWUC	day	728			10	7,280	7,280
3) Material & others	LS	1			15,260	15,260	15,260
Sub total						<u>24,290</u>	<u>24,290</u>
(2)-4 Monitoring and evaluation							
1) MOWRAM	LS/year	7			4,000	28,000	28,000
2) PDOWRAM	LS/year	7			6,000	42,000	42,000
Sub total						<u>70,000</u>	<u>70,000</u>
Sub Total (2) (round)				0		176,540	176,540
(3) Agricultural support service							
(3)-1 Trainer's training							
1) Trainer's training	LS	1			2,080	2,080	2,080
Sub total						<u>2,080</u>	<u>2,080</u>
(3)-2 Field program							
1) Demonstration plot	LS	1			21,900	21,900	21,900
2) Water management	LS	1			19,320	19,320	19,320
Sub total						<u>41,220</u>	<u>41,220</u>
(3)-3 Farmer group training							
1) FG training program	LS	1			14,520	14,520	14,520
Sub total						<u>14,520</u>	<u>14,520</u>
(3)-4 Mass guideline/workshop							
1) Mass guideline/workshop	LS	1			3,120	3,120	3,120
Sub total						<u>3,120</u>	<u>3,120</u>
(3)-5 Consultant							

Item	Unit	Qty	F/C (US\$)		L/C (US\$)		Total (US\$)
			Unit rate	Amount	Unit rate	Amount	
1) Foreign consultant	LS	0.3		12,180			12,180
2) National consultant	LS	3.44				13,640	13,640
Sub total				12,180		13,640	25,820
Sub Total (3) (round)				12,180		74,580	86,760
GRAND TOTAL FOR SPWRRSP				67,067		299,020	366,087

Source: JICA Survey Team

Table AF-2.6.3 Breakdown of Construction Cost for SPWRRSP

Work Item	Unit	Qty	Unit Cost (US\$)			Amount (US\$)			Code of unit price
			L/C	F/C	Total	L/C	F/C	Total	
Main Irrigation and Drainage System									
1. Preparatory Works and Temporary Works									
(1) Cofferdam for intake						53,310	93,639	146,949	
1) Embankment common by equipment with excavated material	m ³	4,900	1.26	5.65	6.91	6,174	27,685	33,859	EW-13
(2) Miscellaneous	LS	1				617	2,769	3,386	10% of sum
(2) Temporary Diversion canal and dewatering work						2,470	10,210	12,680	
1) Temporary diversion canal	place	0	500	2,500	3,000	0	0	0	
2) Dewatering work	LS	1				2,470	10,210	12,680	
(3) Contractor's site office						44,049	52,975	97,024	
1) Construction of site office	m ²	600	50.00	50.00	100.00	30,000	30,000	60,000	
2) Rental cost for land (100 m x 100 m)	m ²	0	0.30	0.00	0.30	0	0	0	
3) Embankment of site	m ³	2,000	1.26	5.65	6.91	2,520	11,300	13,820	EW-13
4) Access road	m	100	15	15	30	1,500	1,500	3,000	
5) Desk & furniture and equipment	LS	1	5,000	5,000	10,000	5,000	5,000	10,000	
6) Office supply	year	2	2,500	2,500	5,000	5,000	5,000	10,000	
7) Temporary pipe culvert (D = 1.0 m, L = 8.0 m)	nos.	3	9.61	58.38	67.99	29	175	204	CW-13
						494,841	2,042,788	2,537,629	
2. Construction of Major Facilities						494,841	2,042,788	2,537,629	
2.1 Srrass Reservoir						418,816	1,939,490	2,358,306	
(1) Dike rehabilitation (L = 9,100 m)									
1) Stripping of top soil (t = 0.2 m)	m ²	145,000	0.08	0.29	0.37	11,600	42,050	53,650	EW-02
2) Excavation common by equipment	m ³	0	0.42	1.54	1.96	0	0	0	EW-03
3) Embankment common by equipment with soil material less than 500 m	m ³	119,000	1.80	8.66	10.46	214,200	1,030,540	1,244,740	EW-13-1
4) Embankment common by equipment with soil material less than 5 km	m ³	51,000	2.20	9.99	12.19	112,200	509,490	621,690	EW-13-2
5) Sodding	m ²	34,200	1.78	7.75	9.53	60,876	265,050	325,926	EW-24
6) Miscellaneous	LS	1				19,940	92,360	112,300	5% of sum
(2) Intake structures Type-1 (Pipe 1,200mm) x 3 nos.						33,127	45,600	78,727	
1) Excavation common by equipment	m ³	1,350	0.42	1.54	1.96	567	2,079	2,646	EW-03
2) Backfill by manpower by tamper with excavated material	m ³	840	3.88	0.23	4.11	3,259	193	3,452	EW-10
3) Backfill by manpower with tamper (transported material less than 500 m)	m ³	360	4.33	3.26	7.59	1,559	1,174	2,733	EW-10-1
4) Concrete pipe (D = 1,200 mm)	m	30	11.53	70.06	81.59	346	2,102	2,448	CW-13 x 1.2
5) Reinforced concrete	m ³	230	65.97	45.03	111.00	15,173	10,357	25,530	CW-101
6) Lean concrete	m ³	30	53.33	36.75	90.08	1,600	1,103	2,703	CW-103
7) Reinforcement bar	kg	18,000.0	0.29	0.94	1.23	5,220	16,920	22,140	CW-10
8) Riprap by gabion (t = 0.4 m)	m ³	120	19.76	5.70	25.46	2,371	684	3,055	EW-20
9) Sand & gravel filter	m ³	0	17.57	2.86	20.43	0	0	0	EW-16&17
10) Slide gate (1.2 m x 1.2 m)	set	3	357.84	2,225.38	2,583.22	1,074	6,676	7,750	GW-01
11) Screen (1.2 m x 4.5 m)	set	6	63.00	357.00	420.00	378	2,142	2,520	
12) Miscellaneous	LS	1				1,580	2,170	3,750	
(3) Intake structures Type-2 (Pipe 1,000 mm) x 3 nos.						31,168	41,744	72,912	
1) Excavation common by equipment	m ³	1,350	0.42	1.54	1.96	567	2,079	2,646	EW-03
2) Backfill by manpower by tamper with excavated material	m ³	840	3.88	0.23	4.11	3,259	193	3,452	EW-10
3) Backfill by manpower with tamper (transported material less than 500 m)	m ³	360	4.33	3.26	7.59	1,559	1,174	2,733	EW-10-1
4) Concrete pipe (D = 1,000 mm)	m	30	11.53	70.06	81.59	346	2,102	2,448	CW-13 x 1.2
5) Reinforced concrete	m ³	210	65.97	45.03	111.00	13,854	9,456	23,310	CW-101
6) Lean concrete	m ³	30	53.33	36.75	90.08	1,600	1,103	2,703	CW-103
7) Reinforcement bar	kg	16,800.0	0.29	0.94	1.23	4,872	15,792	20,664	CW-10
8) Riprap by gabion (t = 0.4 m)	m ³	120	19.76	5.70	25.46	2,371	684	3,055	EW-20
9) Sand & gravel filter	m ³	0	17.57	2.86	20.43	0	0	0	EW-16&17
10) Slide gate (1.0 m x 1.0 m)	set	3	314.84	1,795.38	2,110.22	945	5,386	6,331	GW-02
11) Screen (1.0 m x 4.5 m)	set	6	52.50	297.50	350.00	315	1,785	2,100	
12) Miscellaneous	LS	1				1,480	1,990	3,470	
(4) Intake structures Type-3 (Box culvert) x 1 nos.						11,730	15,954	27,684	
1) Excavation common by equipment	m ³	350	0.42	1.54	1.96	147	539	686	EW-03
2) Backfill by manpower by tamper with excavated material	m ³	210	3.88	0.23	4.11	815	48	863	EW-10
3) Backfill by manpower with tamper (transported material less than 500 m)	m ³	90	4.33	3.26	7.59	390	293	683	EW-10-1
4) Concrete pipe (D = 1,200 mm)	m	0	11.53	70.06	81.59	0	0	0	CW-13 x 1.2
5) Reinforced concrete	m ³	90	65.97	45.03	111.00	5,937	4,053	9,990	CW-101
6) Lean concrete	m ³	10	53.33	36.75	90.08	533	368	901	CW-103
7) Reinforcement bar	kg	7,200.0	0.29	0.94	1.23	2,088	6,768	8,856	CW-10
8) Riprap by gabion (t = 0.4 m)	m ³	40	19.76	5.70	25.46	790	228	1,018	EW-20
9) Sand & gravel filter	m ³	0	17.57	2.86	20.43	0	0	0	EW-16&17
10) Slide gate (1.0 m x 1.5 m)	set	1	365.48	2,301.83	2,667.31	365	2,302	2,667	GW-06
11) Screen (1.0 m x 4.5 m)	set	2	52.50	297.50	350.00	105	595	700	
12) Miscellaneous	LS	1				560	760	1,320	
3. Construction of Sub-project Office						104,790	136,910	241,700	
1) Embankment common by equipment with soil material less than 500 m	m ³	1,500	1.80	8.66	10.46	2,700	12,990	15,690	EW-13-1
2) Office building	m ²	300	292.50	292.50	585.00	87,750	87,750	175,500	OW-01
3) Parking shed	m ²	0	150.00	150.00	300.00	0	0	0	
4) Gate and fencing	m	300	4.50	25.50	30.00	1,350	7,650	9,000	
5) Well drilling	m	100	30.00	170.00	200.00	3,000	17,000	20,000	
6) Electric work	LS	1				5,000	5,000	10,000	
7) Miscellaneous	LS	1				4,990	6,520	11,510	
Construction Cost of SPWRRSP (1+2+3)						652,941	2,273,337	2,926,278	

Source: JICA Survey Team

AF-2.7 Daun Pue Irrigation System Rehabilitation Sub-project (DRISRSP)

The cost estimates for every category concerning to DRISRSP are shown in the following tables.

Table AF-2.7.1 Construction Cost for DRISRSP

Work Item	Cost (US\$)		
	L/C	F/C	Total
<u>Main Irrigation and Drainage System</u>	<u>1,691,746</u>	<u>3,479,749</u>	<u>5,171,495</u>
1. Preparatory Works and Temporary Works	61,592	110,913	172,505
2. Construction of Major Facilities	1,525,364	3,231,926	4,757,290
2.1 Headworks	758,801	1,381,676	2,140,477
2.2 Irrigation and Drainage Canals	566,032	1,466,305	2,032,337
2.3 Secondary Canals	200,531	383,945	584,476
3. Construction of Sub-project Office	104,790	136,910	241,700
Construction Cost Main System of DPISRSP	1,691,946	3,479,749	5,171,495
<u>Tertiary System Construction (1,150 ha)</u>	<u>94,427</u>	<u>255,722</u>	<u>350,149</u>
1. Tertiary System for 1,150 ha	94,427	255,722	350,149
Construction Cost of Tertiary System	94,427	255,722	350,149
Total Construction Cost for DPISRSP	1,786,173	3,735,471	5,521,644

Source: JICA Survey Team

Table AF-2.7.2 Software Component Activity Cost for DRISRSP

Item	Unit	Qty	F/C (US\$)		L/C (US\$)		Total (US\$)
			Unit rate	Amount	Unit rate	Amount	
(1) Capacity development of MOWRAM and PDOWRAM staff							
(1)-1 Remuneration and salary							
1) Foreign consultant	MM	1.5	32,591	48,887			48,887
2) National consultant	MM	6			3,000	18,000	18,000
Sub total				<u>48,887</u>		<u>18,000</u>	<u>66,887</u>
(1)-2 Direct cost							
1) Per diem for foreign consul.	day	45	100	4,500			4,500
2) Per diem for national consul.	day	180			30	5,400	5,400
3) Mobilization of foreign consul.	no	1	1,500	1,500			1,500
4) Mobilization of national consul.	no	2			50	100	100
Sub total				<u>6,000</u>		<u>5,500</u>	<u>11,500</u>
(1)-3 Training cost							
1) Allowance	day	120			50	6,000	6,000
2) Material	LS	1			2,400	2,400	2,400
Sub total						<u>8,400</u>	<u>8,400</u>
(1)-4 Monitoring and evaluation							
1) MOWRAM	LS/year	4			2,000	8,000	8,000
2) PDOWRAM	LS/year	4			2,000	8,000	8,000
Sub total						<u>16,000</u>	<u>16,000</u>
Sub Total (1) (round)				54,887		47,900	102,787
(2) FWUC Formation and Strengthening							
(2)-1 Remuneration and salary							
1) National consultant	MM	21			3,000	63,000	63,000
Sub total						<u>63,000</u>	<u>63,000</u>
(2)-2 Direct cost							
1) Per diem for national consul.	day	630			30	18,900	18,900
2) Mobilization of national consul	no	7			50	350	350
Sub total						<u>19,250</u>	<u>19,250</u>
(2)-3 Training cost							
1) Allowance PDOWRAM	day	35			50	1,750	1,750
2) Allowance FWUC	day	728			10	7,280	7,280
3) Material & others	LS	1			15,260	15,260	15,260
Sub total						<u>24,290</u>	<u>24,290</u>
(2)-4 Monitoring and evaluation							
1) MOWRAM	LS/year	7			4,000	28,000	28,000
2) PDOWRAM	LS/year	7			6,000	42,000	42,000
Sub total						<u>70,000</u>	<u>70,000</u>
Sub Total (2) (round)				0		176,540	176,540
(3) Agricultural support service							
(3)-1 Trainer's training							
1) Trainer's training	LS	1			2,080	2,080	2,080
Sub total						<u>2,080</u>	<u>2,080</u>

Item	Unit	Qty	F/C (US\$)		L/C (US\$)		Total (US\$)
			Unit rate	Amount	Unit rate	Amount	
(3)-2 Field program							
1) Demonstration plot	LS	1			21,900	21,900	21,900
2) Water management	LS	1			19,320	19,320	19,320
Sub total						<u>41,220</u>	<u>41,220</u>
(3)-3 Farmer group training							
1) FG training program	LS	1			14,520	14,520	14,520
Sub total						<u>14,520</u>	<u>14,520</u>
(3)-4 Mass guideline/workshop							
1) Mass guideline/workshop	LS	1			3,120	3,120	3,120
Sub total						<u>3,120</u>	<u>3,120</u>
(3)-5 Consultant							
1) Foreign consultant	LS	0.3		12,180			12,180
2) National consultant	LS	3.44				13,640	13,640
Sub total				<u>12,180</u>		<u>13,640</u>	<u>25,820</u>
Sub Total (3) (round)				12,180		74,580	86,760
GRAND TOTAL FOR DRISRSP				67,067		299,020	366,087

Source: JICA Survey Team

Table AF-2.7.3 Breakdown of Construction Cost for DRISRSP

Work Item	Unit	Qty	Unit Cost (US\$)			Amount (US\$)			Code of unit price
			L/C	F/C	Total	L/C	F/C	Total	
Main Irrigation and Drainage System						1,691,746	3,479,749	5,171,495	
1. Preparatory Works and Temporary Works						61,592	110,913	172,505	
(1) Cofferdam for headwork construction						9,913	41,778	29,575	
1) Excavation of temporary diversion	m ³	4,800	0.42	1.54	1.96	2,016	7,392	9,408	EW-03
2) Backfilling for temporary diversion	m ³	4,800	0.31	1.25	1.56	1,488	6,000	7,488	EW-13-3
3) Embankment of coffer dam	m ³	3,600	1.26	5.65	6.91	4,536	20,340	24,876	EW-13
4) Removal of coffer dam	m ³	3,600	0.27	1.18	1.45	972	4,248	5,220	EW-02-1
5) Miscellaneous	LS	1				901	3,798	4,699	10% of sum
(2) Temporary Diversion canal and dewatering work						7,630	16,160	23,790	
1) Dewatering work	LS	1				7,630	16,160	23,790	0.5% of 2
(3) Contractor's site office						44,049	52,975	97,024	
1) Construction of site office	m ²	600	50.00	50.00	100.00	30,000	30,000	60,000	
2) Rental cost for land (100 m x 100 m)	m ²	0	0.30	0.00	0.30	0	0	0	
3) Embankment of site	m ³	2,000	1.26	5.65	6.91	2,520	11,300	13,820	EW-13
4) Access road	m	100	15	15	30	1,500	1,500	3,000	
5) Desk & furniture and equipment	LS	1	5,000	5,000	10,000	5,000	5,000	10,000	
6) Office supply	year	2	2,500	2,500	5,000	5,000	5,000	10,000	
7) Temporary pipe culvert (D = 1.0 m, L = 8.0 m)	nos.	3	9.61	58.38	67.99	29	175	204	CW-13
2. Construction of Major Facilities						1,525,364	3,231,926	4,757,290	
2.1 Headworks						758,801	1,381,676	2,140,477	
(1) River training						58,266	140,230	198,496	
1) Stripping of top soil (t = 0.2 m)	m ²	4,000	0.08	0.29	0.37	320	1,160	1,480	EW-02
2) Excavation common by equipment	m ³	30,000	0.42	1.54	1.96	12,600	46,200	58,800	EW-03
3) Embankment common by equipment with soil material less than 5 km	m ³	8,000	2.20	9.99	12.19	17,600	79,920	97,520	EW-13-2
4) Riprap rock	m ³	400	19.76	5.70	25.46	7,904	2,280	10,184	EW-20
5) Gabion	m ³	700	19.76	5.70	25.46	13,832	3,990	17,822	EW-20
6) Sodding	m ²	1,200	2.70	0.00	2.70	3,240	0	3,240	EW-15
7) Miscellaneous	LS	1				3,720	10,140	13,860	5% of sum
(2) Headworks						620,603	903,870	1,524,473	
1) Clearing & grubbing	m ²	400	0.06	0.19	0.25	24	76	100	EW-01
2) Stripping of top soil (t = 0.2 m)	m ²	200	0.08	0.29	0.37	16	58	74	EW-02
3) Excavation common by equipment	m ³	13,000	0.42	1.54	1.96	5,460	20,020	25,480	EW-03
4) Embankment common by equipment with soil material less than 500 m	m ³	3,150	1.80	8.66	10.46	5,670	27,279	32,949	EW-13-1
5) Backfilling by equipment	m ³	2,000	2.01	10.05	12.06	4,020	20,100	24,120	EW-12
6) Reinforced concrete	m ³	6,200	65.97	45.03	111.00	409,014	279,186	688,200	CW-101
7) Lean concrete	m ³	280	53.33	36.75	90.08	14,932	10,290	25,222	CW-103
8) Reinforcement bar	kg	310,000	0.29	0.94	1.23	89,900	291,400	381,300	CW-10
9) Concrete pile (300 x 300 mm)	m	820.0	43.67	109.44	153.11	35,809	89,741	125,550	CW-14
10) Steel sheet pile	m ²	800.0	32.76	153.35	186.11	26,208	122,680	148,888	CW-15
11) Miscellaneous	LS	1				29,550	43,040	72,590	
(3) Intake structure						16,801	27,752	44,553	
1) Excavation common by equipment	m ³	250	0	2	2	105	385	490	EW-03
2) Backfilling by equipment	m ³	100	2	9	10	180	866	1,046	EW-13-1
3) Reinforced concrete	m ³	150	66	45	111	9,896	6,755	16,651	CW-101
4) Lean concrete	m ³	12	53	37	90	640	441	1,081	CW-103
5) Reinforcement bar	kg	12,000	0	1	1	3,480	11,280	14,760	CW-10
6) Riprap by gabion (t = 0.4 m)	set	32	20	6	25	632	182	814	EW-20
7) Slide gate (1.5 m x 2.0 m)	set	2	489	3,006	3,496	978	6,013	6,991	GW-00
8) Screen (1.5 m x 2.0 m)	set	2	45	255	300	90	510	600	
9) Miscellaneous	LS	1				800	1,320	2,120	
(4) Gate for movable weir						53,724	214,896	268,620	
1) Tilting gate (10.0 x 2.0 m x 4 nos.)	set	4	11,760	47,040	58,800	47,040	188,160	235,200	
2) Generator (7.5 kVA)	set	1	1,800	7,200	9,000	1,800	7,200	9,000	
3) Miscellaneous	LS	1				4,884	19,536	24,420	
2.2 Irrigation and Drainage Canals						566,032	1,466,305	2,032,337	
(1) Main canal rehabilitation (11.0 km)						396,652	1,182,809	1,504,251	

Preparatory Survey for Irrigation and Drainage System Rehabilitation and Improvement Project

Work Item	Unit	Qty	Unit Cost (US\$)			Amount (US\$)			Code of unit price
			L/C	F/C	Total	L/C	F/C	Total	
1) Stripping of top soil (t = 0.2 m)	m ²	132,000	0.08	0.29	0.37	10,560	38,280	48,840	EW-02
2) Excavation common by equipment	m ³	21,600	0.42	1.54	1.96	9,072	33,264	42,336	EW-03
3) Embankment common by equipment with soil material less than 500 m	m ³	78,800	1.80	8.66	10.46	141,848	682,408	824,248	EW-13-1
4) Embankment common by equipment with soil material less than 5 km	m ³	33,800	2.20	9.99	12.19	74,360	337,662	412,022	EW-13-2
5) Sodding	m ²	49,600	2.70	0.00	2.70	133,920	0	133,920	EW-15
6) Laterite pavement (t = 0.15 m)	m ³	4,500	1.78	7.75	9.53	8,010	34,875	42,885	EW-24
7) Miscellaneous	LS	1				21,590	69,050	90,640	
(2) Structures						<u>168,397</u>	<u>281,381</u>	<u>449,778</u>	
1) Check structure, Type A1	nos.	5	2,138	4,522	6,660	10,688	22,611	33,299	CW-401
2) Check structure, Type A2	nos.	1	1,066	2,256	3,322	1,066	2,256	3,322	CW-402
3) Check structure, Type A3	nos.	1	724	1,770	2,493	724	1,770	2,494	CW-403
4) Check structure, Type B1	nos.	5	3,394	6,183	9,577	16,972	30,915	47,887	CW-404
5) Check structure, Type B2	nos.	2	1,905	3,340	5,244	3,809	6,679	10,488	GW-405
6) Turnout, Type A2	nos.	8	1,003	2,361	3,364	8,020	18,891	26,911	GW-409
7) Turnout, Type B1	nos.	4	1,968	3,560	5,528	7,873	14,238	22,111	GW-410
8) Turnout, Type B2	nos.	22	1,125	2,451	3,576	24,759	53,917	78,676	GW-411
9) Culvert, Type A, box type	nos.	3	7,340	9,478	16,818	22,019	28,435	50,454	GW-412
10) Culvert, Type B1, pipe	nos.	3	1,321	1,881	3,203	3,964	5,644	9,608	GW-413
11) Culvert, Type B2, pipe	nos.	7	660	865	1,525	4,617	6,058	10,675	GW-414
12) Footpath bridge	nos.	2	2,510	3,723	6,233	5,020	7,446	12,466	GW-417
13) Cross drain	nos.	9	5,650	7,680	13,330	50,846	69,121	119,967	GW-418
14) Miscellaneous	LS	1				8,020	13,400	21,420	
(3) Demolition of the existing structure						<u>983</u>	<u>2,115</u>	<u>3,098</u>	
1) Demolition of structure (14 nos.)	m ³	140	7.02	15.11	22.13	983	2,115	3,098	EW-19
2.3 Secondary Canals						200,531	383,945	584,476	
(1) Canal, new and rehabilitation (6 canals 11.2 km in total)						<u>146,964</u>	<u>288,203</u>	<u>435,167</u>	
1) Stripping of top soil (t = 0.2 m)	m ²	7,100	0.08	0.29	0.37	568	2,059	2,627	EW-02
2) Excavation common by equipment	m ³	500	0.42	1.54	1.96	210	770	980	EW-03
3) Embankment common by equipment with soil material less than 500 m	m ³	29,400	1.80	8.66	10.46	52,920	254,604	307,524	EW-13-1
4) Sodding	m ²	30,500	2.70	0.00	2.70	82,350	0	82,350	EW-15
5) Laterite pavement (t = 0.15 m)	m ³	2,200	1.78	7.75	9.53	3,916	17,050	20,966	EW-24
6) Miscellaneous	LS	1				7,000	13,720	20,720	
(2) Structures						<u>53,146</u>	<u>94,835</u>	<u>147,981</u>	
1) Check structure, Type A2	nos.	1	1,066	2,256	3,322	1,066	2,256	3,322	CW-402
2) Check structure, Type A3	nos.	8	724	1,770	2,493	5,791	14,156	19,947	CW-403
3) Turnout, Type A2	nos.	3	1,003	2,361	3,364	3,008	7,084	10,092	GW-409
4) Turnout, Type B2	nos.	12	1,125	2,451	3,576	13,505	29,409	42,914	GW-411
5) Culvert, Type B2, pipe	nos.	8	660	865	1,525	5,277	6,924	12,201	GW-414
6) Footpath bridge	nos.	2	2,510	3,723	6,233	5,020	7,446	12,466	GW-417
7) Cross drain	nos.	3	5,650	7,680	13,330	16,949	23,040	39,989	GW-418
8) Miscellaneous	LS	1				2,530	4,520	7,050	
(3) Demolition of the existing structure						<u>421</u>	<u>907</u>	<u>1,328</u>	
1) Demolition of structure (6 nos.)	m ³	60	7.02	15.11	22.13	421	907	1,328	EW-19
3. Construction of Sub-project Office						104,790	136,910	241,700	
1) Embankment common by equipment with soil material less than 500 m	m ³	1,500	1.80	8.66	10.46	2,700	12,990	15,690	EW-13-1
2) Office building	m ²	300	292.50	292.50	585.00	87,750	87,750	175,500	OW-01
3) Gate and fencing	m	300	4.50	25.50	30.00	1,350	7,650	9,000	
4) Well drilling	m	100	30.00	170.00	200.00	3,000	17,000	20,000	
5) Electric work	LS	1				5,000	5,000	10,000	
6) Miscellaneous	LS	1				4,990	6,520	11,510	
Construction Cost of Main system for DPISRSP (1+2+3)						1,691,746	3,479,749	5,171,495	
Construction of Tertiary system (1,150 ha)									
1. Tertiary System for 1,150 ha						94,427	255,722	350,149	
(1) Construction of tertiary system						<u>94,427</u>	<u>255,722</u>	<u>350,149</u>	
1) Tertiary irrigation and drainage canals incl. structure	ha	500	89.79	219.14	308.93	44,895	109,570	154,465	EW-103
2) Tertiary irrigation canals incl. structure	ha	650	69.28	206.11	275.39	45,032	133,972	179,004	EW-101
3) Miscellaneous	LS	1				4,500	12,180	16,680	
Total Construction Cost of Tertiary System for DPISRSP						94,427	255,722	350,149	
Construction Cost of DPISRSP including Tertiary System						1,786,173	3,735,471	5,521,644	

Source: JICA Survey Team

ANNEX F
Attachments

ANNEX F

Attachment 1

Breakdown of Annual Disbursement Schedule for SPPIDSRIP

ANNEX F

Attachment 2

Breakdown of Unit Prices for Main Work Items

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : **EW-01**
 Work item : **Clearing and Grubbing**
 Remarks : 500 m2 base (t=0.10m, =50m3)
 Payment unit : m2

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. LABOUR							
1	Foreman	MD	0.31	12.50	3.91		
2	Common labor	MD	1.56	4.50	7.03		
3	Heavy equipment operator	MD	0.26	14.00	3.65		
4	Assistant operator	MD	0.26	8.00	2.08		
5							
Sub Total						16.67	0.00
B. MATERIAL							
1	Diesel	liter	35.94			1.10	39.53
2							
3							
4							
5	Miscellaneous	LS					7.91
Sub Total						3.33	47.44
C. EQUIPMENT							
1	Bulldozer 21 ton	MD	0.26			150.00	39.06
2	Chainsaw						7.81
3							
4							
5	Miscellaneous						
Sub Total						0.00	46.88
Sub Total (A+B+C)						20.00	94.31
E. Profit & Over head			10% x D			11.43	
F. TOTAL PRICE by currency / volumeUS\$/m2						0.06	0.19
G. TOTAL PRICE (L/C+F/C) / volume US\$/m2							0.25

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : **EW-02**
 Work item : **Stripping of top soil of 0.2m**
 Remarks : 500 m2base (t=0.20m, 100m3)
 Payment unit : m2

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. LABOUR							
1	Foreman	MD	0.21	12.50	2.60		
2	Common labor	MD	1.04	4.50	4.69		
3	Heavy equipment operator	MD	0.52	14.00	7.29		
4	Assistant operator	MD	0.52	8.00	4.17		
5							
Sub Total						18.75	0.00
B. MATERIAL							
1	Diesel	liter	56.25			1.10	61.88
2							
3							
4							
5	Miscellaneous	LS					12.38
Sub Total						3.75	74.25
C. EQUIPMENT							
1	Backhoe 0.6 m3	MD	0.52			133.00	69.27
2							
3							
4							
5	Miscellaneous						
Sub Total						0.00	69.27
Sub Total (A+B+C)						22.50	143.52
E. Profit & Over head			10% x D			16.60	
F. TOTAL PRICE by currency / volumeUS\$/m2						0.08	0.29
G. TOTAL PRICE (L/C+F/C) / volume US\$/m2							0.37

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : **EW-02-1**
 Work item : **Excavation by Bulldozer 21 ton**
 Remarks : 100 m3base
 Payment unit : m3

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. LABOUR							
1	Foreman	MD	0.13	12.50	1.64		
2	Common labor	MD	0.66	4.50	2.96		
3	Heavy equipment operator	MD	0.33	14.00	4.61		
4	Assistant operator	MD	0.33	8.00	2.63		
5							
Sub Total						11.84	0.00
B. MATERIAL							
1	Diesel	liter	51.97			1.10	57.17
2							
3							
4							
5	Miscellaneous	LS					11.43
Sub Total						2.37	68.61
C. EQUIPMENT							
1	Bulldozer 21 ton	MD	0.33			150.00	49.34
2							
3							
4							
5	Miscellaneous						
Sub Total						0.00	49.34
Sub Total (A+B+C)						14.21	117.95
E. Profit & Over head			10% x D			13.22	
F. TOTAL PRICE by currency / volumeUS\$/m2						0.27	1.18
G. TOTAL PRICE (L/C+F/C) / volume US\$/m2							1.45

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : **EW-03**
 Work item : **Excavation common by Equipment**
 Remarks : 100 m3 base
 Payment unit : m3

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. LABOUR							
1	Heavy equipment operator	MD	0.56	14.00	7.81		
2	Foreman	MD	0.22	12.50	2.79		
3	Common labor	MD	1.12	4.50	5.02		
4	Assistant operator	MD	0.56	8.00	4.46		
5							
Sub Total						20.09	0.00
B. MATERIAL							
1	Diesel	liter	60.27			1.10	66.29
2							
3							
4							
5	Miscellaneous	LS				4.02	13.26
Sub Total						4.02	79.55
C. EQUIPMENT							
1	Backhoe 0.6 m3	MD	0.56			133.00	74.22
2							
3							
4							
5	Miscellaneous						
Sub Total						0.00	74.22
Sub Total (A+B+C)						24.11	153.77
E. Profit & Over head			10% x D			17.79	
F. TOTAL PRICE by currency / volumeUS\$/m3						0.42	1.54
G. TOTAL PRICE (L/C+F/C) / volume US\$/m3							1.96

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : EW-04
 Work item : Excavation common in water by Equipment
 Remarks : 100 m³ base
 Payment unit : m³

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. LABOUR							
1	Heavy equipment operator	MD	1.67	14.00	23.44		
2	Foreman	MD	0.67	12.50	8.37		
3	Common labor	MD	3.35	4.50	15.07		
4	Assistant operator	MD	1.67	8.00	13.39		
5							
Sub Total					60.27		0.00
B. MATERIAL							
1	Diesel	liter	180.80			1.10	198.88
2							
3							
4							
5	Miscellaneous	LS			3.01		9.94
Sub Total					3.01		208.83
C. EQUIPMENT							
1	Backhoe 0.6 m ³	MD	1.67			133.00	222.66
2							
3							
4							
5	Miscellaneous						
Sub Total					0.00		222.66
D. Sub Total (A+B+C)					63.28		431.48
E. Profit & Over head				10% x D		49.48	
F. TOTAL PRICE by currency / volume US\$/m ³					1.13		4.31
G. TOTAL PRICE (L/C+F/C) / volume US\$/m ³							5.44

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : EW-05
 Work item : Excavation, loading and transportation of soil with hauling distance less than 500m
 Remarks : 100 m³ base
 Payment unit : m³

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. LABOUR							
1	Heavy equipment operator	MD	0.46	14.00	6.43		
2	Driver	MD	0.88	6.50	5.74		
3	Foreman	MD	0.18	12.50	2.30		
4	Common labor	MD	0.92	4.50	4.14		
5	Assistant operator	MD	0.46	8.00	3.68		
Sub Total					22.28		0.00
B. MATERIAL							
1	Diesel for backhoe	liter	63.42			1.10	69.76
2	Diesel for dump truck	liter	67.09			1.10	73.80
3							
4							
5	Miscellaneous	LS					7.18
Sub Total					0.00		150.74
C. EQUIPMENT							
1	Backhoe 0.6 m ³	MD	0.46			133.00	61.12
2	Dump Truck 8 ton	MD	0.88			85.00	75.04
3							
4							
5	Miscellaneous						
Sub Total					0.00		136.16
D. Sub Total (A+B+C)					22.28		286.90
E. Profit & Over head				10% x D		30.92	
F. TOTAL PRICE by currency / volume US\$/m ³						0.53	2.87
G. TOTAL PRICE (L/C+F/C) / volume US\$/m ³							3.40

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : EW-06
 Work item : Excavation, loading and transportation of soil with hauling distance more than 500m & less than 5,000m
 Remarks : 100 m³ base
 Payment unit : m³

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. LABOUR							
1	Heavy equipment operator	MD	0.46	14.00	6.43		
2	Driver	MD	1.61	6.50	10.47		
3	Foreman	MD	0.18	12.50	2.30		
4	Common labor	MD	3.22	4.50	14.50		
5	Assistant operator	MD	1.61	8.00	12.89		
Sub Total					46.59		0.00
B. MATERIAL							
1	Diesel for backhoe	liter	63.42			1.10	69.76
2	Diesel for dump truck	liter	122.42			1.10	134.66
3							
4							
5	Miscellaneous	LS					10.22
Sub Total					0.00		214.65
C. EQUIPMENT							
1	Backhoe 0.6 m ³	MD	0.46			133.00	61.12
2	Dump Truck 8 ton	MD	1.61			85.00	136.92
3							
4							
5	Miscellaneous						
Sub Total					0.00		198.04
D. Sub Total (A+B+C)					46.59		412.69
E. Profit & Over head				10% x D		45.93	
F. TOTAL PRICE by currency / volume US\$/m ³					0.93		4.13
G. TOTAL PRICE (L/C+F/C) / volume US\$/m ³							5.05

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : EW-07
 Work item : Excavation, loading and transportation of soil with hauling distance more than 5,000m & less than 10,000m
 Remarks : 100 m³ base
 Payment unit : m³

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. LABOUR							
1	Heavy equipment operator	MD	0.46	14.00	6.43		
2	Driver	MD	3.26	6.50	21.16		
3	Foreman	MD	0.18	12.50	2.30		
4	Common labor	MD	6.51	4.50	29.30		
5	Assistant operator	MD	3.26	8.00	26.04		
Sub Total					85.23		0.00
B. MATERIAL							
1	Diesel for backhoe	liter	63.42			1.10	69.76
2	Diesel for dump truck	liter	247.40			1.10	272.14
3							
4							
5	Miscellaneous	LS					17.09
Sub Total					0.00		358.99
C. EQUIPMENT							
1	Backhoe 0.6 m ³	MD	0.46			133.00	61.12
2	Dump Truck 8 ton	MD	3.26			85.00	276.69
3							
4							
5	Miscellaneous						
Sub Total					0.00		337.81
D. Sub Total (A+B+C)					85.23		696.81
E. Profit & Over head				10% x D		78.20	
F. TOTAL PRICE by currency / volume US\$/m ³						1.63	6.97
G. TOTAL PRICE (L/C+F/C) / volume US\$/m ³							8.60

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : **EW-08**
 Work item : Excavation, loading and transportation of soil with hauling distance more than 10,000m & less than 15,000m
 Remarks : 100 m³ base
 Payment unit : m³

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. LABOUR							
1	Heavy equipment operator	MD	0.46	14.00	6.43		
2	Driver	MD	4.34	6.50	28.21		
3	Foreman	MD	0.18	12.50	2.30		
4	Common labor	MD	8.68	4.50	39.06		
5	Assistant operator	MD	4.34	8.00	34.72		
Sub Total					110.73		0.00
B. MATERIAL							
1	Diesel for backhoe	liter	34.40			1.10	37.84
2	Diesel for dump truck	liter	329.86			1.10	362.85
3							
4							
5	Miscellaneous	LS					20.03
Sub Total					0.00		420.72
C. EQUIPMENT							
1	Backhoe 0.6 m3	MD	0.46			133.00	61.12
2	Dump Truck 8 ton	MD	4.34			85.00	368.92
3							
4							
5	Miscellaneous						
Sub Total					0.00		430.04
D. Sub Total (A+B+C)					110.73		850.77
E. Profit & Over head				10% x D		96.15	
F. TOTAL PRICE by currency / volumeUS\$/m ³					2.07		8.51
G. TOTAL PRICE (L/C+F/C) / volume US\$/m ³							10.58

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : **EW-09**
 Work item : Excavation, loading and transportation of soil with hauling distance more than 15,000m & less than 20,000m
 Remarks : 100 m³ base
 Payment unit : m³

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. LABOUR							
1	Heavy equipment operator	MD	0.46	14.00	6.43		
2	Driver	MD	5.21	6.50	33.85		
3	Foreman	MD	0.18	12.50	2.30		
4	Common labor	MD	10.42	4.50	46.88		
5	Assistant operator	MD	5.21	8.00	41.67		
Sub Total					131.13		0.00
B. MATERIAL							
1	Diesel for backhoe	liter	34.40			1.10	37.84
2	Diesel for dump truck	liter	395.83			1.10	435.42
3							
4							
5	Miscellaneous	LS					23.66
Sub Total					0.00		496.92
C. EQUIPMENT							
1	Backhoe 0.6 m3	MD	0.46			133.00	61.12
2	Dump Truck 8 ton	MD	5.21			85.00	442.71
3							
4							
5	Miscellaneous						
Sub Total					0.00		503.83
D. Sub Total (A+B+C)					131.13		1,000.75
E. Profit & Over head				10% x D		113.19	
F. TOTAL PRICE by currency / volumeUS\$/m ³					2.44		10.01
G. TOTAL PRICE (L/C+F/C) / volume US\$/m ³							12.45

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : **EW-10**
 Work item : Backfill by manpower by tamper with excavated material
 Remarks : 10 m³ base
 Payment unit : m³

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. LABOUR							
1	Light equipment operator	MD	0.69	9.00	6.25		
2	Driver	MD	0.69	6.50	4.51		
3	Foreman	MD	0.69	12.50	8.68		
4	Common labor	MD	3.47	4.50	15.63		
5	Assistant operator	MD					
Sub Total					35.07		0.00
B. MATERIAL							
1							
2							
3							
4							
5	Miscellaneous	LS					0.00
Sub Total					0.00		0.00
C. EQUIPMENT							
1	Tamper	LS	1.00				2.45
2							
3							
4							
5	Miscellaneous						
Sub Total					0.00		2.45
D. Sub Total (A+B+C)					35.07		2.45
E. Profit & Over head				10% x D		3.75	
F. TOTAL PRICE by currency / volumeUS\$/m ³					3.88		0.25
G. TOTAL PRICE (L/C+F/C) / volume US\$/m ³							4.13

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : **EW-10-1**
 Work item : Backfill by manpower with tamper (transported material less than 500m)
 Remarks : 10 m³ base
 Payment unit : m³

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. LABOUR							
1	Light equipment operator	MD	0.69	9.00	6.25		
2	Driver	MD	0.69	6.50	4.51		
3	Foreman	MD	0.69	12.50	8.68		
4	Common labor	MD	3.47	4.50	15.63		
5	Assistant operator	MD					
Sub Total					35.07		0.00
B. MATERIAL							
EW-05 1	Transported material	m3	10.00	0.22	2.23	2.87	28.69
2							
3							
4							
5	Miscellaneous	LS					1.43
Sub Total					2.23		30.12
C. EQUIPMENT							
1	Tamper	LS	1.00				2.45
2							
3							
4							
5	Miscellaneous						
Sub Total					0.00		2.45
D. Sub Total (A+B+C)					37.30		32.58
E. Profit & Over head				10% x D		6.99	
F. TOTAL PRICE by currency / volumeUS\$/m ³					4.43		3.26
G. TOTAL PRICE (L/C+F/C) / volume US\$/m ³							7.69

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : **EW-10-2**
 Work item : **Backfill by manpower with tamper (transported material 500m<L<5,000m)**
 Remarks : 10 m³ base
 Payment unit : m³

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. LABOUR							
1	Light equipment operator	MD	0.69	9.00	6.25		
2	Driver	MD	0.69	6.50	4.51		
3	Foreman	MD	0.69	12.50	8.68		
4	Common labor	MD	3.47	4.50	15.63		
5	Assistant operator	MD					
Sub Total					35.07		0.00
B. MATERIAL							
EW-06 1	Transported material	m3	10.00	0.47	4.66	4.13	41.27
2							
3							
4							
5	Miscellaneous	LS					2.06
Sub Total					4.66		43.33
C. EQUIPMENT							
1	Tamper	LS	1.00				2.45
2							
3							
4							
5	Miscellaneous						
Sub Total					0.00		2.45
D. Sub Total (A+B+C)					39.73		45.79
E. Profit & Over head			10% x D		8.55		
F. TOTAL PRICE by currency / volumeUS\$/m ³					4.83		4.88
G. TOTAL PRICE (L/C+F/C) / volume US\$/m ³							9.41

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : **EW-11**
 Work item : **Backfill by equipment with transported soil material (less than 500 m)**
 Remarks : 50 m³ base
 Payment unit : m³

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. LABOUR							
1	Heavy equipment operator	MD	0.16	14.00	2.19		
2	Driver	MD	1.83	6.50	11.92		
3	Foreman	MD	0.16	12.50	1.95		
4	Common labor	MD	0.78	4.50	3.52		
5	Assistant operator	MD	0.16	8.00	1.25		
Sub Total					20.83		0.00
B. MATERIAL							
EW-05 1	Transported material	m3	50.00	0.22	11.14	2.87	143.45
2	Diesel	liter	24.69			1.10	27.16
3							
4							
5	Miscellaneous	LS					8.53
Sub Total					11.14		179.13
C. EQUIPMENT							
1	Bulldozer 15 ton	MD	0.16			120.00	18.75
2	Road roller 8-10 ton	MD	0.12			75.00	9.01
3	Hand guide roller 0.5 ton	MD	0.78			33.00	25.78
4	Tamper	LS	1.00		1.46		
5	Water tanker (5000-6000 liter)	MD	1.83			111.00	203.57
Sub Total					1.46		257.11
D. Sub Total (A+B+C)					33.43		436.24
E. Profit & Over head			10% x D		46.97		
F. TOTAL PRICE by currency / volumeUS\$/m ³						1.61	8.72
G. TOTAL PRICE (L/C+F/C) / volume US\$/m ³							10.33

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : **EW-12**
 Work item : **Backfill by equipment with transported soil material (500m<L<5,000m)**
 Remarks : 50 m³ base
 Payment unit : m³

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. LABOUR							
1	Heavy equipment operator	MD	0.16	14.00	2.19		
2	Driver	MD	1.83	6.50	11.92		
3	Foreman	MD	0.16	12.50	1.95		
4	Common labor	MD	0.78	4.50	3.52		
5	Assistant operator	MD	0.16	8.00	1.25		
Sub Total					20.83		0.00
B. MATERIAL							
EW-06 1	Transported material	m3	50.00	0.47	23.29	4.13	206.34
2	Diesel	liter	24.69			1.10	27.16
3							
4	Miscellaneous	LS					11.68
Sub Total					23.29		245.18
C. EQUIPMENT							
1	Bulldozer 15 ton	MD	0.16			120.00	18.75
2	Road roller 8-10 ton	MD	0.12			75.00	9.01
3	Hand guide roller 0.5 ton	MD	0.78			33.00	25.78
4	Tamper	LS	1.00		1.46		
5	Water tanker (5000-6000 liter)	MD	1.83			111.00	203.57
Sub Total					1.46		257.11
D. Sub Total (A+B+C)					45.58		502.29
E. Profit & Over head			10% x D		54.79		
F. TOTAL PRICE by currency / volumeUS\$/m ³					2.01		10.05
G. TOTAL PRICE (L/C+F/C) / volume US\$/m ³							12.05

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : **EW-13**
 Work item : **Embankment / Backfill by equipment with excavated material**
 Remarks : 100 m³ base
 Payment unit : m³

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. LABOUR							
1	Heavy equipment operator	MD	0.31	14.00	4.38		
2	Heavy equipment operator	MD	0.24	14.00	3.37		
3	Driver	MD	3.47	6.50	22.57		
4	Driver	MD	3.67	6.50	23.84		
5	Foreman	MD	0.38	12.50	4.69		
6	Common labor	MD	1.88	4.50	8.44		
7	Assistant operator	MD	0.31	8.00	2.50		
8	Assistant operator	MD	0.31	8.00	2.50		
Sub Total					58.84		0.00
B. MATERIAL							
1	Diesel for bulldozer	liter	35.00			1.10	38.50
2	Diesel for vibratory roller	liter	9.13			1.10	10.05
3							
4							
5	Miscellaneous	LS					2.43
Sub Total					0.00		50.98
C. EQUIPMENT							
1	Bulldozer 15 ton	MD	0.31			120.00	37.50
2	Road roller 8-10 ton	MD	0.24			75.00	18.03
3	Hand guide roller 0.5 ton	MD	1.56			33.00	51.56
4	Tamper	LS	3.47		4.12		
5	Water tanker (5000-6000 liter)	MD	3.67			111.00	407.13
Sub Total					4.12		514.22
D. Sub Total (A+B+C)					62.96		565.20
E. Profit & Over head			10% x D		62.82		
F. TOTAL PRICE by currency / volumeUS\$/m ³						1.26	5.65
G. TOTAL PRICE (L/C+F/C) / volume US\$/m ³							6.91

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : EW-13-1
 Work item : **Embankment by equipment with soil material with transportation (less than 500m)**
 Remarks : 100 m³ base
 Payment unit : m³

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. LABOUR							
1	Heavy equipment operator	MD	0.31	14.00	4.38		
2	Heavy equipment operator	MD	0.24	14.00	3.37		
3	Driver	MD	3.47	6.50	22.57		
4	Driver	MD	3.67	6.50	23.84		
5	Foreman	MD	0.38	12.50	4.69		
6	Common labor	MD	1.88	4.50	8.44		
7	Assistant operator	MD	0.31	8.00	2.50		
8	Assistant operator	MD	0.31	8.00	2.50		
Sub Total					58.84		0.00
B. MATERIAL							
1	Diesel for bulldozer	liter	35.00		1.10	38.50	
2	Diesel for vibratory roller	liter	9.13		1.10	10.05	
3	Transportation of soil material	m ³	100.00	0.22	22.28	2.87	286.90
4							
5	Miscellaneous	LS					16.77
Sub Total					22.28		352.22
C. EQUIPMENT							
1	Bulldozer 15 ton	MD	0.31		120.00	37.50	
2	Road roller 8-10 ton	MD	0.24		75.00	18.03	
3	Hand guide roller 0.5 ton	MD	1.56		33.00	51.56	
4	Tamper	LS	3.47	4.12			
5	Water tanker (5000-6000 liter)	MD	3.67		111.00	407.13	
Sub Total					4.12		514.22
D. Sub Total (A+B+C)					85.24		866.44
E. Profit & Over head				10% x D		95.17	
F. TOTAL PRICE by currency / volume US\$/m ³					1.80		8.66
G. TOTAL PRICE (L/C+F/C) / volume US\$/m ³							10.47

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : EW-13-2
 Work item : **Embankment by equipment with soil material with transportation (500 m < L < 5,000m)**
 Remarks : 100 m³ base
 Payment unit : m³

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. LABOUR							
1	Heavy equipment operator	MD	0.31	14.00	4.38		
2	Heavy equipment operator	MD	0.24	14.00	3.37		
3	Driver	MD	3.47	6.50	22.57		
4	Driver	MD	3.67	6.50	23.84		
5	Foreman	MD	0.38	12.50	4.69		
6	Common labor	MD	1.88	4.50	8.44		
7	Assistant operator	MD	0.31	8.00	2.50		
8	Assistant operator	MD	0.31	8.00	2.50		
Sub Total					58.84		0.00
B. MATERIAL							
1	Diesel for bulldozer	liter	35.00		1.10	38.50	
2	Diesel for vibratory roller	liter	9.13		1.10	10.05	
3	Transportation of soil material	m ³	100.00	0.47	46.59	4.13	412.69
4							
5	Miscellaneous	LS					23.06
Sub Total					46.59		484.30
C. EQUIPMENT							
1	Bulldozer 15 ton	MD	0.31		120.00	37.50	
2	Road roller 8-10 ton	MD	0.24		75.00	18.03	
3	Hand guide roller 0.5 ton	MD	1.56		33.00	51.56	
4	Tamper	LS	3.47	4.12			
5	Water tanker (5000-6000 liter)	MD	3.67		111.00	407.13	
Sub Total					4.12		514.22
D. Sub Total (A+B+C)					109.54		998.52
E. Profit & Over head				10% x D		110.81	
F. TOTAL PRICE by currency / volume US\$/m ³					2.20		9.99
G. TOTAL PRICE (L/C+F/C) / volume US\$/m ³							12.19

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : EW-13-3
 Work item : **Embankment by Bulldozer with excavated soil**
 Remarks : 100 m³ base
 Payment unit : m³

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. LABOUR							
1	Heavy equipment operator	MD	0.33	14.00	4.62		
2	Heavy equipment operator	MD	0.28	14.00	3.92		
3	Foreman	MD	0.05	12.50	0.63		
4	Common labor	MD	0.90	4.50	4.05		
5	Assistant operator	MD	0.42	8.00	3.36		
Sub Total					16.58		0.00
B. MATERIAL							
1	Diesel for bulldozer	liter	36.96		1.10	40.66	
2	Diesel for road roller	liter	10.64		1.10	11.70	
3							
4							
5	Miscellaneous	LS					2.62
Sub Total					0.00		54.98
C. EQUIPMENT							
1	Bulldozer 21 ton	MD	0.33		150.00	49.50	
2	Road roller 8-10 ton	MD	0.28		75.00	21.00	
3							
4							
5							
Sub Total					0.00		70.50
D. Sub Total (A+B+C)					16.58		125.48
E. Profit & Over head				10% x D		14.21	
F. TOTAL PRICE by currency / volume US\$/m ³					0.31		1.25
G. TOTAL PRICE (L/C+F/C) / volume US\$/m ³							1.56

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : EW-14
 Work item : **Soil cement placing**
 Remarks : 10 m³ base
 Payment unit : m³

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. LABOUR							
1	Heavy equipment operator	MD	0.04	14.00	0.52		
2	Foreman	MD	0.02	12.50	0.23		
3	Common labor	MD	0.19	4.50	0.84		
4							
5							
Sub Total					1.59		0.00
B. MATERIAL							
1	Soil	m ³	9.90	0.22	2.21	2.87	28.40
2	Cement (7%)	kg	2135.00		0.10	211.37	
3	Diesel	liter	4.02		1.10	4.42	
4							
5	Miscellaneous	LS			0.15	12.21	
Sub Total					2.36		256.40
C. EQUIPMENT							
1	Backhoe 0.6 m ³	MD	0.04		133.00	4.95	
2	Hand guide roller 0.5 ton	MD	0.16		33.00	5.16	
3							
Sub Total					0.00		10.10
D. Sub Total (A+B+C)					3.95		266.50
E. Profit & Over head				10% x D		27.05	
F. TOTAL PRICE by currency / volume US\$/m ³					3.10		26.65
G. TOTAL PRICE (L/C+F/C) / volume US\$/m ³							29.75

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : **EW-15**
 Work item : **Sod facing**
 Remarks : 100 m² base
 Payment unit : m²

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A.	LABOUR						
1	Foreman	MD	0.25	12.50	3.13		
2	Common labor	MD	2.50	4.50	11.25		
3							
4							
5							
	Sub Total				14.38		0.00
B.	MATERIAL						
1	Grass for sodding	m ² liter	110.00	2.00	220.00		
2							
3							
4							
5	Miscellaneous	LS			11.00		
	Sub Total				231.00		0.00
C.	EQUIPMENT						
1		MD					
2							
3							
	Sub Total				0.00		0.00
D.	Sub Total (A+B+C)				245.38		0.00
E.	Profit & Over head		10% x D		24.54		
F.	TOTAL PRICE by currency / volume				2.70		0.00
G.	TOTAL PRICE (L/C+F/C) / volume						2.70

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : **EW-16**
 Work item : **Foundation gravel**
 Remarks : 10 m³ base
 Payment unit : m³

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A.	LABOUR						
1	Foreman	MD	0.00	12.50	0.00		
2	Skilled labor	MD	0.35	10.00	3.50		
3	Common labor	MD	2.66	4.50	11.97		
4							
5							
	Sub Total				15.47		0.00
B.	MATERIAL						
1	Boulder Foundation stone	m ³	10.50	16.20	170.10		
2							
3							
4							
5	Miscellaneous	LS			11.91		0.00
	Sub Total				182.01		0.00
C.	EQUIPMENT						
1	Tamper	LS					36.40
2							
3							
	Sub Total				0.00		36.40
D.	Sub Total (A+B+C)				197.48		36.40
E.	Profit & Over head		10% x D		23.39		
F.	TOTAL PRICE by currency / volume				22.09		3.64
G.	TOTAL PRICE (L/C+F/C) / volume						25.73

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : **EW-17**
 Work item : **Foundation of sand**
 Remarks : 10 m³ base
 Payment unit : m³

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A.	LABOUR						
1	Skilled labor	MD	0.35	10.00	3.50		
2	Common labor	MD	2.22	4.50	9.99		
3							
4							
5							
	Sub Total				13.49		0.00
B.	MATERIAL						
1	Sand	m ³	11.00	8.78	96.54		
2							
3							
4							
5	Miscellaneous	LS			6.76		0.00
	Sub Total				103.30		0.00
C.	EQUIPMENT						
1	Tamper	LS					20.66
2							
3							
	Sub Total				0.00		20.66
D.	Sub Total (A+B+C)				116.79		20.66
E.	Profit & Over head		10% x D		13.75		
F.	TOTAL PRICE by currency / volume				13.05		2.07

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : **EW-18**
 Work item : **Demolishment of small concrete structure without disposal**
 Remarks : 10 m³ base
 Payment unit : m³

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A.	LABOUR						
1	Heavy equipment operator	MD	0.10	14.00	1.46		
2	Foreman	MD	0.02	12.50	0.26		
3	Common labor	MD	0.10	4.50	0.47		
4	Assistant operator	MD	0.10	8.00	0.83		
5							
	Sub Total				3.02		0.00
B.	MATERIAL						
1	Diesel	liter	11.25			1.10	12.38
2							
3							
4							
5	Miscellaneous	LS					0.62
	Sub Total				0.00		12.99
C.	EQUIPMENT						
1	Backhoe 0.6 m ³	MD	0.10			133.00	13.85
2							
3							
4							
5							
	Sub Total				0.00		13.85
D.	Sub Total (A+B+C)				3.02		26.85
E.	Profit & Over head		10% x D		2.99		
F.	TOTAL PRICE by currency / volume				0.60		2.68
G.	TOTAL PRICE (L/C+F/C) / volume						3.29

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : **EW-19**
 Work item : **Demolishment of big concrete structure with disposal**
 Remarks : 10 m³ base
 Payment unit : m³

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. LABOUR							
1	Foreman	MD	0.42	12.50	5.21		
2	Skilled labor	MD	2.08	10.00	20.83		
3	Common labor	MD	4.17	4.50	18.75		
4	Heavy equipment operator	MD	0.06	14.00	0.81		
5	Assistant operator	MD	0.06	8.00	0.46		
6	Driver	MD	0.14	6.50	0.94		
7	Mechanic	MD	0.26	12.00	3.13		
Sub Total						50.13	0.00
B. MATERIAL							
1	Diesel for backhoe	liter	40.00			1.10	44.00
2	Diesel for dump truck	liter	70.11			1.10	77.12
3							
4							
5							
Sub Total						0.00	121.12
C. EQUIPMENT							
1	Backhoe 0.6 m3	MD	0.06			133.00	7.70
2	Dump truck 8 ton	MD	0.14			85.00	12.25
3	Others	LS					10.03
4							
5							
Sub Total						0.00	29.97
D. Sub Total (A+B+C)						50.13	151.10
E. Profit & Over head						1% x D	20.12
F. TOTAL PRICE by currency / volumeUS\$/m ³						7.02	15.11
G. TOTAL PRICE (L/C+F/C) / volume US\$/m ³							22.13

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : **EW-20**
 Work item : **Riprap placing with transportation**
 Remarks : 100 m³ base
 Payment unit : m³

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. LABOUR							
1	Heavy equipment operator	MD	0.78	14.00	10.94		
2	Foreman	MD	0.16	12.50	1.95		
3	Common labor	MD	0.78	4.50	3.52		
4	Assistant operator	MD	0.78	8.00	6.25		
5	Driver	MD	3.26	6.50	21.16		
Sub Total						43.82	0.00
B. MATERIAL							
1	Diesel backhoe	liter	84.38			1.10	92.81
2	Diesel dump truck	liter	59.38			1.10	65.31
3	Boulder	m3	105.00	16.20	1,701.00		
4							
5	Miscellaneous	LS					31.63
Sub Total						1,701.00	189.75
C. EQUIPMENT							
1	Backhoe 0.6 m3	MD	0.78			133.00	103.91
2	Dump truck 8 ton	MD	3.26			85.00	276.69
3							
4							
5							
Sub Total						0.00	380.60
D. Sub Total (A+B+C)						1,744.82	570.35
E. Profit & Over head						10% x D	231.52
F. TOTAL PRICE by currency / volumeUS\$/m ³						19.76	5.70
G. TOTAL PRICE (L/C+F/C) / volume US\$/m ³							25.47

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : **EW-21**
 Work item : **Sub-base course, well graded sand & gravel of max size 100mm, hauling from stockpile or r-deposit at any d**
 Remarks : 100 m³ base
 Payment unit : m³

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. LABOUR							
1	Foreman	MD	0.17	12.50	2.08		
2	Skilled labor	MD	0.42	10.00	4.16		
3	Common labor	MD	0.83	4.50	3.74		
4	Heavy equipment operator	MD	0.42	14.00	5.82		
5	Assistant operator	MD	0.42	8.00	3.33		
6	Heavy equipment operator	MD	0.24	14.00	3.37		
7	Assistant operator	MD	0.24	8.00	1.92		
Sub Total						24.41	0.00
B. MATERIAL							
1	Boulder	m3	60.50	16.20	980.10		
2	Sand	m3	38.50	8.78	337.91		
3	Clay/soil transported	m3	11.00	0.47	5.12	4.13	45.40
4	Diesel Motor grader 3.1 m	liter	22.45			1.10	24.70
5	Diesel Road roller 8-10 ton	liter	9.13			1.10	10.05
6							
7	Miscellaneous	LS					4.01
Sub Total						1,323.13	84.15
C. EQUIPMENT							
1	Motor grader 3.1m	MD	0.42			135.00	56.13
2	Road roller 8-10 ton	MD	0.24			75.00	18.03
3							
4							
Sub Total						0.00	74.16
D. Sub Total (A+B+C)						1,347.55	158.31
E. Profit & Over head						10% x D	150.59
F. TOTAL PRICE by currency / volumeUS\$/m ³						14.98	1.58
G. TOTAL PRICE (L/C+F/C) / volume US\$/m ³							16.56

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : **EW-22**
 Work item : **Sub-base course, common soil of max size 100mm, hauling from stockpile at any distance**
 Remarks : 100 m³ base
 Payment unit : m³

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. LABOUR							
1	Foreman	MD	0.17	12.50	2.08		
2	Skilled labor	MD	0.42	10.00	4.17		
3	Common labor	MD	0.83	4.50	3.75		
4	Heavy equipment operator	MD	0.42	14.00	5.83		
5	Assistant operator	MD	0.42	8.00	3.33		
6	Heavy equipment operator	MD	0.24	14.00	3.37		
7	Assistant operator	MD	0.24	8.00	1.92		
Sub Total						24.46	0.00
B. MATERIAL							
1	Crushed stone, 30-50mm : 20%	m ³	22.00	5.00	110.00		
2	Crushed stone, 10-20mm : 35%	m ³	38.50	5.00	192.50		
3	Sand (fine aggregate < 50mm) :	m ³	44.00	8.78	386.18		
4	Clay/soil : 5%	m ³	5.50	0.47	2.56	4.13	22.70
5	Diesel Motor grader 3.1 m	liter	22.50			1.10	24.75
6	Diesel Road roller 8-10 ton	liter	9.13			1.10	10.05
7	Miscellaneous	LS					4.01
Sub Total						691.24	160.91
C. EQUIPMENT							
1	Motor grader 3.1m	MD	0.42			135.00	56.25
2	Road roller 8-10 ton	MD	0.24			75.00	18.03
3							
Sub Total						0.00	74.28
D. Sub Total (A+B+C)						715.70	235.19
E. Profit & Over head						10% x D	95.09
F. TOTAL PRICE by currency / volumeUS\$/m ³						8.11	2.35
G. TOTAL PRICE (L/C+F/C) / volume US\$/m ³							10.46

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : EW-23
 Work item : Base course, well graded sand & gravel of max size 40mm, hauling from stockpile or river deposit at any dist
 Remarks : 100 m³ base
 Payment unit : m³

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. LABOUR							
1	Foreman	MD	0.17	12.50	2.08		
2	Skilled labor	MD	0.42	10.00	4.16		
3	Common labor	MD	0.83	4.50	3.74		
4	Heavy equipment operator	MD	0.42	14.00	5.82		
5	Assistant operator	MD	0.42	8.00	3.33		
6	Heavy equipment operator	MD	0.24	14.00	3.37		
7	Assistant operator	MD	0.24	8.00	1.92		
Sub Total						24.41	0.00
B. MATERIAL							
EW-05 1	Sand and gravel with transportation	m3	120.00	0.47	55.90	4.13	495.23
2	Gravel	m3	100.00	17.14	1,713.60		
3	Diesel Motor grader 3.1 m	liter		22.45		4.13	92.66
4	Diesel Road roller 8-10 ton	liter		9.13		4.13	37.70
5	Miscellaneous	LS					31.28
Sub Total						1,769.50	656.86
C. EQUIPMENT							
1	Motor grader 3.1m	MD	0.42		135.00		56.13
2	Road roller 8-10 ton	MD	0.24		75.00		18.03
4							
5							
Sub Total						0.00	74.16
D. Sub Total (A+B+C)						1,793.92	731.02
E. Profit & Over head			10% x D		252.49		
F. TOTAL PRICE by currency / volume US\$/m ³						20.46	7.31
G. TOTAL PRICE (L/C+F/C) / volume US\$/m ³							27.77

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : EW-24
 Work item : Laterite pavement (t=0.1m)
 Remarks : 100 m³ base
 Payment unit : m³

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. LABOUR							
1	Foreman	MD	0.17	12.50	2.08		
2	Skilled labor	MD	0.42	10.00	4.16		
3	Common labor	MD	0.83	4.50	3.74		
4	Heavy equipment operator	MD	0.42	14.00	5.82		
5	Assistant operator	MD	0.42	8.00	3.33		
6	Heavy equipment operator	MD	0.24	14.00	3.37		
7	Assistant operator	MD	0.24	8.00	1.92		
Sub Total						24.41	0.00
B. MATERIAL							
EW-06 1	Laterite transported	m3	120.00	0.47	55.90	4.13	495.23
2	Diesel Motor grader 3.1 m	liter		22.45		1.10	24.70
3	Diesel Road roller 8-10 ton	liter		58.46		1.10	64.31
4							
5	Miscellaneous	LS				11.18	116.85
Sub Total						67.08	701.08
C. EQUIPMENT							
1	Motor grader 3.1m	MD	0.42		135.00		56.13
2	Road roller 8-10 ton	MD	0.24		75.00		18.03
4							
5							
Sub Total						0.00	74.16
D. Sub Total (A+B+C)						91.50	775.24
E. Profit & Over head			10% x D		86.67		
F. TOTAL PRICE by currency / volume US\$/m ³						1.78	7.75
G. TOTAL PRICE (L/C+F/C) / volume US\$/m ³							9.53

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : EW-101
 Work item : Construction of new tertiary canal (Combined unit price)
 Remarks : 1 ha base
 Payment unit : ha

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. LABOUR							
1							
2							
3							
4							
5							
Sub Total						0.00	0.00
B. BASE UNIT PRICE							
EW-02 1	Stripping top soil (31m/ha)	m2	65.10	0.05	2.93	0.29	18.69
EW-12 2	Embankment (31m/ha)	m3	20.93	0.04	0.86	5.14	107.60
EW-05 3	Transportation of soil	m3	11.51	0.47	5.36	4.13	47.50
CW-101 4	Structure (1 no), concrete 1:2:4	m3	0.50	65.97	32.99	45.03	22.52
5	Miscellaneous	LS			2.11		9.81
Sub Total						44.24	206.11
C. EQUIPMENT							
1							
2							
3							
4							
5							
Sub Total						0.00	0.00
D. Sub Total (A+B+C)						44.24	206.11
E. Profit & Over head			10% x D		25.04		
F. TOTAL PRICE by currency / volume US\$/ha						69.28	206.11
G. TOTAL PRICE (L/C+F/C) / volume US\$/ha							275.39

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : EW-102
 Work item : Rehabilitation of tertiary canal (Combined unit price)
 Remarks : 1 ha base
 Payment unit : ha

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. LABOUR							
1							
2							
3							
4							
5							
Sub Total						0.00	0.00
B. BASE UNIT PRICE							
EW-02 1	Stripping top soil (20m/ha)	m2	42.00	0.05	1.89	0.29	12.06
EW-12 2	Embankment (20m/ha)	m3	13.50	0.04	0.56	5.14	69.42
EW-05 3	Transportation of soil	m3	7.43	0.47	3.46	4.13	30.64
CW-101 4	Structure (0.5 no), concrete 1:2:4	m3	0.25	65.97	16.49	45.03	11.26
5	Miscellaneous	LS			1.12		6.17
Sub Total						23.52	129.54
C. EQUIPMENT							
1							
2							
3							
4							
5							
Sub Total						0.00	0.00
D. Sub Total (A+B+C)						23.52	129.54
E. Profit & Over head			10% x D		15.31		
F. TOTAL PRICE by currency / volume US\$/ha						38.82	129.54
G. TOTAL PRICE (L/C+F/C) / volume US\$/ha							168.37

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No : **EW-103**
 Work item : **Construction of new tertiary system including drainage canal (Combined unit price)**
 Remarks : 1 ha base
 Payment unit : ha

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. LABOUR							
1							
2							
3							
4							
5							
Sub Total					0.00		0.00
B. BASE UNIT PRICE							
EW-02	1 Stripping top soil (31m/ha)	m2	65.10	0.05	2.93	0.29	18.69
EW-12	2 Embankment (31m/ha)	m3	20.93	0.04	0.86	5.14	107.60
EW-05	3 Transportation of soil	m3	11.51	0.47	5.36	4.13	47.50
EW-03	4 Excavation common	m3	0.75	0.18	0.13	1.54	1.15
CW-101	5 Structure (1 no), concrete 1:2:4	m3	0.75	65.97	49.48	45.03	33.77
	6 Miscellaneous	LS			2.94		10.44
Sub Total					61.70		219.14
C. EQUIPMENT							
1							
2							
3							
4							
5							
Sub Total					0.00		0.00
D. Sub Total (A+B+C)					61.70		219.14
E. Profit & Over head			10% x D		28.08		
F. TOTAL PRICE by currency / volume				US\$/ha	89.79		219.14
G. TOTAL PRICE (L/C+F/C) / volume				US\$/ha			308.93

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No : **CW-01**
 Work item : **Mixing concrete (Reinforced concrete 1:2:4) by concrete plant 0.5m³**
 Remarks : 50 m³ base
 Payment unit : m³

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. LABOUR							
1	Foreman	MD	1.12	12.50	13.95		
2	Common labor	MD	3.35	4.50	15.07		
3	Light equipment operator	MD	1.12	9.00	10.04		
4	Assistant operator	MD	1.12	8.00	8.93		
5	Mechanic	MD	1.12	12.00	13.39		
Sub Total					61.38		0.00
B. MATERIAL							
1	Diesel	liter	133.74			1.10	147.11
2	Cement	ton	15.30			99.00	1,514.70
3	Sand	m3	29.15	8.78	255.84		
4	Aggregate	m3	43.40	21.42	929.63		
5	Miscellaneous	LS					83.09
Sub Total					1,185.47		1,744.90
C. EQUIPMENT							
1	Concrete plant	MD	1.12			300.00	334.82
2	Generator	MD	1.12			125.00	139.51
3							
4							
5	Miscellaneous						
Sub Total					0.00		474.33
D. Sub Total (A+B+C)					1,246.86		2,219.24
E. Profit & Over head			10% x D		346.61		
F. TOTAL PRICE by currency / volume				US\$/m3	31.87		44.38
G. TOTAL PRICE (F/C+L/C) / volume				US\$/m3			76.25

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No : **CW-02**
 Work item : **Mixing concrete (Plain concrete 1:3:6) by concrete plant 0.5m³**
 Remarks : 50 m³ base
 Payment unit : m³

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. LABOUR							
1	Foreman	MD	1.12	12.50	13.95		
2	Common labor	MD	3.35	4.50	15.07		
3	Light equipment operator	MD	1.12	9.00	10.04		
4	Assistant operator	MD	1.12	8.00	8.93		
5	Mechanic	MD	1.12	12.00	13.39		
Sub Total					61.38		0.00
B. MATERIAL							
1	Diesel	liter	133.74			1.10	147.11
2	Cement	ton	12.75			99.00	1,262.25
3	Sand	m3	29.50	8.78	258.92		
4	Aggregate	m3	42.00	21.42	899.64		
5	Miscellaneous	LS					70.47
Sub Total					1,158.56		1,479.83
C. EQUIPMENT							
1	Concrete plant	MD	1.12			300.00	334.82
2	Generator	MD	1.12			125.00	139.51
3							
4							
5	Miscellaneous						
Sub Total					0.00		474.33
D. Sub Total (A+B+C)					1,219.94		1,954.16
E. Profit & Over head			10% x D		317.41		
F. TOTAL PRICE by currency / volume				US\$/m3	30.75		39.08
G. TOTAL PRICE (F/C+L/C) / volume				US\$/m3			69.83

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : CW-03
 Work item : **Mixing concrete (lean concrete) by concrete plant 0.5m³**
 Remarks : 50 m³ base
 Payment unit : m³

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. LABOUR							
1	Foreman	MD	1.12	12.50	13.95		
2	Common labor	MD	3.35	4.50	15.07		
3	Light equipment operator	MD	1.12	9.00	10.04		
4	Assistant operator	MD	1.12	8.00	8.93		
5	Mechanic	MD	1.12	12.00	13.39		
Sub Total					61.38		0.00
B. MATERIAL							
1	Diesel	liter	133.74			1.10	147.11
2	Cement	ton	11.20			99.00	1,108.80
3	Sand	m ³	30.05	8.78	263.74		
4	Aggregate	m ³	40.95	21.42	877.15		
5	Miscellaneous	LS					62.80
Sub Total					1,140.89		1,318.71
C. EQUIPMENT							
1	Concrete plant	MD	1.12			300.00	334.82
2	Generator	MD	1.12			125.00	139.51
3							
4							
5	Miscellaneous						
Sub Total					0.00		474.33
D. Sub Total (A+B+C)					1,202.28		1,793.04
E. Profit & Over head				10% x D			299.53
F. TOTAL PRICE by currency / volume				US\$/m ³			30.04
G. TOTAL PRICE (F/C+L/C) / volume				US\$/m ³			65.90

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : CW-04
 Work item : **Placing concrete by manual**
 Remarks : 50 m³ base
 Payment unit : m³

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. LABOUR							
1	Foreman	MD	1.25	12.50	15.63		
2	Common labor	MD	6.25	4.50	28.13		
3	Skilled labor	MD	1.56	10.00	15.63		
4							
5							
Sub Total					59.38		0.00
B. MATERIAL							
1							
2							
3							
4							
5	Miscellaneous (vibrator etc.)	LS			17.81		0.00
Sub Total					17.81		0.00
C. EQUIPMENT							
1							
2							
3							
4							
5	Miscellaneous						
Sub Total					0.00		0.00
D. Sub Total (A+B+C)					77.19		0.00
E. Profit & Over head				10% x D			7.72
F. TOTAL PRICE by currency / volume				US\$/m ³			1.70
G. TOTAL PRICE (F/C+L/C) / volume				US\$/m ³			1.70

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : CW-05
 Work item : **Carrying concrete, L=1,000m**
 Remarks : 50 m³ base
 Payment unit : m³

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. LABOUR							
1	Foreman	MD	0.19	12.50	2.42		
2	Driver	MD	1.94	6.50	12.58		
3							
4							
5							
Sub Total					15.00		0.00
B. MATERIAL							
1	Diesel	liter	147.11			1.10	161.82
2							
3							
4							
5	Miscellaneous	LS					8.09
Sub Total					0.00		169.91
C. EQUIPMENT							
1	Agitator truck 1.6 m3	MD	1.94			192.00	371.64
2							
3							
4							
5	Miscellaneous						
Sub Total					0.00		371.64
D. Sub Total (A+B+C)					15.00		541.56
E. Profit & Over head				10% x D			55.66
F. TOTAL PRICE by currency / volume				US\$/m ³			1.41
G. TOTAL PRICE (F/C+L/C) / volume				US\$/m ³			12.24

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : CW-06
 Work item : **Carrying concrete, L=2,000m**
 Remarks : 50 m³ base
 Payment unit : m³

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. LABOUR							
1	Foreman	MD	0.28	12.50	3.53		
2	Driver	MD	2.83	6.50	18.38		
3							
4							
5							
Sub Total					21.92		0.00
B. MATERIAL							
1	Diesel	liter	214.93			1.10	236.42
2							
3							
4							
5	Miscellaneous	LS					11.82
Sub Total					0.00		248.24
C. EQUIPMENT							
1	Agitator truck 1.6 m3	MD	2.83			192.00	542.97
2							
3							
4							
5	Miscellaneous						
Sub Total					0.00		542.97
D. Sub Total (A+B+C)					21.92		791.21
E. Profit & Over head				10% x D			81.31
F. TOTAL PRICE by currency / volume				US\$/m ³			2.06
G. TOTAL PRICE (F/C+L/C) / volume				US\$/m ³			15.82

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : CW-07
 Work item : Mixing concrete by portable concrete mixer 0.25m³ for reinforcement concrete (1:2:4)
 Remarks : 50 m³ base
 Payment unit : m³

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. LABOUR							
1	Foreman	MD	8.18	12.50	102.31		
2	Skilled labor	MD	8.18	10.00	81.85		
3	Common labor	MD	40.92	4.50	184.16		
4	Mechanic	MD	8.18	12.00	98.22		
5							
Sub Total					466.54		0.00
B. MATERIAL							
1	Diesel	liter	133.74			1.10	147.11
2	Cement	ton	15.30			99.00	1,514.70
3	Sand	m ³	29.15	8.78	255.84		
4	Aggregate	m ³	43.40	21.42	929.63		
5	Miscellaneous	LS			23.71		33.24
Sub Total					1,209.18		1,695.05
C. EQUIPMENT							
1	Concrete mixer 0.25 m ³	MD	8.18			68.00	556.57
2							
3							
4							
5	Miscellaneous						
Sub Total					0.00		556.57
D. Sub Total (A+B+C)					1,675.72		2,251.62
E. Profit & Over head				10% x D		392.73	
F. TOTAL PRICE by currency / volume				US\$/m ³	41.37		45.03
G. TOTAL PRICE (F/C+L/C) / volume				US\$/m ³			86.40

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : CW-08
 Work item : Mixing concrete by portable concrete mixer 0.25m³ for plain concrete (1:3:6)
 Remarks : 50 m³ base
 Payment unit : m³

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. LABOUR							
1	Foreman	MD	8.18	12.50	102.31		
2	Skilled labor	MD	8.18	10.00	81.85		
3	Common labor	MD	40.92	4.50	184.16		
4	Mechanic	MD	8.18	12.00	98.22		
5							
Sub Total					466.54		0.00
B. MATERIAL							
1	Diesel	liter	133.74			1.10	147.11
2	Cement	ton	12.75			99.00	1,262.25
3	Sand	m ³	29.50	8.78	258.92		
4	Aggregate	m ³	42.00	21.42	899.64		
5	Miscellaneous	LS			23.17		28.19
Sub Total					1,181.73		1,437.55
C. EQUIPMENT							
1	Concrete mixer 0.25 m ³	MD	8.18			68.00	556.57
2							
3							
4							
5	Miscellaneous						
Sub Total					0.00		556.57
D. Sub Total (A+B+C)					1,648.27		1,994.13
E. Profit & Over head				10% x D			
F. TOTAL PRICE by currency / volume				US\$/m ³	40.25		39.88
G. TOTAL PRICE (F/C+L/C) / volume				US\$/m ³			80.13

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : CW-09
 Work item : Mixing concrete by portable concrete mixer 0.25m³ for plain concrete (lean concrete)
 Remarks : 50 m³ base
 Payment unit : m³

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. LABOUR							
1	Foreman	MD	8.18	12.50	102.31		
2	Skilled labor	MD	8.18	10.00	81.85		
3	Common labor	MD	40.92	4.50	184.16		
4	Mechanic	MD	8.18	12.00	98.22		
5							
Sub Total					466.54		0.00
B. MATERIAL							
1	Diesel	liter	133.74			1.10	147.11
2	Cement	ton	11.20			99.00	1,108.80
3	Sand	m ³	30.05	8.78	263.74		
4	Aggregate	m ³	40.95	21.42	877.15		
5	Miscellaneous	LS			22.82		25.12
Sub Total					1,163.71		1,281.03
C. EQUIPMENT							
1	Concrete mixer 0.25 m ³	MD	8.18			68.00	556.57
2							
3							
4							
5	Miscellaneous						
Sub Total					0.00		556.57
D. Sub Total (A+B+C)					1,630.25		1,837.61
E. Profit & Over head				10% x D		346.79	
F. TOTAL PRICE by currency / volume				US\$/m ³	39.54		36.75
G. TOTAL PRICE (F/C+L/C) / volume				US\$/m ³			76.29

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : CW-10
 Work item : Reinforcing bar, deformed (Cut and installation)
 Remarks : 100 kg base
 Payment unit : kg

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. LABOUR							
1	Foreman	MD	0.21	12.50	2.65		
2	Steel worker	MD	2.12	5.00	10.61		
3	Common labor	MD	1.06	4.50	4.77		
4	Driver	MD	0.04	6.50	0.25		
5							
Sub Total					18.29		0.00
B. MATERIAL							
1	Reinforcement bar (deformed)	kg	105.00			0.82	86.10
2	Iron wire	kg	0.50			0.85	0.43
3							
4							
5	Miscellaneous	LS					4.33
Sub Total					0.00		90.85
C. EQUIPMENT							
1	Bar bending machine etc.	LS	1.00				2.73
2							
3							
4							
5	Miscellaneous						
Sub Total					0.00		2.73
D. Sub Total (A+B+C)					18.29		93.58
E. Profit & Over head				10% x D		11.19	
F. TOTAL PRICE by currency / volume				US\$/kg	0.29		0.94
G. TOTAL PRICE (F/C+L/C) / volume				US\$/kg			1.23

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : CW-11
 Work item : Placement of concrete pipe ϕ 600mm ϕ 800 : 126% ϕ 1,000 : 152%
 Remarks : 10 mbase
 Payment unit : m

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. LABOUR							
1	Driver	MD	0.50	6.50	3.25		
2	foreman	MD	0.50	12.50	6.25		
3	Skilled labor	MD	0.40	10.00	4.00		
4	Common labor	MD	2.00	4.50	9.00		
5							
Sub Total					22.50		0.00
B. MATERIAL							
1	Diesel	liter	17.00		1.10	18.70	
2	Concrete pipe	m	10.30		30.00	309.00	
5	Miscellaneous	LS				16.39	
Sub Total					0.00	344.09	
C. EQUIPMENT							
1	Truck crane	MD	0.50		80.00	40.00	
2							
5	Miscellaneous						
Sub Total					0.00	40.00	
D. Sub Total (A+B+C)					22.50	384.09	
E. Profit & Over head			10% x D		40.66		
F. TOTAL PRICE by currency / volume			US\$/m		6.32		38.41
G. TOTAL PRICE (F/C+L/C) / volume			US\$/m				44.72

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : CW-101 (Combined unit price)
 Work item : Placing concrete (1:2:4) including form, curing & other miscellaneous works using portable mixer
 Remarks : 1 mbase
 Payment unit : m3

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. BASE UNIT PRICE							
CW-07	Mixing concrete	m3	1.00	33.51	33.51	45.03	45.03
CW-04	Placing concrete	m3	1.00	1.54	1.54	0.00	0.00
3							
4							
5							
Sub Total					35.06		45.03
B. MATERIAL							
1	Form, curing etc.	LS	1.00		16.02		
2							
3							
5	Miscellaneous	LS			4.81		
Sub Total					20.82		0.00
C. EQUIPMENT							
1							
2							
5	Miscellaneous						
Sub Total					0.00		0.00
D. Sub Total (A+B+C)					55.88		45.03
E. Profit & Over head			10% x D		10.09		
F. TOTAL PRICE by currency / volume			US\$/m3		65.97		45.03
G. TOTAL PRICE (F/C+L/C) / volume			US\$/m3				111.01

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : CW-102 (Combined unit price)
 Work item : Placing concrete (1:3:6) including form, curing & other miscellaneous works using portable mixer
 Remarks : 1 mbase
 Payment unit : m3

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. BASE UNIT PRICE							
CW-08	Mixing concrete	m3	1.00	32.97	32.97	39.88	39.88
CW-04	Placing concrete	m3	1.00	1.54	1.54	0.00	0.00
3							
4							
5							
Sub Total					34.51		39.88
B. MATERIAL							
1	Form, curing etc.	LS	1.00		14.88		
2							
3							
5	Miscellaneous	LS			4.46		
Sub Total					19.34		0.00
C. EQUIPMENT							
1							
2							
5	Miscellaneous						
Sub Total					0.00		0.00
D. Sub Total (A+B+C)					53.85		39.88
E. Profit & Over head			10% x D		9.37		
F. TOTAL PRICE by currency / volume			US\$/m3		63.22		39.88

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : CW-103 (Combined unit price)
 Work item : Placing concrete (lean concrete) including form, curing & other miscellaneous works using portable mixer
 Remarks : 1 mbase
 Payment unit : m3

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. BASE UNIT PRICE							
CW-09	Mixing concrete	m3	1.00	32.60	32.60	36.75	36.75
CW-04	Placing concrete	m3	1.00	1.54	1.54	0.00	0.00
3							
4							
5							
Sub Total					34.15		36.75
B. MATERIAL							
1	Form, curing etc.	LS	1.00		7.09		
2							
3							
4							
5	Miscellaneous	LS			3.90		
Sub Total					10.99		0.00
C. EQUIPMENT							
1							
2							
3							
4							
5	Miscellaneous						
Sub Total					0.00		0.00
D. Sub Total (A+B+C)					45.14		36.75
E. Profit & Over head			10% x D		8.19		
F. TOTAL PRICE by currency / volume			US\$/m3		53.33		36.75
G. TOTAL PRICE (F/C+L/C) / volume			US\$/m3				90.08

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : **CW-201 (Combined unit price)**
 Work item : **Diversion structure on main canal**
 Remarks : 1 place base
 Payment unit : place or no

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. BASE UNIT PRICE							
EW-03 1	Excavation common	m3	214.00	0.18	39.42	1.26	269.32
EW-10 2	Backfill by manpower	m3	94.00	3.49	327.97	0.24	22.94
CW-101 3	Reinforcement concrete	m3	72.00	55.88	4,023.49	45.03	3,242.34
CW-101 4	Lean concrete	m3	8.00	45.14	361.11	36.75	294.02
CW-10 5	Reinforcement bar, deformed bar	kg	7200.00	0.18	1,316.69	0.94	6,737.53
SW-02 6	Stone masonry	m3	14.00	34.52	483.28	19.31	270.34
7	Others works	LS	1.00		131.04		216.73
8							
9							
	Sub Total				6,682.99		11,053.21
B. MATERIAL							
1	Slide gate 0.6m x 0.6m	unit	2.00	48.97	97.94	1,243.97	2,487.94
2	Miscellaneous	LS	1.00		1.96		49.76
3							
	Sub Total				99.90		2,537.70
D.	Sub Total (A+B+C)				6,782.88		13,590.91
E.	Profit & Over head	10% x D			2,037.38		
F.	TOTAL PRICE by currency / volume	US\$/place			8,820.26		13,590.91
G.	TOTAL PRICE (F/C+L/C) / volume	US\$/place					22,411.17

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : **CW-202 (Combined unit price)**
 Work item : **Box culvert (2m x 1.5m x 6m) on main canal**
 Remarks : 1 place base
 Payment unit : place or no

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. BASE UNIT PRICE							
EW-03 1	Excavation common	m3	47.00	0.18	8.66	1.26	59.15
EW-10 2	Backfill by manpower	m3	47.00	3.49	164.03	0.24	11.47
EW-13 3	Embankment	m3	32.00	6.46	206.72	5.61	179.52
CW-101 4	Reinforcement concrete	m3	41.00	55.88	2,291.15	45.03	1,846.33
CW-103 5	Lean concrete	m3	5.00	45.14	225.69	36.75	183.76
CW-10 6	Reinforcement bar, deformed bar	kg	4080.00	0.18	746.12	0.94	3,817.93
SW-02 7	Stone masonry	m3	35.00	34.52	1,208.20	19.31	675.85
8	Others works	LS	1.00		97.01		135.48
9							
#							
	Sub Total				4,947.59		6,909.49
B. MATERIAL							
1	Miscellaneous	LS	1.00		98.95		138.19
2							
3							
4							
	Sub Total				98.95		138.19
D.	Sub Total (A+B+C)				5,046.54		7,047.68
E.	Profit & Over head	10% x D			1,209.42		
F.	TOTAL PRICE by currency / volume	US\$/place			6,255.96		7,047.68
G.	TOTAL PRICE (F/C+L/C) / volume	US\$/place					13,303.64

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : **CW-203 (Combined unit price)**
 Work item : **Diversion structure on secondary canal**
 Remarks : 1 place base
 Payment unit : place or nos

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. BASE UNIT PRICE							
EW-03 1	Excavation common	m3	5.00	0.18	0.92	1.26	6.29
EW-10 2	Backfill by manpower	m3	14.00	3.49	48.86	0.24	3.42
EW-13 3	Embankment	m3	0.00	6.46	0.00	5.61	0.00
CW-101 4	Reinforcement concrete	m3	24.00	55.88	1,341.16	45.03	1,080.78
CW-103 5	Lean concrete	m3	3.00	45.14	135.42	36.75	110.26
CW-10 6	Reinforcement bar, deformed bar	kg	2400.00	0.18	438.90	0.94	2,245.84
SW-02 7	Stone masonry	m3	8.00	34.52	276.16	19.31	154.48
8	Others works	LS	1.00		44.83		72.02
9							
#							
	Sub Total				2,286.24		3,673.09
B. MATERIAL							
1	Slide gate 0.6m x 0.6m	unit	1.00	48.97	48.97	1,243.97	1,243.97
2	Miscellaneous	LS			0.98		24.88
3							
	Sub Total				49.95		1,268.85
D.	Sub Total (A+B+C)				2,336.19		4,941.94
E.	Profit & Over head	10% x D			727.81		
F.	TOTAL PRICE by currency / volume	US\$/place			3,064.01		4,941.94
G.	TOTAL PRICE (F/C+L/C) / volume	US\$/place					8,005.94

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : **CW-204 (Combined unit price)**
 Work item : **Cross drain on secondary canal**
 Remarks : 1 place base
 Payment unit : place or nos

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. BASE UNIT PRICE							
EW-03 1	Excavation common	m3	54.00	0.18	9.95	1.26	67.96
EW-10 2	Backfill by manpower	m3	26.00	3.49	90.74	0.24	6.34
EW-13 3	Embankment	m3	26.00	6.46	167.96	5.61	145.86
CW-101 4	Reinforcement concrete	m3	7.00	55.88	391.17	45.03	315.23
CW-103 5	Lean concrete	m3	3.00	45.14	135.42	36.75	110.26
CW-102 6	Plain concrete	m3	13.00	53.75	698.75	39.88	518.44
CW-10 7	Reinforcement bar, deformed bar	kg	350.00	0.18	64.01	0.94	327.52
CW-12 8	Concrete pipe Dia. 800mm	m3	11.00	2.87	31.60	47.05	517.53
SW-01 9	Gabion mattress	m3	8.00	46.52	372.16	29.31	234.48
#	Other works				39.24		44.87
	Sub Total				2,000.99		2,288.49
B. MATERIAL							
1							
2							
3							
	Sub Total				0.00		0.00
D.	Sub Total (A+B+C)				2,000.99		2,288.49
E.	Profit & Over head	10% x D			428.95		
F.	TOTAL PRICE by currency / volume	US\$/place			2,429.93		2,288.49
G.	TOTAL PRICE (F/C+L/C) / volume	US\$/place					4,718.42

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : **CW-205 (Combined unit price)**
 Work item : **Pipe culver for road crossing**
 Remarks : 1 place base
 Payment unit : place or nos

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. BASE UNIT PRICE							
EW-03 1	Excavation common	m3	12.00	0.18	2.21	1.26	15.10
EW-10 2	Backfill by manpower	m3	7.00	3.49	24.43	0.24	1.71
EW-13 3	Embankment	m3	34.00	6.46	219.64	5.61	190.74
CW-101 4	Reinforcement concrete	m3	3.00	55.88	167.65	45.03	135.10
CW-103 5	Lean concrete	m3	2.00	45.14	90.28	36.75	73.50
CW-102 6	Plain concrete	m3	5.00	53.75	268.75	39.88	199.40
CW-10 7	Reinforcement bar, deformed bar	kg	100.00	0.18	18.29	0.94	93.58
CW-12 8	Concrete pipe Dia.800mm	m3	12.00	2.87	34.47	47.05	564.58
#	Other works				41.29		63.69
Sub Total					867.00		1,337.39
B. MATERIAL							
1							
2							
3							
Sub Total					0.00		0.00
D. Sub Total (A+B+C)					867.00		1,337.39
E. Profit & Over head				10% x D	220.44		
F. TOTAL PRICE by currency / volume				US\$/place	1,087.44		1,337.39
G. TOTAL PRICE (F/C+L/C) / volume				US\$/place			2,424.83

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : **CW-206 (Combined unit price)**
 Work item : **Pipe culver for house or farm road**
 Remarks : 1 place base
 Payment unit : place or nos

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. BASE UNIT PRICE							
EW-03 1	Excavation common	m3	7.00	0.18	1.29	1.26	8.81
EW-10 2	Backfill by manpower	m3	4.00	3.49	13.96	0.24	0.98
EW-13 3	Embankment	m3	21.00	6.46	135.66	5.61	117.81
CW-101 4	Reinforcement concrete	m3	3.00	55.88	167.65	45.03	135.10
CW-103 5	Lean concrete	m3	1.00	45.14	45.14	36.75	36.75
CW-102 6	Plain concrete	m3	3.00	53.75	161.25	39.88	119.64
CW-10 7	Reinforcement bar, deformed bar	kg	100.00	0.18	18.29	0.94	93.58
CW-12 8	Concrete pipe Dia.800mm	m3	6.00	2.87	17.24	47.05	282.29
#	Other works				28.02		39.75
Sub Total					588.49		834.70
B. MATERIAL							
1							
2							
3							
Sub Total					0.00		0.00
D. Sub Total (A+B+C)					588.49		834.70
E. Profit & Over head				10% x D	142.32		
F. TOTAL PRICE by currency / volume				US\$/place	730.81		834.70
G. TOTAL PRICE (F/C+L/C) / volume				US\$/place			1,565.51

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : **CW-207 (Combined unit price)**
 Work item : **Off-take Type-1 for main canal (Q > 0.2 m3/s)**
 Remarks : 1 place base
 Payment unit : place or nos

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. BASE UNIT PRICE							
EW-03 1	Excavation common	m3	24.00	0.18	4.42	1.26	30.20
EW-10 2	Backfill by manpower	m3	22.00	3.49	76.78	0.24	5.37
EW-13 3	Embankment	m3	6.46	0.00	5.61	0.00	0.00
CW-101 4	Reinforcement concrete	m3	5.00	55.88	279.41	45.03	225.16
CW-103 5	Lean concrete	m3	2.00	45.14	90.28	36.75	73.50
CW-102 6	Plain concrete	m3	6.00	53.75	322.50	39.88	239.28
CW-10 7	Reinforcement bar, deformed bar	kg	400.00	0.18	73.15	0.94	374.31
CW-12 8	Concrete pipe Dia.800mm	m3	5.00	2.87	14.36	47.05	235.24
SW-02 9	Stone masonry	m3	10.00	34.52	345.20	19.31	193.10
#	Other works	LS			24.12		27.52
Sub Total					1,230.22		1,403.69
B. MATERIAL							
1	Slide gate						
2							
3							
Sub Total					0.00		0.00
D. Sub Total (A+B+C)					1,230.22		1,403.69
E. Profit & Over head				10% x D	263.39		
F. TOTAL PRICE by currency / volume				US\$/place	1,493.61		1,403.69
G. TOTAL PRICE (F/C+L/C) / volume				US\$/place			2,897.30

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : **CW-208 (Combined unit price)**
 Work item : **Off-take Type-2 for main canal (Q > 0.2 m3/s)**
 Remarks : 1 place base
 Payment unit : place or nos

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. BASE UNIT PRICE							
EW-03 1	Excavation common	m3	6.00	0.18	1.11	1.26	7.55
EW-10 2	Backfill by manpower	m3	6.00	3.49	20.94	0.24	1.46
EW-13 3	Embankment	m3	6.46	0.00	5.61	0.00	0.00
CW-101 4	Reinforcement concrete	m3	4.00	55.88	223.53	45.03	180.13
CW-103 5	Lean concrete	m3	2.00	45.14	90.28	36.75	73.50
CW-102 6	Plain concrete	m3	3.00	53.75	161.25	39.88	119.64
CW-10 7	Reinforcement bar, deformed bar	kg	320.00	0.18	58.52	0.94	299.45
CW-12 8	Concrete pipe Dia.800mm	m3	5.00	2.87	14.36	47.05	235.24
SW-02 9	Stone masonry	m3	5.00	34.52	172.60	19.31	96.55
#	Other works	LS			14.85		20.27
Sub Total					757.43		1,033.80
B. MATERIAL							
1	Slide gate						
2							
3							
Sub Total					0.00		0.00
D. Sub Total (A+B+C)					757.43		1,033.80
E. Profit & Over head				10% x D	179.12		
F. TOTAL PRICE by currency / volume				US\$/place	936.56		1,033.80
G. TOTAL PRICE (F/C+L/C) / volume				US\$/place			1,970.35

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : **CW-301 (Combined unit price)**
 Work item : **Spillway (NMC-22)**
 Remarks : 1 place base
 Payment unit : place or nos

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. BASE UNIT PRICE							
EW-03 1	Excavation common	m3	3,708	0.18	683.01	1.26	4,666.52
EW-10 2	Backfill by manpower	m3	372	3.49	1,298.28	0.24	90.77
CW-101 3	Reinforcement concrete	m3	99	55.88	5,532.29	45.03	4,458.22
CW-103 4	Lean concrete	m3	24	45.14	1,083.32	36.75	882.05
CW-10 5	Reinforcement bar, deformed bar	kg	4,956	0.18	906.32	0.94	4,637.67
SW-02 6	Stone masonry	m3	2,616	34.52	90,304.32	19.31	50,514.96
EW-16 7	Cobble stone foudation	m3	243	19.75	4,798.76	3.64	884.52
EW-20 8	R/rap protection	m3	84	17.45	1,465.80	5.70	479.05
9							
#	Other works	LS			5,303.61		3,330.69
	Sub Total				111,375.72		69,944.44
B. MATERIAL							
1	Slide gate 1.0 x 1.0 m	no	3	92.25	276.75	1,697.43	5,092.29
2							
3							
	Sub Total				276.75		5,092.29
C. EQUIPMENT							
1							
2							
3							
	Sub Total				0.00		0.00
D.	Sub Total (A+B+C)				111,652.47		75,036.73
E.	Profit & Over head	10% x D			18,668.92		
F.	TOTAL PRICE by currency / volume	US\$/place			130,321.39		75,036.73
G.	TOTAL PRICE (F/C+L/C) / volume	US\$/place					205,358.12

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : **CW-302 (Combined unit price)**
 Work item : **Spillway (SMC-18)**
 Remarks : 1 place base
 Payment unit : place or nos

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. BASE UNIT PRICE							
EW-03 1	Excavation common	m3	668	0.18	123.05	1.26	840.68
EW-10 2	Backfill by manpower	m3	404	3.49	1,409.96	0.24	98.58
CW-101 3	Reinforcement concrete	m3	53	55.88	2,961.73	45.03	2,386.72
CW-103 4	Lean concrete	m3	17	45.14	767.35	36.75	624.79
CW-10 5	Reinforcement bar, deformed bar	kg	4,488	0.18	820.74	0.94	4,199.73
SW-02 6	Stone masonry	m3	539	34.52	18,606.28	19.31	10,408.09
EW-16 7	Cobble stone foudation	m3	116	19.75	2,290.77	3.64	422.24
EW-20 8	R/rap protection	m3	77	17.45	1,343.65	5.70	439.13
9							
#	Other works	LS			1,416.18		971.00
	Sub Total				29,739.70		20,390.95
B. MATERIAL							
1	Slide gate 1.0 x 1.0 m	no	2	92.25	184.50	1,697.43	3,394.86
2							
3							
	Sub Total				184.50		3,394.86
C. EQUIPMENT							
1							
2							
3							
	Sub Total				0.00		0.00
D.	Sub Total (A+B+C)				29,924.20		23,785.81
E.	Profit & Over head	10% x D			5,371.00		
F.	TOTAL PRICE by currency / volume	US\$/place			35,295.20		23,785.81
G.	TOTAL PRICE (F/C+L/C) / volume	US\$/place					59,081.01

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : **CW-303 (Combined unit price)**
 Work item : **Spillway (SMC-24)**
 Remarks : 1 place base
 Payment unit : place or nos

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. BASE UNIT PRICE							
EW-03 1	Excavation common	m3	1,039	0.18	191.38	1.26	1,307.58
EW-10 2	Backfill by manpower	m3	367	3.49	1,280.83	0.24	89.55
CW-101 3	Reinforcement concrete	m3	48	55.88	2,682.32	45.03	2,161.56
CW-103 4	Lean concrete	m3	15	45.14	677.08	36.75	551.28
CW-10 5	Reinforcement bar, deformed bar	kg	4,080	0.18	746.12	0.94	3,817.93
SW-02 6	Stone masonry	m3	1,237	34.52	42,701.24	19.31	23,886.47
EW-16 7	Cobble stone foudation	m3	338	19.75	6,674.82	3.64	1,230.32
EW-20 8	R/rap protection	m3	70	17.45	1,221.50	5.70	399.21
9							
#	Other works	LS			2,808.77		1,672.20
	Sub Total				58,984.07		35,116.10
B. MATERIAL							
1	Slide gate 1.0 x 1.0 m	no	2	92.25	184.50	1,697.43	3,394.86
2							
3							
	Sub Total				184.50		3,394.86
C. EQUIPMENT							
1							
2							
3							
	Sub Total				0.00		0.00
D.	Sub Total (A+B+C)				59,168.57		38,510.96
E.	Profit & Over head	10% x D			9,767.95		
F.	TOTAL PRICE by currency / volume	US\$/place			68,936.52		38,510.96
G.	TOTAL PRICE (F/C+L/C) / volume	US\$/place					107,447.48

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : **CW-304 (Combined unit price)**
 Work item : **Spillway (SMC-25)**
 Remarks : 1 place base
 Payment unit : place or nos

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. BASE UNIT PRICE							
EW-03 1	Excavation common	m3		0.18	0.00	1.26	0.00
EW-10 2	Backfill by manpower	m3		3.49	0.00	0.24	0.00
CW-101 3	Reinforcement concrete	m3		55.88	0.00	45.03	0.00
CW-103 4	Lean concrete	m3		45.14	0.00	36.75	0.00
CW-10 5	Reinforcement bar, deformed bar	kg		0.18	0.00	0.94	0.00
SW-02 6	Stone masonry	m3		34.52	0.00	19.31	0.00
EW-16 7	Cobble stone foudation	m3		19.75	0.00	3.64	0.00
EW-20 8	R/rap protection	m3		17.45	0.00	5.70	0.00
9							
#	Other works	LS			0.00		0.00
	Sub Total				0.00		0.00
B. MATERIAL							
1	Slide gate 1.0 x 2.5 m	no	1	184.50	184.50	3,394.86	3,394.86
2							
3	Miscellaneous	LS			9.23		169.74
	Sub Total				193.73		3,564.60
C. EQUIPMENT							
1							
2							
3							
	Sub Total				0.00		0.00
D.	Sub Total (A+B+C)				193.73		3,564.60
E.	Profit & Over head	10% x D			375.83		
F.	TOTAL PRICE by currency / volume	US\$/place			569.56		3,564.60
G.	TOTAL PRICE (F/C+L/C) / volume	US\$/place					4,134.16

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : **CW-305 (Combined unit price)**
 Work item : **Check structure on main canal, replacement with new**
 Remarks : 1 place base
 Payment unit : place or nos

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. BASE UNIT PRICE							
EW-03 1	Excavation common	m3	670.00	0.18	123.41	1.26	843.20
EW-05	Excavation, transportation & disposal	m3	739.00	0.22	162.58	2.87	2,120.93
EW-10 2	Backfill by manpower	m3	670.00	3.49	2,338.30	0.24	163.48
EW-13-1 3	Embankment by borrow material	m3	363.00	0.85	308.55	8.66	3,143.58
CW-101 4	Reinforcement concrete	m3	283.30	55.88	15,831.30	45.03	12,757.70
CW-103 5	Lean concrete	m3	27.70	45.14	1,250.33	36.75	1,018.03
CW-102 6	Plain concrete	m3	16.00	53.75	860.00	39.88	638.08
CW-10 7	Reinforcement bar, deformed bar	kg	13,189	0.18	2,411.92	0.94	12,341.84
EW-16 8	Sand & gravel foundation	m3	42.50	19.75	839.29	3.64	154.70
SW-01 9	Gabon mattress	m3	89.00	46.70	4,156.30	31.06	2,764.34
EW-19	Demolition of concrete	m3	327.00	5.01	1,638.27	15.11	4,940.97
#	Other works	LS			1,414.10		1,797.29
Sub Total					31,334.35		42,684.15
B. MATERIAL							
1	Slide gate (2.0 x 3.0 m)	no	3.00	171.30	513.90	3,006.45	9,019.35
2							
3							
Sub Total					513.90		9,019.35
C. EQUIPMENT							
1							
2							
3							
Sub Total					0.00		0.00
D. Sub Total (A+B+C)					31,848.25		51,703.50
E. Profit & Over head				10% x D	8,355.18		
F. TOTAL PRICE by currency / volume				US\$/place	40,203.43		51,703.50
G. TOTAL PRICE (F/C+L/C) / volume				US\$/place			91,906.93

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : **CW-306 (Combined unit price)**
 Work item : **Check structure on main canal, new**
 Remarks : 1 place base
 Payment unit : place or nos

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. BASE UNIT PRICE							
EW-03 1	Excavation common	m3	670.00	0.18	123.41	1.26	843.20
EW-05	Excavation, transportation & disposal	m3	739.00	0.22	162.58	2.87	2,120.93
EW-10 2	Backfill by manpower	m3	670.00	3.49	2,338.30	0.24	163.48
EW-13-1 3	Embankment by borrow material	m3	363.00	0.85	308.55	8.66	3,143.58
CW-101 4	Reinforcement concrete	m3	283.30	55.88	15,831.30	45.03	12,757.70
CW-103 5	Lean concrete	m3	27.70	45.14	1,250.33	36.75	1,018.03
CW-102 6	Plain concrete	m3	16.00	53.75	860.00	39.88	638.08
CW-10 7	Reinforcement bar, deformed bar	kg	13,189	0.18	2,411.92	0.94	12,341.84
EW-16 8	Sand & gravel foundation	m3	42.50	19.75	839.29	3.64	154.70
SW-01 9	Gabon mattress	m3	89.00	46.70	4,156.30	31.06	2,764.34
#	Other works	LS			1,414.10		1,797.29
Sub Total					29,696.08		37,743.18
B. MATERIAL							
1	Slide gate (2.0 x 3.0 m)	no	3.00	171.30	513.90	3,006.45	9,019.35
2							
3							
Sub Total					513.90		9,019.35
C. EQUIPMENT							
1							
2							
3							
Sub Total					0.00		0.00
D. Sub Total (A+B+C)					30,209.98		46,762.53
E. Profit & Over head				10% x D	7,697.25		
F. TOTAL PRICE by currency / volume				US\$/place	37,907.24		46,762.53
G. TOTAL PRICE (F/C+L/C) / volume				US\$/place			84,669.76

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : **CW-307 (Combined unit price)**
 Work item : **Turnout, replacement with new**
 Remarks : 1 place base
 Payment unit : place or nos

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. BASE UNIT PRICE							
EW-03 1	Excavation common	m3	30.00	0.18	5.53	1.26	37.76
EW-05	Excavation, transportation & disposal	m3	20.00	0.22	4.40	2.87	57.40
EW-10 2	Backfill by manpower	m3	30.00	3.49	104.70	0.24	7.32
EW-13-1 3	Embankment by borrow material	m3	8.00	0.85	6.80	8.66	69.28
CW-101 4	Reinforcement concrete	m3	8.80	55.88	491.76	45.03	396.29
CW-103 5	Lean concrete	m3	2.00	45.14	90.28	36.75	73.50
CW-102 6	Plain concrete	m3		53.75	0.00	39.88	0.00
CW-10 7	Reinforcement bar, deformed bar	kg	360	0.18	65.83	0.94	336.88
CW-11 8	Concrete pipe Dia. 500mm	m3	5.30	2.25	11.93	38.41	203.57
EW-19 9	Demolition of concrete	m3	10.80	5.01	54.11	15.11	163.19
#	Other works	LS			41.77		67.26
Sub Total					877.10		1,412.44
B. MATERIAL							
GW-04 1	Slide gate (0.5 x 1.0 m)	no	1.00	61.50	61.50	1,326.05	1,326.05
2							
3							
Sub Total					61.50		1,326.05
C. EQUIPMENT							
1							
2							
3							
Sub Total					0.00		0.00
D. Sub Total (A+B+C)					938.60		2,738.49
E. Profit & Over head				10% x D	367.71		
F. TOTAL PRICE by currency / volume				US\$/place	1,306.30		2,738.49
G. TOTAL PRICE (F/C+L/C) / volume				US\$/place			4,044.80

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : **CW-308 (Combined unit price)**
 Work item : **Turnout, new**
 Remarks : 1 place base
 Payment unit : place or nos

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. BASE UNIT PRICE							
EW-03 1	Excavation common	m3	30.00	0.18	5.53	1.26	37.76
EW-05	Excavation, transportation & disposal	m3	20.00	0.22	4.40	2.87	57.40
EW-10 2	Backfill by manpower	m3	30.00	3.49	104.70	0.24	7.32
EW-13-1 3	Embankment by borrow material	m3	8.00	0.85	6.80	8.66	69.28
CW-101 4	Reinforcement concrete	m3	8.80	55.88	491.76	45.03	396.29
CW-103 5	Lean concrete	m3	2.00	45.14	90.28	36.75	73.50
CW-102 6	Plain concrete	m3		53.75	0.00	39.88	0.00
CW-10 7	Reinforcement bar, deformed bar	kg	360	0.18	65.83	0.94	336.88
CW-11 8	Concrete pipe Dia. 500mm	m3	5.30	2.25	11.93	38.41	203.57
#	Other works	LS			39.06		59.10
Sub Total					820.28		1,241.09
B. MATERIAL							
GW-04 1	Slide gate (0.5 x 1.0 m)	no	1.00	61.50	61.50	1,326.05	1,326.05
2							
3							
Sub Total					61.50		1,326.05
C. EQUIPMENT							
1							
2							
3							
Sub Total					0.00		0.00
D. Sub Total (A+B+C)					881.78		2,567.14
E. Profit & Over head				10% x D	344.89		
F. TOTAL PRICE by currency / volume				US\$/place	1,226.68		2,567.14
G. TOTAL PRICE (F/C+L/C) / volume				US\$/place			3,793.82

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : CW-309 (Combined unit price)
 Work item : Construction of bridge with demolition of existing bridge
 Remarks : 1 place base
 Payment unit : place or nos

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A.	BASE UNIT PRICE						
EW-03 1	Excavation common	m3	78.00	0.18	14.37	1.26	98.16
EW-05	Excavation, transportation & disposal	m3	156.00	0.22	34.32	2.87	447.72
EW-10 2	Backfill by manpower	m3	78.00	3.49	272.22	0.24	19.03
EW-13-1 3	Embankment by borrow material	m3	520.00	0.85	442.00	8.66	4,503.20
CW-101 4	Reinforcement concrete	m3	93.60	55.88	5,230.53	45.03	4,215.04
CW-103 5	Lean concrete	m3	8.20	45.14	370.13	36.75	301.37
CW-102 6	Plain concrete	m3	26.70	53.75	1,435.13	39.88	1,064.80
CW-10 7	Reinforcement bar, deformed bar	kg	6,682	0.18	1,221.96	0.94	6,252.80
EW-16 8	Sand & gravel foundation	m3	39.00	19.75	770.17	3.64	141.96
SW-01 9	Gabion mattress	m3	37.70	46.70	1,760.59	31.06	1,170.96
EW-19 9	Demolition of concrete	m3	97.00	5.01	485.97	15.11	1,465.67
#	Other works	LS			601.87		984.04
	Sub Total				12,639.26		20,664.75
B.	MATERIAL						
1							
2							
3							
	Sub Total				0.00		0.00
C.	EQUIPMENT						
1							
2							
3							
	Sub Total				0.00		0.00
D.	Sub Total (A+B+C)				12,639.26		20,664.75
E.	Profit & Over head			10% x D			3,330.40
F.	TOTAL PRICE by currency / volume	US\$/place			15,969.66		20,664.75
G.	TOTAL PRICE (F/C+L/C) / volume	US\$/place					36,634.41

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : CW-310 (Combined unit price)
 Work item : Construction of new Bridge
 Remarks : 1 place base
 Payment unit : place or nos

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A.	BASE UNIT PRICE						
EW-03 1	Excavation common	m3	78.00	0.18	14.37	1.26	98.16
EW-05	Excavation, transportation & disposal	m3	156.00	0.22	34.32	2.87	447.72
EW-10 2	Backfill by manpower	m3	78.00	3.49	272.22	0.24	19.03
EW-13-1 3	Embankment by borrow material	m3	520.00	0.85	442.00	8.66	4,503.20
CW-101 4	Reinforcement concrete	m3	93.60	55.88	5,230.53	45.03	4,215.04
CW-103 5	Lean concrete	m3	8.20	45.14	370.13	36.75	301.37
CW-102 6	Plain concrete	m3	26.70	53.75	1,435.13	39.88	1,064.80
CW-10 7	Reinforcement bar, deformed bar	kg	6,682	0.18	1,221.96	0.94	6,252.80
EW-16 8	Sand & gravel foundation	m3	39.00	19.75	770.17	3.64	141.96
SW-01 9	Gabion mattress	m3	37.70	46.70	1,760.59	31.06	1,170.96
EW-19 9	Demolition of concrete	m3	97.00	5.01	485.97	15.11	1,465.67
#	Other works	LS			513.84		925.49
	Sub Total				10,790.64		19,435.24
B.	MATERIAL						
1							
2							
3							
	Sub Total				0.00		0.00
C.	EQUIPMENT						
1							
2							
3							
	Sub Total				0.00		0.00
D.	Sub Total (A+B+C)				10,790.64		19,435.24
E.	Profit & Over head			10% x D			3,022.59
F.	TOTAL PRICE by currency / volume	US\$/place			13,813.23		19,435.24
G.	TOTAL PRICE (F/C+L/C) / volume	US\$/place					33,248.47

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : CW-311 (Combined unit price)
 Work item : Construction of foot bridge
 Remarks : 1 place base
 Payment unit : place or nos

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A.	BASE UNIT PRICE						
EW-03 1	Excavation common	m3	3.00	0.18	0.55	1.26	3.78
EW-05	Excavation, transportation & disposal	m3	72.00	0.22	15.84	2.87	206.64
EW-10 2	Backfill by manpower	m3	3.00	3.49	10.47	0.24	0.73
EW-13-1 3	Embankment by borrow material	m3	190.00	0.85	161.50	8.66	1,645.40
CW-101 4	Reinforcement concrete	m3	28.40	55.88	1,587.04	45.03	1,278.92
CW-103 5	Lean concrete	m3	6.50	45.14	293.40	36.75	238.89
CW-102 6	Plain concrete	m3	19.00	53.75	1,021.25	39.88	757.72
CW-10 7	Reinforcement bar, deformed bar	kg	1,400	0.18	252.02	0.94	1,310.08
EW-16 8	Sand & gravel foundation	m3	28.00	19.75	552.94	3.64	101.92
SW-01 9	Gabion mattress	m3	27.00	46.70	1,260.90	31.06	838.62
#	Other works	LS			258.00		319.13
	Sub Total				5,417.92		6,701.83
B.	MATERIAL						
1							
2							
3							
	Sub Total				0.00		0.00
C.	EQUIPMENT						
1							
2							
3							
	Sub Total				0.00		0.00
D.	Sub Total (A+B+C)				5,417.92		6,701.83
E.	Profit & Over head			10% x D			1,211.97
F.	TOTAL PRICE by currency / volume	US\$/place			6,629.89		6,701.83
G.	TOTAL PRICE (F/C+L/C) / volume	US\$/place					13,331.72

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : CW-312 (Combined unit price)
 Work item : Drainage inlet
 Remarks : 1 place base
 Payment unit : place or nos

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A.	BASE UNIT PRICE						
EW-03 1	Excavation common	m3	29.00	0.18	5.34	1.26	36.50
EW-05	Excavation, transportation & disposal	m3	8.00	0.22	1.76	2.87	22.96
EW-10 2	Backfill by manpower	m3	29.00	3.49	101.21	0.24	7.08
EW-13-1 3	Embankment by borrow material	m3	0.00	0.85	0.00	8.66	0.00
CW-101 4	Reinforcement concrete	m3		55.88	0.00	45.03	0.00
CW-103 5	Lean concrete	m3	1.80	45.14	81.25	36.75	66.15
CW-102 6	Plain concrete	m3		53.75	0.00	39.88	0.00
CW-10 7	Reinforcement bar, deformed bar	kg		0.18	0.00	0.94	0.00
EW-16 8	Concrete pipe Dia. 800mm	m3	9.00	2.84	25.52	48.40	435.57
#	Other works	LS			10.75		28.41
	Sub Total				225.83		596.67
B.	MATERIAL						
1							
2							
3							
	Sub Total				0.00		0.00
C.	EQUIPMENT						
1							
2							
3							
	Sub Total				0.00		0.00
D.	Sub Total (A+B+C)				225.83		596.67
E.	Profit & Over head			10% x D			82.25
F.	TOTAL PRICE by currency / volume	US\$/place			308.08		596.67
G.	TOTAL PRICE (F/C+L/C) / volume	US\$/place					904.75

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : **SW-01**
 Work item : **Galton mattress**
 Remarks : 10 m³ base
 Payment unit : m³

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. LABOUR							
1	Foreman	MD	2.12	12.50	26.50		
2	Mason	MD	16.67	8.00	133.33		
3	Common labor	MD	23.33	4.50	105.00		
4	Driver	MD	1.25	6.50	8.13		
5							
Sub Total					272.96		0.00
B. MATERIAL							
1	Boulder	m ³	12.00	16.20	194.40		
2	Iron wire	kg	250.00			0.85	212.50
3							
4							
5							10.63
Sub Total					194.40		223.13
C. EQUIPMENT							
1	Pickup truck	MD	1.25			70.00	87.50
2							
3							
4							
5	Miscellaneous						
Sub Total					0.00		87.50
Sub Total (A+B+C)					467.36		310.63
D. Profit & Over head				10% x D		77.80	
E. TOTAL PRICE by currency / volume					54.52		31.06
G. TOTAL PRICE (F/C+L/C) / volum US\$/m ³							85.58

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : **SW-02**
 Work item : **Stone masonry with 1:3 cement/sand ratio mortar**
 Remarks : 10 m³ base
 Payment unit : m³

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. LABOUR							
1	Foreman	MD	1.33	12.50	16.67		
2	Mason	MD	6.67	8.00	53.33		
3	Common labor	MD	20.00	4.50	90.00		
4	Mechanic	MD	0.83	12.00	10.00		
5	Driver	MD	3.33	6.50	21.67		
Sub Total					191.67		0.00
B. MATERIAL							
1	Boulder	m ³	7.80	16.20	126.36		
2	Cement	ton	0.88			0.10	0.09
3	Sand	m ³	3.15	8.78	27.65		
4							
5							0.00
Sub Total					154.01		0.09
C. EQUIPMENT							
1	Concrete mixer 0.25 m ³	MD	1.59			68.00	108.42
2	Pickup truck	MD	1.21			70.00	84.58
3							
4							
5	Miscellaneous						
Sub Total					0.00		193.00
Sub Total (A+B+C)					345.67		193.09
D. Profit & Over head				10% x D		53.88	
E. TOTAL PRICE by currency / volume						39.96	19.31
G. TOTAL PRICE (F/C+L/C) / volum US\$/m ³							59.26

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : **CW-03**
 Work item : **Riprap placing with transported material**
 Remarks : 100 m³ base
 Payment unit : m³

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. LABOUR							
1	Heavy equipment operator	MD	0.78	14.00	10.94		
2	Foreman	MD	0.16	12.50	1.95		
3	Common labor	MD	0.78	4.50	3.52		
4	Assistant operator	MD	0.78	8.00	6.25		
5	Driver	MD	3.26	6.50	21.16		
Sub Total					43.82		0.00
B. MATERIAL							
1	Diesel Backhoe 0.6 m ³	liter	84.38			1.10	92.81
2	Diesel Dump truck 8 ton	liter	59.38			1.10	65.31
3	Boulder	m ³	105.00	16.20	1,701.00		
4							
5	Miscellaneous	LS					31.63
Sub Total					1,701.00		189.75
C. EQUIPMENT							
1	Backhoe 0.6 m ³	MD	0.78			133.00	103.91
2	Dump truck 8 ton	MD	3.26			85.00	276.69
3							
4							
5							
Sub Total					0.00		380.60
Sub Total (A+B+C)					1,744.82		570.35
E. Profit & Over head				10% x D		231.52	
F. TOTAL PRICE by currency / volume						19.76	5.70
G. TOTAL PRICE (F/C+L/C) / volum US\$/m ³							25.47

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : **GW-01**
 Work item : **Installation of gate, 2.0m x 2.0m**
 Remarks : 1 unit base
 Payment unit : unit

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. LABOUR							
1	Driver	MD	2.20	6.50	14.30		
2	Skilled labor	MD	2.20	10.00	22.00		
3	Common labor	MD	30.00	4.50	135.00		
4							
5							
Sub Total					171.30		0.00
B. MATERIAL							
1	Diesel	liter	289.50			1.10	318.45
2	Steel slide gate, 2.0m x 2.0m	liter	1.00		2,490.00		2,490.00
3							
4							
5	Miscellaneous	LS					
Sub Total					0.00		2,808.45
C. EQUIPMENT							
1	Truck crane 6 ton	MD	2.20	90.00		90.00	198.00
2							
3							
4							
5							
Sub Total					0.00		198.00
Sub Total (A+B+C)					171.30		3,006.45
D. Profit & Over head				10% x D			317.78
E. TOTAL PRICE by currency / volume					489.08		3,006.45
G. TOTAL PRICE (F/C+L/C) / volum US\$/m ³							3,495.53

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : **GW-02**
 Work item : **Installation of gate, 1.5m x 1.5m**
 Remarks : 1 unit base
 Payment unit : unit

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. LABOUR							
1	Driver	MD	2.00	6.50	13.00		
2	Skilled labor	MD	2.00	10.00	20.00		
3	Common labor	MD	20.00	4.50	90.00		
4							
5							
Sub Total					123.00		0.00
B. MATERIAL							
1	Diesel	liter	241.25			1.10	265.38
2	Steel slide gate, 1.5m x 1.5m	liter	1.00		1,780.00		1,780.00
3							
4							
5	Miscellaneous	LS					
Sub Total					0.00		2,045.38
C. EQUIPMENT							
1	Truck crane 6 ton	MD	2.00	90.00		90.00	180.00
2							
3							
4							
5							
Sub Total					0.00		180.00
Sub Total (A+B+C)					123.00		2,225.38
E. Profit & Over head				10% x D			234.84
F. TOTAL PRICE by currency / volume					357.84		2,225.38
G. TOTAL PRICE (F/C+L/C) / volum US\$/m ³							2,583.21

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : **GW-02**
 Work item : **Installation of gate, 1.5m x 1.5m**
 Remarks : 1 unit base
 Payment unit : unit

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. LABOUR							
1	Driver	MD	2.00	6.50	13.00		
2	Skilled labor	MD	2.00	10.00	20.00		
3	Common labor	MD	20.00	4.50	90.00		
4							
5							
Sub Total					123.00		0.00
B. MATERIAL							
1	Diesel	liter	241.25			1.10	265.38
2	Steel slide gate, 1.5m x 1.5m	liter	1.00		1,780.00		1,780.00
3							
4							
5	Miscellaneous	LS					
Sub Total					0.00		2,045.38
C. EQUIPMENT							
1	Truck crane 6 ton	MD	2.00	90.00		90.00	180.00
2							
3							
4							
5							
Sub Total					0.00		180.00
Sub Total (A+B+C)					123.00		2,225.38
E. Profit & Over head				10% x D			234.84
F. TOTAL PRICE by currency / volume					357.84		2,225.38
G. TOTAL PRICE (F/C+L/C) / volum US\$/m ³							2,583.21

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : **GW-04**
 Work item : **Installation of gate, 0.8m x 0.8m**
 Remarks : 1 unit base
 Payment unit : unit

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. LABOUR							
1	Driver	MD	1.00	6.50	6.50		
2	Skilled labor	MD	1.00	10.00	10.00		
3	Common labor	MD	10.00	4.50	45.00		
4							
5							
Sub Total					61.50		0.00
B. MATERIAL							
1	Diesel	liter	132.77			1.10	146.05
2	Steel slide gate, 0.8m x 0.8m	liter	1.00		1,090.00		1,090.00
3							
4							
5	Miscellaneous	LS					
Sub Total					0.00		1,236.05
C. EQUIPMENT							
1	Truck crane 6 ton	MD	1.00	90.00		90.00	90.00
2							
3							
4							
5							
Sub Total					0.00		90.00
Sub Total (A+B+C)					61.50		1,326.05
E. Profit & Over head				10% x D			138.75
F. TOTAL PRICE by currency / volume					200.25		1,326.05
G. TOTAL PRICE (F/C+L/C) / volum US\$/m ³							1,526.30

UNIT PRICE ANALYSIS

Project : SPPIDRIP
 No. : **GW-05**
 Work item : **Installation of gate, 0.6m x 0.6m**
 Remarks : 1 unit base
 Payment unit : unit

No.	Component	Unit	Quantity	L/C(US\$)		F/C(US\$)	
				U Price	Amount	U Price	Amount
A. LABOUR							
1	Driver	MD	0.80	6.50	5.20		
2	Skilled labor	MD	0.80	10.00	8.00		
3	Common labor	MD	8.00	4.50	36.00		
4							
5							
Sub Total					49.20		0.00
B. MATERIAL							
1	Diesel	liter	72.42			1.10	79.66
2	Steel slide gate, 0.8m x 0.8m	liter	1.00			1,090.00	1,090.00
3							
4							
5	Miscellaneous	LS					
Sub Total					0.00		1,169.66
C. EQUIPMENT							
1	Truck crane 6 ton	MD	0.80	90.00		90.00	72.00
2							
3							
4							
5							
Sub Total					0.00		72.00
D. Sub Total (A+B+C)					49.20		1,241.66
E. Profit & Over head 10% x D					129.09		
F. TOTAL PRICE by currency / volume					178.29		1,241.66
G. TOTAL PRICE (F/C+L/C) / volume US\$/m3							1,419.95

ANNEX G

Project Evaluation

PREPARATORY SURVEY
FOR
IRRIGATION AND DRAINAGE SYSTEM
REHABILITATION AND IMPROVEMENT PROJECT
IN
THE KINGDOM OF CAMBODIA

ANNEX G
PROJECT EVALUATION

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ANNEX G

PROJECT EVALUATION

CHAPTER AG-1 GENERAL INFORMATION

AG-1.1 General

The objective of project evaluation is to justify whether the proposed plan for SPPIDRIP is appropriate or inappropriate from the economic and financial viewpoints. By referring to the previous studies, the project evaluation is to be undertaken with updated data in terms of quantifiable monetary indicators. In this Annex, the results of project evaluation are presented in terms of SPPIDRIP as well as the breakdown of six sub-projects comprising RCHRSP, USISRSP, KSBISRSP, MC35RSP, SPWRRSP and DPISRSP under SPPIDRIP. Regarding RCHRSP, the result of economic evaluation on an alternative case is also presented, as a new regulated irrigation water source facility is under construction at upstream of the Prek Thnot River..

AG-1.2 Given Conditions for Project Evaluation

Among various factors applied to the project evaluation, the following numerical values of exchange rate, price escalation and physical contingency are employed as given conditions in carrying out the project evaluation in accordance with the instruction by JICA:

- Exchange rate is US\$ 1.0 = Riel 4,084 = JPY 76.8 as of November 2011;
- Base cost is expressed as of November 2011;
- Price escalation is 1.6% for foreign currency portion and 6.7% for local currency portion to estimate the financial project cost, but it is not applied to estimate the economic project cost; and
- Physical contingency is 5% for consulting services cost and 10% for all other cost components.

AG-1.3 Basic Assumptions

The economic viability of the project is expressed in the form of net present value (NPV), benefit-cost (B/C) ratio and economic internal rate of return (EIRR), while the financial viability of five sub-projects and the improvement plan for the model area of RCHRSP is to be examined focusing on beneficial farmers' perspective from the viewpoint of their capacity to pay. To do so, several factors in addition to the above given conditions are applied. Focal points are summarized below.

(1) Evaluation Period

The period of project evaluation is set up for 50 years from the beginning of 2013.

(2) Consumer Price Index

In referring to the data of various studies previously made, the inflation rate during the period between the time when original data concerned were prepared and November 2011 is calculated for this evaluation, citing the Consumer Price Index Report officially released by the National Institute of Statistics, Cambodia.

(3) Standard Conversion Factor

A standard conversion factor (SCF) is determined at 0.978 based on the formula as mentioned below. Input data are referred to Cambodia Statistical Yearbook 2008 and IMF Cambodia Staff Report for the 2011 Article IV. This SCF is applied to convert the local currency portion of financial project cost to the economic cost. For converting the foreign currency portion of financial project cost, SCF is set up at 1.00.

$$SCF = (I + E) / [(I - I_s + I_t) + (E + E_s - E_t)]$$

Where, I = Total import value (CIF) to Cambodia,
 E = Total export value (FOB) from Cambodia,
 s = subsidy, and
 t = tax;

(4) Shadow Wage Rate Factor

In order to estimate the economic price of labors to be employed during the construction period as well as O&M period, a shadow wage rate factor (SWRF) is determined at 0.601 applied to skilled labor cost and 0.363 for unskilled labor cost. Such SWRF is estimated based on the following data:

- The average unit daily labor cost for the project is US\$ 9.0 for skilled labors and US\$ 4.5 for unskilled labors; and
- The actual daily labor wage in rural areas is assumed to be US\$ 5.38 for skilled labors and US\$ 1.62 for unskilled labors on the current price base by referring to the data on household income and consumption available in the report of Cambodia Socio-economic Survey 2009, which was officially published by the National Institute of Statistics under the Ministry of Planning in October 2010.

(5) Price Forecast

For estimating the economic price of farm inputs and outputs, the following two methods are taken into account:

- As for farm inputs and outputs domestically produced and traded, SCF of 0.978 is applied to those financial farm gate prices for converting to the economic prices; and
- With regard to farm inputs and outputs internationally produced and traded, the economic farm gate price is computed by referring to the international market prices forecasted by the World Bank Economic Policy and Prospects Group, FOB or CIF prices at port as of January 2012, as well as local costs of logistic, processing and transportation.

As chemical fertilizers correspond to the latter case, the economic farm gate prices are calculated as materials fully imported from abroad. Concerning milled rice, it is well known that there is a considerable discrepancy between the official record and the actual situation regarding quantity imported to and exported from Cambodia. At moment, however, the trade statistics officially released by the Food and Agriculture Organization of the United Nations (FAO) is only one useful data source. According to FAO statistic data as of 2009, Cambodia had been a rice import country until 2008 and then became a rice export country in 2009 for the first time. Citing such trend, the economic farm gate price of paddy is to be determined at US\$ 1,153 based on the average parity ratio of milled rice for the 10-year period from 2000 to 2009 that is 0.870 for imported rice and 0.130 for exported rice.

(6) Price Conversion

Considering the abovementioned conditions and basic assumptions, the both financial and economic prices of farm inputs and outputs are determined as summarized in Table AG-1.3.1.

Table AG-1.3.1 List of Price Conversion

Particulars	Unit	Financial Price	Conversion Factor	Economic Price
1. Farm Product				
- Paddy (Early maturity variety)	Riel/kg	1,150	a	1,153
- Paddy (Medium maturity variety)	Riel/kg	1,250	a	1,153
- Upland crop (Mungbean)	Riel/kg	3,850	b	3,766
- Vegetable (Cucumber)	Riel/kg	1,400	b	1,369
- Vegetable (String bean)	Riel/kg	1,900	b	1,858
- Vegetable (Tomato)	Riel/kg	1,800	b	1,761
2. By-products				
- Crop residue (Rice straw)	Riel/kg	350	b, c, d	342
- Other crop residue (equivalent to 100% of crop yield)	Riel/kg	50	b	49
3. Seed				
- Paddy (Early maturity variety)	Riel/kg	1,800	b	1,761
- Paddy (Medium maturity variety)	Riel/kg	2,400	b	2,347
- Upland crop (Mungbean)	Riel/kg	11,000	b	10,759
- Vegetable (Cucumber and String bean))	Riel/kg	6,000	b	5,869
- Vegetable (Tomato)	Riel/kg	15,000	b	14,671
4. Fertilizer				
- Urea	Riel/kg	2,300	a	1,531
- DAP	Riel/kg	3,000	a	2,456
- KCl	Riel/kg	2,700	a	1,641
- Farm manure	Riel/kg	200	b	196
5. Agro-chemicals				
- Liquid type	Riel/lit	15,000	b	14,671
6. Farming Equipment and Tools				
- Annual depreciation cost	Riel/ha	8,000	b	7,825
7. Farm Labor				
- Hired labor	man-day	7,000	b, e	2,487
- Family labor	man-day	0	f	2,487
8. Paid Services				
- Land preparation (first time operation by draft animal)	Riel/ha	140,000	b, e	49,742
- Land preparation (second time operation by draft animal)	Riel/ha	180,000	b, e	63,954
- Land preparation (first time operation by hired tractor)	Riel/ha	230,000	b, g	135,212
- Land preparation (second time operation by hired tractor)	Riel/ha	250,000	b, g	146,969
- Irrigating by using water pump	Riel/ha	800,000	b, e	284,238
- Harvesting by combine harvester	Riel/ha	500,000	b, g	293,938
- Manual cutting and threshing	Riel/ha	450,000	b, e	159,884
- Carrying of harvests from field to yard	Riel/ha	170,000	b, g	99,939
9. Transportation				
- Carrying out of dried harvests from yard	Riel/kg	20	b	19
Remarks on conversion factors:				
a; The projected prices for 2020 in 2011 constant price are determined by adjusting forecasted prices at 2005 constant price presented in "Projections as of January 17, 2012" by the World Bank Economic Policy and Prospects Group				
b; Financial prices are converted to economic prices by multiplying with SCF of <u>0.978</u> .				
c; Among by-products of paddy, financial and economic values of broken rice, rice bran and rice husk are not counted as rice millers take advantages as a part of milling cost				
d; Rice straw weight is equivalent to 90% of early maturity variety paddy yield and 100% of medium variety paddy yield.				
e; Financial hired farm labor cost is converted to economic price by multiplying with SCF and SWRF of <u>0.363</u> for unskilled labor.				
f; Economic price of family labor is considered as the same price of economic price of hired labor.				
g; Financial cost of hired tractor, combine harvester and vehicle for carrying is converted to economic cost by multiplying with SCF and SWRF of <u>0.601</u> for skilled labor.				

Source: JICA Survey Team

CHAPTER AG-2 RESULTS OF ECONOMIC AND FINANCIAL EVALUATION

AG-2.1 Project Evaluation for Southwest Phnom Penh Irrigation and Drainage Rehabilitation and Improvement Project

AG-2.1.1 Summary of Economic Evaluation

Considering specific features of the respective sub-projects under SPPIDRIP, the expected project benefits are to be categorized into three types:

- The first type is defined as an incremental net benefit that is attributable to the anticipated increase in the total net return from crop production by securing irrigation water supply to paddy cultivation for the both early rainy and rainy seasons in such sub-project areas as USISRSP, KSBISRSP, MC35RSP and DPISRSP as well as the model area of RCHRSP where irrigation and drainage facilities will be newly constructed or rehabilitated under the project;
- The second type is defined as an incremental net benefit that is attributable to the anticipated increase in the total net return from crop production by creating a new stable water resource facility for supporting the prevailing pump irrigation system in SPWRRSP Area; and
- The third type is defined as an imputed loss of profits that are attributable to the surplus of net returns earned from crop production in RCHRSP area between under the existing partially irrigated condition and under the fully rain-fed condition.

Based on the basic assumptions set up in Chapter AG-1, the economic project benefits for the above three types are predicted and the economic project cost is computed by converting the financial project cost. The annual disbursement of initial investment cost, O&M cost and increment net benefit of the proposed SPPIDRIP plan for the initial 12-year period up to 2024 is summarized in the form of cash flow of economic cost and benefit as presented in Table AG-2.1.1.1.

Table AG-2.1.1.1 Cash Flow of Economic Cost and Benefit for SPPIDRIP

(Unit: US\$1,000)

Item	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Investment cost	2,170	1,325	1,405	3,072	13,590	20,028	14,800	5,542	-	-	-	-
O&M cost	-	-	-	-	11	68	157	216	239	239	239	239
Increment benefit	-	-	-	-	-	3,036	5,569	7,402	9,641	10,039	10,164	10,288

Source: JICA Survey Team

Based on the above cash flow, the economic evaluation is made in terms of NPV, B/C ratio and EIRR of the proposed plan. In addition, sensitivity analyses are done for such cases as cost 10% and 20% up, benefit 10% and 20% down, and combination of each case. The results of the economic evaluation are summarized in Table AG-2.1.1.2

Table AG-2.1.1.2 Results of Economic Evaluation for SPPIDRIP

Evaluation Item	Evaluation Results			
	NPV at 12 % discount rate	NPV of benefit (US\$)	41,028,255	NPV (US\$)	6,642,769
	NPV of cost (US\$)	34,385,486		
B/C ratio and EIRR	B/C ratio	1.19	EIRR (%)	14.3
Sensitivity analysis (%)		Cost normal	Cost 10% up	Cost 20% up
	Benefit normal	14.3	13.0	11.9
	Benefit 10% down	12.9	11.7	10.7
	Benefit 20% down	11.5	10.4	9.5

Source: JICA Survey Team

The result of economic evaluation for each sub-project is given in AG-2.2 to AG-2.7.

AG-2.1.2 Economic Evaluation on Alternative Case

On the Stung Tasal River, a tributary of the Prek Thnot River System, a new dam with the gross storage capacity of 147 MCM is under construction. Considering this situation, the water balance study for RCHRSP was made through the Survey. The results as described in Annex B (AB-3.3.2) reveal that irrigation water will be able to be supplied to paddy fields in RCHRSP of 12,600 ha during the early rainy season and 16,000 ha during the rainy season with 80% dependability after completion of the Stung Tasal Dam. In connection with such creation of stable irrigation water supply source, an alternative case of economic evaluation on RCHRSP is examined focusing on the third type of project benefit. The result is presented in AG-2.2.

As for the alternative case with the Stung Tasal Dam, the annual disbursement of initial investment cost, O&M cost and increment net benefit of the proposed SPPIDRIP plan for the initial 12-year period up to 2024 is summarized in the form of cash flow of economic cost and benefit as presented in Table AG-2.1.2.1.

Table AG-2.1.2.1 Cash Flow of Economic Cost and Benefit for Alternative Case of SPPIDRIP

(Unit: US\$1,000)

Item	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Investment cost	2,170	1,325	1,405	3,072	13,590	20,028	14,800	5,542	-	-	-	-
O&M cost	-	-	-	-	11	68	157	216	239	239	239	239
Increment benefit	-	-	-	-	-	3,036	5,569	7,402	13,099	13,498	13,662	13,747

Source: JICA Survey Team

Based on the above cash flow, the economic evaluation is made in terms of NPV, B/C ratio and EIRR of the proposed plan. In addition, sensitivity analyses are done for such cases as cost 10% and 20% up, benefit 10% and 20% down, and combination of each case. The results of the economic evaluation are summarized in Table AG-2.1.2.2

Table AG-2.1.2.2 Results of Economic Evaluation for Alternative Case of SPPIDRIP

Evaluation Item	Evaluation Results				
NPV at 12 % discount rate	NPV of benefit (US\$)	52,568,465		NPV (US\$)	18,182,978
	NPV of cost (US\$)	34,385,486			
B/C ratio and EIRR	B/C ratio	1.53		EIRR (%)	17.7
		Cost normal	Cost 10% up	Cost 20% up	
Sensitivity analysis (%)	Benefit normal	17.7	16.3	15.0	
	Benefit 10% down	16.1	14.8	13.7	
	Benefit 20% down	14.5	13.3	12.2	

Source: JICA Survey Team

AG-2.1.3 Summary of Financial Evaluation

In this project evaluation, financial; evaluation is made focusing on the capacity to pay of beneficiary farmers and the impact of increased crop production in paddy field on their farm household economy. The results of financial analysis are summarized in Table AG-2.1.3.1 and the details are mentioned in AG-2.2 to AG-2.7.

Table AG-2.1.3.1 Summary of Financial Evaluation for SPPIDRIP

Sub-project	Increased Capacity to Pay (US\$/ha)	Farmer's Share of O&M Cost (US\$/ha)	Average Holding Size of Paddy Field (ha/household)	Increased Gross Income per Farm Household		Increased Net Return per Farm Household	
				(US\$)	(%)	(US\$)	(%)
RCHRSP*	806	10	1.03	1,025	79.3	830	93.1
USISRSP	735	10	1.08	929	109.6	793	148.5
KSBISRSP	784	5	0.83	1,316	189.9	651	198.5
MC35RSP	539	9	0.79	530	81.9	426	102.9
SPWRRSP	666	12	0.39	458	161.3	260	174.3
DPISRSP	686	6	1.77	1,030	80.7	827	101.3
Average	825	8**	0.98	881	117.1	631	136.4

Note: RCHRSP*: Model area **; Weighted average

Source: JICA Survey Team

AG-2.2 Roleang Chrey Headworks Rehabilitation Sub-project

AG-2.2.1 Economic Evaluation

(1) Economic Cost

The economic cost for RCHRSP as shown in Table AG-2.2.1.1 is converted from the financial cost taking the above basic assumptions into account.

Table AG-2.2.1.1 Economic Cost for RCHRSP

Cost Component	Foreign Currency Portion (US\$1,000)	Local Currency Portion (US\$1,000)	Total Economic Cost (US\$1,000)
Construction Cost for Main System of RCHRSP	11,174	2,771	13,945
Tertiary System Development Cost for Model Area	81	19	100
Procurement Cost	476	64	540
Mine Survey Cost	0	0	0
Soft Component Program Cost	26	142	168
Physical Contingency for the above	1,176	300	1,476
Consulting Services Cost including price contingency)	954	1,313	2,267
Total	13,887	4,609	18,496

Source: JICA Survey Team

After completing the proposed construction works, the following costs are regularly required:

- Economic O&M cost equivalent to 0.5% of sum of economic construction and tertiary system development costs; and
- Economic repairing cost equivalent to 5% of the above sum excluding initially purchased cost of gates every 10 years.

(2) Economic Benefit

The economic benefit for RCHRSP is composed of the first and third types as follows:

- Incremental net return generated by tertiary canal system development in the 570-ha model area; and
- The current planted areas are 18,190 ha in total, comprising 10,280-ha irrigated paddy areas, 7,770-ha rain-fed paddy areas, and 140-ha upland crop and vegetable areas. Then, it is assumed that the planted areas when the Roleang Chrey Headworks are totally malfunctioned will change to 16,920-ha rain-fed paddy areas as well as 140-ha upland crop and vegetable areas. Therefore, imputed loss of profits defined as the surplus of net returns earned from crop production between under the existing partially irrigated condition and under the fully rain-fed condition in the existing 17,060-ha command areas..

Table AG-2.2.1.2 gives the incremental return generated in the model area as the first type of economic benefits for RCHRSP.

Table AG-2.2.1.2 Incremental Net Return in Model Area as Economic Benefit for RCHRSP

Crop	Without Project			With Project			Increment Net Return (US\$1,000)
	Planted Area (ha)	Net Return (US\$/ha)	Amount (US\$1,000)	Planted Area (ha)	Net Return (US\$/ha)	Amount (US\$1,000)	
Paddy (Irrigated early)	200	710	142	570	1,075	613	471
Paddy (Irrigated medium)	580	556	322	285	926	264	-58
Vegetable	0	0	0	30	2,248	67	67
Total	780	-	464	885	-	944	480

Source: JICA Survey Team

Table AG-2.2.1.3 shows the recovered loss of profits as the third type of economic benefits for RCHRSP.

Table AG-2.2.1.3 Recovered Loss of Profits as Economic Benefit for RCHRSP

Crop	Without Project			With Project			Recovered Loss (US\$1,000)
	Planted Area (ha)	Net Return (US\$/ha)	Amount (US\$1,000)	Planted Area (ha)	Net Return (US\$/ha)	Amount (US\$1,000)	
Paddy (Rain-fed medium)	16,920	466	7,892	7,770	466	3,624	-4,268
Paddy (Irrigated early)	0	0	0	1,130	710	803	803
Paddy (Irrigated medium)	0	0	0	9,150	556	5,083	5,083
Upland crop	125	172	22	125	172	22	0
Vegetable	15	1,088	16	15	1,088	16	0
Total	17,060	-	7,930	18,190	-	9,548	1,618

Source: JICA Survey Team

(3) Cash Flow of Economic Cost and Benefit

The proposed rehabilitation works of Roleang Chrey Headworks are scheduled to be completed in 2020. Therefore, the imputed loss of profits will be fully recovered in 2021, while the additional incremental net return will be borne from 2022 and its target crop yield will be fully realized in 2024. Based on such assumption, the cash flow of economic cost and benefit for RCHRSP is set up as shown in Table AG-2.2.1.4.

Table AG-2.2.1.4 Cash Flow of Economic Cost and Benefit for RCHRSP

(Unit: US\$1,000)

Item	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Investment cost	297	368	308	205	1,746	4,538	6,680	4,355	-	-	-	-
O&M cost	-	-	-	-	-	6	27	56	77	77	77	77
Recovered loss	-	-	-	-	-	-	-	-	1,618	1,618	1,618	1,618
Increment benefit	-	-	-	-	-	-	-	-	-	231	356	480
Total benefit	-	-	-	-	-	-	-	-	1,618	1,849	1,974	2,098

Source: JICA Survey Team

(4) Economic Evaluation

Based on the above cash flow of economic cost and benefit, the economic evaluation is made in terms of NPV, B/C ratio and EIRR of the proposed rehabilitation plan. In addition, sensitivity analyses are done for such cases as cost 10% and 20% up, benefit 10% and 20% down, and combination of each case. The results of the economic evaluation are summarized in Table AG-2.2.1.5.

Table AG-2.2.1.5 Results of Economic Evaluation for RCHRSP

Evaluation Item	Evaluation Results			
	NPV at 12% discount rate	NPV of benefit (US\$)	6,711,667	NPV (US\$)	-2,792,525
	NPV of cost (US\$)	9,504,192		
B/C ratio and EIRR	B/C ratio:	0.71	EIRR (%):	8.6
Sensitivity analysis (%)		Cost normal	Cost 10% up	Cost 2% up
	Benefit normal	8.6	7.8	7.1
	Benefit 10% down	7.7	6.9	6.2
	Benefit 20% down	6.7	6.0	5.4

Source: JICA Survey Team

AG-2.2.2 Economic Evaluation for Alternative Case

(1) Evaluation Condition

From the hydrological viewpoint as mentioned in AG-2.1.2, stable irrigation water supply will be secured for 12,600 ha paddy fields during the early rainy season and 16,000 ha during the rainy season out of the 17,060 ha command area of RCHRSP after completing construction works of the Stung Tasal Dam on the upper reach of Prek Thnot River System. In this Survey, however, development of tertiary canal systems of the whole command area except for the 570 ha model area is out of consideration. In estimating the impact of sustainable irrigation water source creation on predicted increase in irrigated paddy cultivation areas of the RCHRSP command area, therefore, the following conditions are taken into consideration:

- In terms of irrigation facility condition, the capacity of main and secondary canal systems will be same as it is, although necessary cost for rehabilitation works are appropriated. No tertiary canal system development will be implemented, resulting in that irrigation water will be unable to be properly distributed to paddy filed plots. In other words, the expected irrigation water supply condition will be upgraded to the existing level of model area and the estimated project cost for RCHRSP will be applied to this alternative case without any change;
- As for cropping pattern, irrigated paddy cultivation will be expected to be practiced fully in 16,000 ha paddy fields during the rainy season and 5,600 ha during the early rainy season, corresponding to the present cropping intensity of 135% in the model area, resulting in that 920 ha paddy fields will be left under rain-fed condition; and
- Concerning paddy yield, the rainy season paddy will be 2.31 ton/ha and the early rainy season paddy will be 2.79 ton/ha same as the current yield level in the model area under the condition of without tertiary canal system development and guidance for improving farming practices.

(2) Economic Benefit

Based on the above conditions, the recovered loss of profits as the third type of economic benefit for RCHRSP is re-estimated as shown in Table AG-2.2.2.1.

Table AG-2.2.2.1 Recovered Loss of Profits as Economic Benefit for Alternative Case of RCHRSP

Crop	Without Project			With Project			Recovered Loss (US\$1,000)
	Planted Area (ha)	Net Return (US\$/ha)	Amount (US\$1,000)	Planted Area (ha)	Net Return (US\$/ha)	Amount (US\$1,000)	
Paddy (Rain-fed medium)	16,920	466	7,892	920	466	429	-7,463
Paddy (Irrigated early)	0	0	0	5,600	710	3,977	3,977
Paddy (Irrigated medium)	0	0	0	16,000	556	8,888	8,888
Upland crop	125	172	22	125	172	22	0
Vegetable	15	1,088	16	15	1,088	16	0
Total	17,060	-	7,930	18,190	-	13,332	5,402

Source: JICA Survey Team

(3) Cash Flow of Economic Cost and Benefit

The proposed rehabilitation works of Roleang Chrey Headworks are scheduled to be completed in 2020. Also, regulated flow will be released from the reservoir of Stung Tasal Dam by 2020. Therefore, the imputed loss of profits will be fully recovered in 2021, while the additional incremental net return will be borne from 2022 and its target crop yield will be fully realized in 2024. Based on such assumption, the cash flow of economic cost and benefit for RCHRSP is set up as shown in Table AG-2.2.2.2.

Table AG-2.2.2.2 Cash Flow of Economic Cost and Benefit for Alternative Case of RCHRSP

Item	(Unit: US\$1,000)											
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Investment cost	297	368	308	205	1,746	4,538	6,680	4,355	-	-	-	-
O&M cost	-	-	-	-	-	6	27	56	77	77	77	77
Recovered loss	-	-	-	-	-	-	-	-	5,402	5,402	5,402	5,402
Increment benefit	-	-	-	-	-	-	-	-	-	231	356	480
Total benefit	-	-	-	-	-	-	-	-	5,402	5,633	5,758	5,882

Source: JICA Survey Team

(4) Economic Evaluation

Based on the above cash flow of economic cost and benefit, the economic evaluation is made in terms of NPV, B/C ratio and EIRR of the proposed rehabilitation plan. In addition, sensitivity analyses are done for such cases as cost 10% and 20% up, benefit 10% and 20% down, and combination of each case. The results of the economic evaluation are summarized in Table AG-2.2.2.3.

Table AG-2.2.2.3 Results of Economic Evaluation for Alternative Case of RCHRSP

Evaluation Item	Evaluation Results			
	NPV at 12% discount rate	NPV of benefit (US\$)	19,341,354	NPV (US\$)	9,837,162
	NPV of cost (US\$)	9,504,192		
B/C ratio and EIRR	B/C ratio:	2.04	EIRR (%):	21.5
Sensitivity analysis (%)		Cost normal	Cost 10% up	Cost 2% up
	Benefit normal	21.5	20.0	18.7
	Benefit 10% down	19.9	18.5	17.2
	Benefit 20% down	18.1	16.8	15.6

Source: JICA Survey Team

AG-2.2.3 Financial Evaluation

(1) Capacity to Pay

Financial evaluation aims to examine how much beneficiary farmer's capacity to pay will increase and also presume how much an individual beneficiary farmer will be able to share annual O&M cost of irrigation system after implementing the proposed tertiary system development program in the model area of RCHRSP succeeding the completion of rehabilitation works of Roleang Chrey Headworks. The crop planted area per 1-ha paddy field is anticipated to be 1.35 ha under the present/without project condition and 1.56 ha under the with-project condition. Based on such conditions, the annual net return is estimated to increase by US\$ 806 from US\$ 865 to US\$ 1,671 as shown in Table AG-2.2.3.1.

According to the proposed plan, the required annual O&M costs of secondary and tertiary systems are estimated at US\$ 7.2/ha. Adding annual charge of management cost for FWUC and FWUG, every beneficiary farmer needs to pay annually about US\$ 10/ha. Compared with the predicted increase in farmer's capacity to pay by US\$ 806/ha, this allocated annual O&M cost is affordable to the respective beneficiaries. Same situation can be expected among beneficiary farmers' society in the model area of RCHRSP.

Table AG-2.2.3.1 Financial Crop Budget of 1-ha Paddy Field Holder in Model Area of RCHRSP

Crop	Present/Without Project				With Project			
	Planted Area (ha)	Gross Income (US\$)	Production Cost (US\$)	Net Return (US\$)	Planted Area (ha)	Gross Income (US\$)	Production Cost (US\$)	Net Return (US\$)
Early rainy season								
Paddy	0.35	350	105	245	1.00	1,435	381	1,054
Rainy season								
Paddy	1.00	905	285	620	0.50	686	185	501
Vegetables	-	-	-	-	0.06	143	27	116
Total	1.35	1,255	390	865	1.56	2,250	588	1,671

Source: JICA Survey Team

(2) Impact of Increased Crop Production on Farm Household Economy

Another aim of financial evaluation is to grasp the impact of increased crop production in paddy field on household economy of beneficiary farmers. By referring to the results of the socio-economic survey conducted by JICA Survey Team, the average holding size of paddy field is estimated at 1.03 ha per farm household. Based on Table AG-2.2.3.1, the gross income of crop cultivation in this average holding size will increase by US\$ 1,025 or 79.3% from US\$ 1,293 to US\$ 2,318, while the net return defined as disposable income will increase by US\$ 830 or 93.1% from US\$ 891 to US\$ 1,721.

AG-2.3 Upper Slakou Irrigation System Rehabilitation Sub-project

AG-2.3.1 Economic Evaluation

(1) Economic Cost

The economic cost for USISRSP as shown in Table AG-2.3.1.1 is converted from the financial cost taking the above basic assumptions into account.

Table AG-2.3.1.1 Economic Cost for USISRSP

Cost Component	Foreign Currency Portion (US\$1,000)	Local Currency Portion (US\$1,000)	Total Economic Cost (US\$1,000)
Construction Cost for Main System of USISRSP	6,156	2,009	8,165
Tertiary System Development Cost	677	127	804
Procurement Cost	262	45	307
Mine Survey Cost	0	587	587
Soft Component Program Cost	159	873	1,032
Physical Contingency for the above	725	365	1,090
Consulting Services Cost including physical contingency	526	1,117	1,643
Total	8,505	5,123	13,628

Source: JICA Survey Team

After completing the proposed construction works, the following costs are regularly required:

- Economic O&M cost equivalent to 0.5% of sum of economic construction and tertiary system development costs; and
- Economic repairing cost equivalent to 5% of the above sum every 10 years.

(2) Economic Benefit

The economic benefit anticipated for USISRSP is to increase net cultivated areas by 380 ha through reuse of paddy field presently left fallow, net irrigation areas by 3,180 ha, and crop yield by 1.87 ton/ha of early maturity rice varieties, 1.41 ton/ha for medium rice maturities and around two times for irrigated vegetables.

Table AG-2.3.1.2 gives the incremental return generated in the USISRSP area.

Table AG-2.3.1.2 Incremental Net Return as Economic Benefit for USISRSP

Crop	Without Project			With Project			Increment Net Return (US\$1,000)
	Planted Area (ha)	Net Return (US\$/ha)	Amount (US\$1,000)	Planted Area (ha)	Net Return (US\$/ha)	Amount (US\$1,000)	
Paddy (Rain-fed early)	470	470	221	0	0	0	-221
Paddy (Rain-fed medium)	2,800	449	1,258	0	0	0	-1,258
Paddy (Irrigated early)	0	0	0	1,300	1,090	1,417	1,417
Paddy (Irrigated medium)	0	0	0	2,400	904	2,170	2,170
Vegetable	70	1,112	78	200	2,542	508	430
Total	3,340	-	1,557	3,900	-	4,095	2,538

Source: JICA Survey Team

(3) Cash Flow of Economic Cost and Benefit

The proposed rehabilitation works of the existing main system of USISRSP are scheduled to be completed in 2019, while the proposed implementation schedule of tertiary development system will start from 2017 and last 2020. Therefore, the incremental net return will be borne from 2019 and its full target will be realized in 2023. Based on such assumption, the cash flow of economic cost and benefit for USISRSP is set up as shown in Table AG-2.3.1.3.

Table AG-2.3.1.3 Cash Flow of Economic Cost and Benefit for USISRSP

(Unit: US\$1,000)

Item	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Investment cost	814	286	343	724	3,914	5,767	1,401	379	-	-	-	-
O&M cost	-	-	-	-	3	19	45	48	49	49	49	49
Increment benefit	-	-	-	-	-	-	1,193	2,059	2,426	2,538	2,538	2,538

Source: JICA Survey Team

(4) Economic Evaluation

Based on the above cash flow of economic cost and benefit, the economic evaluation is made in terms of NPV, B/C ratio and EIRR of the proposed rehabilitation plan. In addition, sensitivity analyses are done for such cases as cost 10% and 20% up, benefit 10% and 20% down, and combination of each case. The results of the economic evaluation are summarized in Table AG-2.3.1.4.

Table AG-2.3.1.4 Results of Economic Evaluation for USISRSP

Evaluation Item	Evaluation Results			
	NPV at 12% discount rate	NPV of benefit (US\$)	9,800,890	NPV (US\$)	1,864,948
	NPV of cost (US\$)	7,935,942		
B/C ratio and EIRR	B/C ratio	1.24	EIRR (%)	14.5
Sensitivity analysis (%)		Cost normal	Cost 10% up	Cost 20% up
	Benefit normal	14.5	13.3	12.3
	Benefit 10% down	13.2	12.1	11.2
	Benefit 20% down	11.9	10.9	10.0

Source: JICA Survey Team

AG-2.3.2 Financial Evaluation

(1) Capacity to Pay

Financial evaluation aims to examine how much beneficiary farmer's capacity to pay will increase and also presume how much an individual beneficiary farmer will be able to share annual O&M cost of irrigation system after implementing the proposed rehabilitation plan in the USISRSP Area. The crop planted area per 1-ha paddy field is anticipated to be 0.95 ha under the present/without project condition and 1.11 ha under the with-project condition. Based on such conditions, it is estimated that the annual net return will increase by US\$ 735 from US\$ 495 to US\$ 1,230 as shown in Table AG-2.3.2.1.

Table AG-2.3.2.1 Financial Crop Budget of 1-ha Paddy Field Holder in USISRSP Area

Crop	Without Project				With Project			
	Planted Area (ha)	Gross Income (US\$)	Production Cost (US\$)	Net Return (US\$)	Planted Area (ha)	Gross Income (US\$)	Production Cost (US\$)	Net Return (US\$)
Early rainy season								
Paddy	0.13	103	42	61	0.37	533	138	395
Rainy season								
Paddy	0.80	655	243	412	0.68	940	248	692
Vegetables	0.02	27	5	22	0.06	172	29	143
Full season								
Fallow	(0.05)	0	0	0	-	-	-	-
Total	0.95	785	290	495	1.11	1,645	415	1,230

Source: JICA Survey Team

According to the proposed plan, the required annual O&M cost of secondary and tertiary canal systems is estimated at US\$ 7.2/ha. Adding annual charge of management cost for FWUC and FWUG, every beneficiary farmer needs to pay annually about US\$ 10/ha. Compared with the predicted increase in farmer's capacity to pay by US\$ 735, this allocated annual O&M cost is affordable to the respective beneficiaries. Same situation can be expected among beneficiary farmers' society in the USISRSP Area.

(2) Impact of Increased Crop Production on Farm Household Economy

Another aim of financial evaluation is to grasp the impact of increased crop production in paddy field on household economy of beneficiary farmers. By referring to the results of the socio-economic survey conducted by JICA Survey Team, the average holding size of paddy field is estimated at 1.08 ha per farm household. Based on Table AG-2.3.2.1, the gross income of crop cultivation in this average holding size will increase by US\$ 929 or 109.6% from US\$ 848 to US\$ 1,377, while the net return defined as disposable income will increase by US\$ 793 or 148.5% from US\$ 535 to US\$ 1,328.

AG-2.4 Kandal Stung-Bati Irrigation System Rehabilitation Sub-project

AG-2.4.1 Economic Evaluation

(1) Economic Cost

The economic cost for KSBISRSP as shown in Table AG-2.4.1.1 is converted from the financial cost taking the above basic assumptions into account and excluding the pre-investment component of connecting canal construction cost for the future extension area.

Table AG-2.4.1.1 Economic Cost for KSBISRSP

Cost Component	Foreign Currency Portion (US\$1,000)	Local Currency Portion (US\$1,000)	Total Economic Cost (US\$1,000)
Construction Cost for Main System of KSBISRSP	6,499	2,681	9,180
Tertiary System Development Cost	743	155	898
Procurement Cost	304	68	372
Mine Survey Cost	0	391	391
Soft Component Program Cost	80	437	517
Physical Contingency for the above	763	373	1,136
Consulting Services Cost including physical contingency	610	1,611	2,221
Total	8,999	5,716	14,715

Source: JICA Survey Team

After completing the proposed construction works, the following costs are regularly required:

- Economic O&M cost equivalent to 0.5% of sum of economic construction and tertiary system development costs; and
- Economic repairing cost equivalent to 5% of the above sum every 10 years.

(2) Economic Benefit

The economic benefit anticipated for KSBISRSP is to increase net cultivated areas for the early rainy season by 2,540 ha of early maturity rice varieties with paddy yield increase from 2.58 ton/ha under supplemental irrigation condition at present to 4.00 ton/ha under full irrigated condition in the future as well as during the rainy season to switch 500 ha existing irrigated paddy fields from early maturity to medium rice varieties and 2,850 ha paddy fields from rain-fed to irrigated condition for growing medium rice varieties with increase in paddy yield by 0.92 ton/ha and 1.42 ton/ha, respectively.

Table AG-2.4.1.2 gives the incremental return generated in the KSBISRSP Area.

Table AG-2.4.1.2 Incremental Net Return as Economic Benefit for KSBISRSP

Crop	Without Project			With Project			Increment Net Return (US\$1,000)
	Planted Area (ha)	Net Return (US\$/ha)	Amount (US\$1,000)	Planted Area (ha)	Net Return (US\$/ha)	Amount (US\$1,000)	
Paddy (Rain-fed early)	140	546	76	0	0	0	-76
Paddy (Rain-fed medium)	2,850	428	1,219	0	0	0	-1,219
Paddy (Irrigated early)	500	407	204	2,680	935	2,505	2,301
Paddy (Irrigated medium)	0	0	0	3,350	728	2,608	2,608
Vegetable	0	0	0	0	0	0	0
Total	3,490	-	1,499	6,030	-	5,113	3,614

Source: JICA Survey Team

(3) Cash Flow of Economic Cost and Benefit

The proposed rehabilitation works of the existing main system of KSBISRSP are scheduled to be completed in 2019, while the proposed implementation schedule of tertiary development system will start from 2017 and last 2020. Therefore, the incremental net return will be borne from 2018 and its full target will be realized in 2022. Based on such assumption, the cash flow of economic cost and benefit for KSBISRSP is set up as shown in Table AG-2.4.1.3.

Table AG-2.4.1.3 Cash Flow of Economic Cost and Benefit for KSBISRSP

Item	(Unit: US\$1,000)												
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	
Investment cost	635	338	395	845	2,852	5,452	3,834	365	-	-	-	-	
O&M cost	-	-	-	-	3	15	39	55	55	55	55	55	
Increment benefit	-	-	-	-	-	821	1,871	3,070	3,446	3,614	3,614	3,614	

Source: JICA Survey Team

(4) Economic Evaluation

Based on the above cash flow of economic cost and benefit, the economic evaluation is made in terms of NPV, B/C ratio and EIRR of the proposed rehabilitation plan. In addition, sensitivity analyses are done for such cases as cost 10% and 20% up, benefit 10% and 20% down, and combination of each case. The results of the economic evaluation are summarized in Table AG-2.4.1.4.

Table AG-2.4.1.4 Results of Economic Evaluation for KSBISRSP

Evaluation Item	Evaluation Results			
	NPV at 12% discount rate	NPV of benefit (US\$)	14,500,827	NPV (US\$)	6,202,694
	NPV of cost (US\$)	8,298,133		
B/C ratio and EIRR	B/C ratio	1.75	EIRR (%)	20.0
Sensitivity analysis (%)		Cost normal	Cost 10% up	Cost 20% up
	Benefit normal	20.0	18.4	17.1
	Benefit 10% down	18.3	16.8	15.5
	Benefit 20% down	16.5	15.1	13.9

Source: JICA Survey Team

AG-2.4.2 Financial Evaluation

(1) Capacity to Pay

Financial evaluation aims to examine how much beneficiary farmer's capacity to pay will increase and also presume how much an individual beneficiary farmer will be able to share annual O&M cost of irrigation system after the implementation of proposed rehabilitation plan in the KSBISRSP Area. The crop planted area per 1-ha paddy field is anticipated to be 1.00 ha under the present/without project condition and 1.73 ha under the with-project condition. Based on such conditions, it is estimated that the annual net return will increase by US\$ 784 from US\$ 395 to US\$ 1,179 as shown in Table AG-2.4.2.1.

Table AG-2.4.2.1 Financial Crop Budget of 1-ha Paddy Field Holder in KSBISRSP Area

Crop	Without Project				With Project			
	Planted Area (ha)	Gross Income (US\$)	Production Cost (US\$)	Net Return (US\$)	Planted Area (ha)	Gross Income (US\$)	Production Cost (US\$)	Net Return (US\$)
Early rainy season								
Early rice	0.04	40	26	14	0.77	1,105	556	549
Rainy season								
Early rice	0.14	124	74	50	-	-	-	-
Medium rice	0.82	671	340	331	0.96	1,316	686	630
Total	1.00	835	440	395	1.73	2,421	1,242	1,179

Source: JICA Survey Team

According to the proposed plan, the required annual O&M cost of Secondary and Tertiary Canal Systems is estimated at US\$ 3.5/ha. Adding annual charge of management cost for FWUC and FWUG, every beneficiary farmer needs to pay annually about US\$ 5/ha. Compared with the predicted increase in farmer's capacity to pay by US\$ 784, this allocated annual O&M cost is affordable to the respective beneficiaries. Same situation can be expected among beneficiary farmers' society in the KSBISRSP area.

(2) Impact of Increased Crop Production on Farm Household Economy

Another aim of financial evaluation is to grasp the impact of increased crop production in paddy field on household economy of beneficiary farmers. By referring to the results of the socio-economic survey conducted by JICA Survey Team, the average holding size of paddy field is estimated at 0.83 ha per farm household. Based on Table AG-2.4.2.1, the gross income of crop cultivation in this average holding size will increase by US\$ 1,316 or 189.9% from US\$ 693 to US\$ 2,009, while the net return defined as disposable income will increase by US\$ 651 or 198.5% from US\$ 328 to US\$ 979.

AG-2.5 Main Canal 35 Rehabilitation Sub-project

AG-2.5.1 Economic Evaluation

(1) Economic Cost

The economic cost for MA35RSP as shown in Table AG-2.5.1.1 is converted from the financial cost taking the above basic assumptions into account.

Table AG-2.5.1.1 Economic Cost for MC35RSP

Cost Component	Foreign Currency Portion (US\$1,000)	Local Currency Portion (US\$1,000)	Total Economic Cost (US\$1,000)
Construction Cost for Main System of MC35RSP	1,800	544	2,344
Tertiary System Development Cost	189	40	229
Procurement Cost	82	13	95
Mine Survey Cost	0	0	0
Soft Component Program Cost	39	212	251
Physical Contingency for the above	211	81	292
Consulting Services Cost including physical contingency	165	333	498
Total	2,486	1,223	3,709

Source: JICA Survey Team

After completing the proposed construction works, the following costs are regularly required:

- Economic O&M cost equivalent to 0.5% of sum of economic construction and tertiary system development costs; and
- Economic repairing cost equivalent to 5% of the above sum every 10 years.

(2) Economic Benefit

The economic benefit anticipated for MC35RSP is to increase in net cultivated areas of early maturity rice varieties by 130 ha for the early rainy season and paddy yield increase by 1.41 ton/ha of medium maturity rice varieties for the rainy season through new irrigation water supply, although the planted areas in this season will reduce by 50 ha in order to allocate farm land for constructing new irrigation canals. Table AG-2.5.1.2 gives the incremental return generated in the MC35RSP Area.

Table AG-2.5.1.2 Incremental Net Return as Economic Benefit for MC35RSP

Crop	Without Project			With Project			Increment Net Return (US\$1,000)
	Planted Area (ha)	Net Return (US\$/ha)	Amount (US\$1,000)	Planted Area (ha)	Net Return (US\$/ha)	Amount (US\$1,000)	
Paddy (Rain-fed early)	0	0	0	0	0	0	0
Paddy (Rain-fed medium)	900	467	420	0	0	0	-420
Paddy (Irrigated early)	0	0	0	130	1,085	141	141
Paddy (Irrigated medium)	0	0	0	850	899	764	764
Vegetable	0	0	0	0	0	0	0
Total	900	-	420	980	-	905	485

Source: JICA Survey Team

(3) Cash Flow of Economic Cost and Benefit

The proposed rehabilitation works of the existing main system of MC35RSP are scheduled to be completed in 2019, while the proposed implementation schedule of tertiary development system will start from 2019 and last 2020. Therefore, the incremental net return will be borne from 2018 and its full target will be realized in 2021. Based on such assumption, the cash flow of economic cost and benefit for MC35RSP is set up as shown in Table AG-2.5.1.3.

Table AG-2.5.1.3 Cash Flow of Economic Cost and Benefit for MC35RSP

(Unit: US\$1,000)

Item	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Investment cost	52	83	102	274	1,505	1,109	470	113	-	-	-	-
O&M cost	-	-	-	-	1	8	12	14	14	19	19	19
Increment benefit	-	-	-	-	-	156	360	446	485	485	485	485

Source: JICA Survey Team

(4) Economic Evaluation

Based on the above cash flow of economic cost and benefit, the economic evaluation is made in terms of NPV, B/C ratio and EIRR of the proposed rehabilitation plan. In addition, sensitivity analyses are

done for such cases as cost 10% and 20% up, benefit 10% and 20% down, and combination of each case. The results of the economic evaluation are summarized in Table AG-2.5.1.4.

Table AG-2.5.1.4 Results of Economic Evaluation for MC35RSP

Evaluation Item	Evaluation Results			
	NPV at 12% discount rate	NPV of benefit (US\$)	2,040,807	NPV (US\$)	-119,055
	NPV of cost (US\$)	2,159,862		
B/C ratio and EIRR	B/C ratio	0.94	EIRR (%)	11.3
Sensitivity analysis (%)		Cost normal	Cost 10% up	Cost 20% up
	Benefit normal	11.3	10.2	9.3
	Benefit 10% down	10.1	9.1	8.2
	Benefit 20% down	8.9	7.9	7.1

Source: JICA Survey Team

AG-2.5.2 Financial Evaluation

(1) Capacity to Pay

Financial evaluation aims to examine how much beneficiary farmer's capacity to pay will increase and also presume how much an individual beneficiary farmer will be able to share annual O&M cost of irrigation system after the implementation of proposed rehabilitation plan in the MC35RSP Area. The crop planted area per 1-ha paddy field is anticipated to be 1.00 ha under the present/without project condition and 1.08 ha under the with-project condition. Based on such conditions, it is estimated that the annual net return will increase by US\$ 539 from US\$ 524 to US\$ 1,063 as shown in Table AG-2.5.2.1.

Table AG-2.5.2.1 Financial Crop Budget of 1-ha Paddy Field Holder in MC35RSP Area

Crop	Without Project				With Project			
	Planted Area (ha)	Gross Income (US\$)	Production Cost (US\$)	Net Return (US\$)	Planted Area (ha)	Gross Income (US\$)	Production Cost (US\$)	Net Return (US\$)
Early rainy season								
Paddy	-	-	-	-	0.14	201	56	145
Rainy season					0.94	1,289	371	918
Paddy	1.00	819	295	524	-	-	-	-
Total	1.00	819	295	524	1.08	1,490	4,27	1,063

Source: JICA Survey Team

According to the proposed plan, the required annual O&M cost of Secondary and Tertiary Canal Systems is estimated at US\$ 6.6/ha. Adding annual charge of management cost for FWUC and FWUG, every beneficiary farmer needs to pay annually about US\$ 9/ha. Compared with the predicted increase in farmer's capacity to pay by US\$ 539/ha, this allocated annual O&M cost is affordable to the respective beneficiaries. Same situation can be expected among beneficiary farmers' society in the MC35RSP Area.

(2) Impact of Increased Crop Production on Farm Household Economy

Another aim of financial evaluation is to grasp the impact of increased crop production in paddy field on household economy of beneficiary farmers. By referring to the latest population and farm household data of relevant communes as of 2010, the average holding size of paddy field is estimated at 0.79 ha per farm household. Based on Table AG-2.5.2.1, the gross income of crop cultivation in this average holding size will increase by US\$ 530 or 81.9% from US\$ 647 to US\$ 1,177, while the net return defined as disposable income will increase by US\$ 426 or 102.9% from US\$ 414 to US\$ 840.

AG-2.6 Srrass Prambai Water Recession Rehabilitation Sub-project

AG-2.6.1 Economic Evaluation

(1) Economic Cost

The economic cost for SPWRRSP as shown in Table AG-2.6.1.1 is converted from the financial cost taking the above basic assumptions into account.

After completing the proposed construction works, the following costs are regularly required:

- Economic O&M cost equivalent to 0.5% of sum of economic construction and tertiary system development costs; and
- Economic repairing cost equivalent to 5% of the above sum every 10 years.

Table AG-2.6.1.1 Economic Cost for SPWRRSP

Cost Component	Foreign Currency Portion (US\$1,000)	Local Currency Portion (US\$1,000)	Total Economic Cost (US\$1,000)
Construction Cost for Main System of SPWRRSP	2,273	534	2,807
Tertiary System Development Cost	0	0	0
Procurement Cost	97	11	108
Mine Survey Cost	0	0	0
Soft Component Program Cost	55	299	354
Physical Contingency for the above	242	85	327
Consulting Services Cost including physical contingency	194	239	433
Total	2,861	1,168	4,029

Source: JICA Survey Team

(2) Economic Benefit

The economic benefit anticipated for SPWRRSP is to increase net cultivated areas for the dry season by 500 ha through reuse of paddy field presently left fallow through construction of a new reservoir and new irrigation areas of 70 ha for the early rainy season as well as to increase paddy yield by 1.50 ton/ha for early maturity rice varieties grown in the dry season. Table AG-2.6.1.2 gives the incremental return generated in the SPWRRSP Area.

Table AG-2.6.1.2 Incremental Net Return as Economic Benefit for SPWRRSP

Crop	Without Project			With Project			Increment Net Return (US\$1,000)
	Planted Area (ha)	Net Return (US\$/ha)	Amount (US\$1,000)	Planted Area (ha)	Net Return (US\$/ha)	Amount (US\$1,000)	
Early rainy season							
Paddy	0	0	0	70	1,256	88	88
Dry season							
Paddy	700	854	598	1,200	1,241	1,490	892
Total	700	-	598	1,270	-	1,578	980

Source: JICA Survey Team

(3) Cash Flow of Economic Cost and Benefit

The proposed construction works of new water resources facilities with rehabilitation works of the existing water distribution system of SPWRRSP are scheduled to be completed in 2017, while no other facilities will be provided. Therefore, the incremental net return will be borne from 2018 and its full target will be realized in 2020. Based on such assumption, the cash flow of economic cost and benefit for SPWRRSP is set up as shown in Table AG-2.6.1.3.

Table AG-2.6.1.3 Cash Flow of Economic Cost and Benefit for SPWRRSP

(Unit: US\$1,000)

Item	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Investment cost	59	94	89	649	2,695	163	205	74	-	-	-	-
O&M cost	-	-	-	-	3	15	15	15	15	15	15	15
Increment benefit	-	-	-	-	-	680	855	980	980	980	980	980

Source: JICA Survey Team

(4) Economic Evaluation

Based on the above cash flow of economic cost and benefit, the economic evaluation is made in terms of NPV, B/C ratio and EIRR of the proposed rehabilitation plan. In addition, sensitivity analyses are done for such cases as cost 10% and 20% up, benefit 10% and 20% down, and combination of each case. The results of the economic evaluation are summarized in Table AG-2.6.1.4.

Table AG-2.6.1.4 Results of Economic Evaluation for SPWRRSP

Evaluation Item	Evaluation Results				
NPV at 12% discount rate	NPV of benefit (US\$)	4,397,982		NPV (US\$)	1,944,349
	NPV of cost (US\$)	2,453,633			
B/C ratio and EIRR	B/C ratio	1.79		EIRR (%):	21.0
		Cost normal	Cost 10% up	Cost 20% up	
Sensitivity analysis (%)	Benefit normal	21.0	19.3	17.8	
	Benefit 10% down	19.1	17.5	16.1	
	Benefit 20% down	17.1	15.6	14.3	

Source: JICA Survey Team

AG-2.6.2 Financial Evaluation**(1) Capacity to Pay**

Financial evaluation aims to examine how much beneficiary farmer's capacity to pay will increase and also presume how much an individual beneficiary farmer will be able to share annual O&M cost of irrigation system after the implementation of proposed rehabilitation plan in the SPWRRSP Area. The crop planted area per 1-ha paddy field is anticipated to be 0.58 ha under the present/without project condition and 1.06 ha under the with-project condition. Based on such conditions, it is estimated that the annual net return will increase by US\$ 666 from US\$ 382 to US\$ 1,048 as shown in Table AG-2.6.2.1.

Table AG-2.6.2.1 Financial Crop Budget of 1-ha Paddy Field Holder in SPWRRSP Area

Crop	Without Project				With Project			
	Planted Area (ha)	Gross Income (US\$)	Production Cost (US\$)	Net Return (US\$)	Planted Area (ha)	Gross Income (US\$)	Production Cost (US\$)	Net Return (US\$)
Early rainy season								
Paddy	-	-	-	-	0.06	108	48	60
Dry season								
Paddy	0.58	728	346	382	1.00	1,794	806	988
Total	0.58	728	346	382	1.06	1,902	854	1,048

Source: JICA Survey Team

According to the proposed plan, the required annual O&M cost of water resources facilities is estimated at US\$ 8.8/ha. Adding annual charge of management cost for FWUC and FWUG, every beneficiary farmer needs to pay annually about US\$ 12/ha. Compared with the predicted increase in farmer's capacity to pay by US\$ 666, this allocated annual O&M cost is affordable to the respective beneficiaries. Same situation can be expected among beneficiary farmers' society in the SPWRRSP Area.

(2) Impact of Increased Crop Production on Farm Household Economy

Another aim of financial evaluation is to grasp the impact of increased crop production in paddy field on household economy of beneficiary farmers. By referring to the latest population and farm household data of relevant communes as of 2010, the average holding size of paddy field is estimated at 0.39 ha per farm household. Based on Table AG-2.6.2.1, the gross income of crop cultivation in this average holding size will increase by US\$ 458 or 161.3% from US\$ 284 to US\$ 742, while the net return defined as disposable income will increase by US\$ 260 or 174.3% from US\$ 149 to US\$ 409.

AG-2.7 Daun Pue Irrigation System Rehabilitation Sub-project**AG-2.7.1 Economic Evaluation**

(1) Economic Cost

The economic cost for DPISRSP as shown in Table AG-2.7.1.1 is converted from the financial cost taking the above basic assumptions into account.

Table AG-2.7.1.1 Economic Cost for DPISRSP

Cost Component	Foreign Currency Portion (US\$1,000)	Local Currency Portion (US\$1,000)	Total Economic Cost (US\$1,000)
Construction Cost for Main System of DPISRSP	3,479	1,322	4,801
Tertiary System Development Cost	256	54	310
Procurement Cost	148	28	176
Mine Survey Cost	0	196	196
Soft Component Program Cost	52	287	339
Physical Contingency for the above	394	188	582
Consulting Services Cost including physical contingency	297	653	950
Total	4,626	2,728	7,354

Source: JICA Survey Team

After completing the proposed construction works, the following costs are regularly required:

- Economic O&M cost equivalent to 0.5% of sum of economic construction and tertiary system development costs; and
- Economic repairing cost equivalent to 5% of the above sum every 10 years.

(2) Economic Benefit

The economic benefit anticipated for DPISRSP is to switch 1,060 ha rain-fed areas to irrigated paddy fields for the rainy season and increase additional 90 ha irrigated paddy fields for the rainy season by providing irrigation facilities coupled with increase in paddy yield by 0.92 ton/ha for medium maturity rice varieties. Table AG-2.7.1.2 gives the incremental return generated in the DPISRSP Area.

Table AG-2.7.1.2 Incremental Net Return as Economic Benefit for DPISRSP

Crop	Without Project			With Project			Increment Net Return (US\$1,000)
	Planted Area (ha)	Net Return (US\$/ha)	Amount (US\$1,000)	Planted Area (ha)	Net Return (US\$/ha)	Amount (US\$1,000)	
Paddy (Rain-fed early)	0	0	0	0	0	0	0
Paddy (Rain-fed medium)	1,060	467	495	0	0	0	-495
Paddy (Irrigated early)	0	0	0	0	0	0	0
Paddy (Irrigated medium)	0	0	0	1,150	928	1,068	1,068
Vegetable	0	0	0	0	0	0	0
Total	1,060	-	495	1,150	-	1,068	573

Source: JICA Survey Team

(3) Cash Flow of Economic Cost and Benefit

The proposed rehabilitation works of the existing main system of DPISRSP are scheduled to be completed in 2019, while the proposed implementation schedule of tertiary development system will start from 2019 and last 2020. Therefore, the incremental net return will be borne from 2018 and its full target will be realized in 2023. Based on such assumption, the cash flow of economic cost and benefit for DPISRSP is set up as shown in Table AG-2.7.1.3.

Table AG-2.7.1.3 Cash Flow of Economic Cost and Benefit for DPISRSP

(Unit: US\$1,000)

Item	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Investment cost	312	156	169	375	878	2,998	2,210	256	-	-	-	-
O&M cost	-	-	-	-	1	4	18	27	28	28	28	28
Increment benefit	-	-	-	-	-	184	425	481	573	573	573	573

Source: JICA Survey Team

(4) Economic Evaluation

Based on the above cash flow of economic cost and benefit, the economic evaluation is made in terms of NPV, B/C ratio and EIRR of the proposed rehabilitation plan. In addition, sensitivity analyses are done for such cases as cost 10% and 20% up, benefit 10% and 20% down, and combination of each case. The results of the economic evaluation are summarized in Table AG-2.7.1.4.

Table AG-2.7.1.4 Results of Economic Evaluation for DPISRSP

Evaluation Item	Evaluation Results			
	NPV at 12% discount rate	NPV of benefit (US\$)	2,391.193	NPV (US\$)	-1,681,475
	NPV of cost (US\$)	4,072,668		
B/C ratio and EIRR	B/C ratio	0.59	EIRR (%):	6.5
Sensitivity analysis (%)		Cost normal	Cost 10% up	Cost 20% up
	Benefit normal	6.5	5.7	5.0
	Benefit 10% down	5.6	4.9	4.2
	Benefit 20% down	4.7	4.0	Less than 3.0

Source: JICA Survey Team

AG-2.7.2 Financial Evaluation

(1) Capacity to Pay

Financial evaluation aims to examine how much beneficiary farmer's capacity to pay will increase and also presume how much an individual beneficiary farmer will be able to share annual O&M cost of irrigation system after the implementation of proposed rehabilitation plan in the DPISRSP Area. The crop planted area per 1-ha paddy field is anticipated to be 0.88 ha under the present/without project condition and 0.95 ha under the with-project condition. Based on such conditions, it is estimated that the annual net return will increase by US\$ 686 from US\$ 546 to US\$ 1,232 as shown in Table AG-2.7.2.1,

Table AG-2.7.2.1 Financial Crop Budget of 1-ha Paddy Field Holder in DPISRSP Area

Crop	Without Project				With Project			
	Planted Area (ha)	Gross Income (US\$)	Production Cost (US\$)	Net Return (US\$)	Planted Area (ha)	Gross Income (US\$)	Production Cost (US\$)	Net Return (US\$)
Early rainy season								
Paddy	-	-	-	-	-	-	-	-
Rainy season								
Paddy	0.88	721	280	461	0.95	1,303	375	928
Total	0.88	721	280	461	0.95	1,303	375	928

Source: JICA Survey Team

According to the proposed plan, the required annual O&M cost of Secondary and Tertiary Canal Systems is estimated at US\$ 3.9/ha. Adding annual charge of management cost for FWUC and FWUG, every beneficiary farmer needs to pay annually about US\$ 6/ha. Compared with the predicted increase in farmer's capacity to pay by US\$ 686, this allocated annual O&M cost is affordable to the respective beneficiaries. Same situation can be expected among beneficiary farmers' society in the DPISRSP Area.

(2) Impact of Increased Crop Production on Farm Household Economy

Another aim of financial evaluation is to grasp the impact of increased crop production in paddy field on household economy of beneficiary farmers. By referring to the latest population and farm household data of relevant communes as of 2010, the average holding size of paddy field is estimated at 1.77 ha per farm household. Based on Table AG-2.7.2.1, the gross income of crop cultivation in this average holding size will increase by US\$ 1,030 or 80.7% from US\$ 1,276 to US\$ 2,306, while the net return defined as disposable income will increase by US\$ 827 or 101.3% from US\$ 816 to US\$ 1,643.

AG-2.8 Indirect Benefits and Socio-economic Impact

As a typical case of indirect benefits generated through implementation of the proposed construction and rehabilitation works, temporary employment opportunities will be generated in and around the six sub-project areas of SPPIDRIP. It is predicted that the total requirement of unskilled labors is around 1.3 million person-days during the 4-year construction period. Except for peak time of farm operation like transplanting and harvesting, therefore, local residents will be able to earn additional cash income if they intend to utilize such temporary job opportunities. The total households in 82 Communes where 6 Sub-projects are located are estimated at around 104,000, of which about 40% is engaged in farming activities according to the result of Socio-Economic Survey conducted by JICA Survey Team in August 2011. Thus, it is expected that extra cash income for one farm household can be earned by taking advantages of such temporary job opportunity for 31 person-days on an average.

Concerning socio-economic impacts when implemented, the proposed project would create various impacts on the direct beneficiaries attributable to an increase in their net household income are expected:

- To enable them to improve nutritionally balanced diet and primary health care conditions of their family members;
- To ensure their children complete primary schooling, access higher education and participate in the early childhood education program; and;
- To enable them to buy goods and services as well as luxuries for meeting families' needs contributing to rural economy with positive effects.

Additional socio-economic impact expected through adding funds amounting to US\$ 1,200,000 for de-mining to the project cost for USISRSP, KSBISRSP and DPISRSP is to contribute to reduction of casualties from landmines and explosive remnants of war, as the period for landmine clearance was officially decided by the government to extend until 2019 in order to clear another 47,000 ha.

AG-2.9 Operation and Effect Indicators

AG-2.9.1 Operation Indicators

Operation indicators proposed for monitoring SPPIDRIP are listed in Table AG-2.9.1.1. The project benefit is to be borne from the next year after the completion of civil works and reach to the target yield

in the third year. For the case of RCHRSP, operation indicators need to be selected from hydrological viewpoints in order to confirm whether the design capacities of diversion systems will be maintained at the original level to ensure satisfaction of irrigation water demand in command areas.

Table AG-2.9.1.1 Operation Indicators for SPPIDRIP

Indicator / Sub-project	Unit	RCHRSP	USISRSP	KSBISRSP	MC35RSP	SPWRRSP	DPISRSP
Net irrigation area	ha	570	2,400	3,350	850	1,200	1,150
Planted area of paddy	ha	855	3,700	6,030	980	1,270	1,150
Cropping intensity of paddy	%	150	154	189	115	106	100
Establishment of FWUC							
- FWUC	nos.	1	1	1	1	1	1
- FWUG	nos.	3	14	18	6	5	4
- Sub-FWUG	nos.	22	106	67	20	-	23
Collection rate of water charge	%	90	80	80	80	80	80
Design discharge							
- Roleang Chrey Regulator*	m ³ /s	5.0	-	-	-	-	-
- Andong Sla Intake Gate	m ³ /s	10.3	-	-	-	-	-
- Vat Krouch Intake Gate	m ³ /s	16.3	-	-	-	-	-

Note: *: Discharge consists of river maintenance flow and responsible discharge for downstream irrigation areas.

Source: JICA Survey Team

AG-2.9.2 Effect Indicators

Effect indicators selected for monitoring the first type of predicted benefits to be born through the proposed development or rehabilitation of irrigation and drainage systems are paddy yield and production at the end of build-up period that is the fourth year after practicing improved farming method. These indicators are to be applied to four sub-projects, USISRSP, KSBISRSP, MC35RSP and DPISRSP as well as the model area of RCHRSP. As for the second type of predicted benefits attributable to creation of the proposed water source facility, paddy yield and production for the dry season are taken up as effective indicators taking the access condition to SPWRRSP site into account. Concerning the third type of predicted project benefits, recovery condition of irrigation water supply area is to be provisionally selected as a qualitative indicator until improvement works of main and secondary canal systems as well as tertiary system development works will be undertaken. At that time, it will be required to carry out a baseline survey aiming at collection of relevant data to the both operation and effect indicators. The effective indicators selected are summarized in Table AG-2.9.2.1.

Table AG-2.9.2.1 Effect Indicators for SPPIDRIP

Type of Project Benefit Sub-project	Unit	1st & 3rd	1st				2nd
		RCHRSP	USISRSP	KSBISRSP	MC35RSP	DPISRSP	SPWRRSP
Paddy yield for early rainy season							
- Early maturity variety	ton/ha	4.00	4.00	4.00	4.00	-	-
Paddy yield for rainy season							
- Medium maturity variety	ton/ha	3.50	3.50	3.50	3.50	3.50	-
Paddy yield for dry season							
- Early maturity variety	ton/ha	-	-	-	-	-	5.00
Paddy production (annual)							
- Annual	ton	3,278	13,600	23,445	3,495	4,025	-
- Dry season	ton	-	-	-	-	-	6,000
Irrigation water supply area	ha	10,270	-	-	-	-	-

Source: JICA Survey Team

AG-2.9.3 Procedures for Monitoring Operation and Effect Indicators

The operation and effect indicators above mentioned will be collected by the persons concerned who will carry out baseline survey and monitoring and evaluation activities (M&E). Based on the collected data, monthly, quarterly and annual report will be prepared by them. After finishing the project, M&E activity will be handed over to MOWRAM.

ANNEX H

Environmental and Social Consideration

PREPARATORY SURVEY
FOR
IRRIGATION AND DRAINAGE SYSTEM
REHABILITATION AND IMPROVEMENT PROJECT
IN
THE KINGDOM OF CAMBODIA

ANNEX H
ENVIRONMENTAL AND SOCIAL CONSIDERATION

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ANNEX H

ENVIRONMENTAL AND SOCIAL CONSIDERATION

CHAPTER AH-1 GENERAL INFORMATION

AH-1.1 List of Related Laws, Sub-decrees and Regulations

Environmental Protection and Natural Resources Management was prepared by the Ministry of Environment (MOE) from 1993 to 1995 and was passed by the National Assembly on 24 December 1998. This is the supreme legal instrument governing environmental protection and natural resources management.

In order to ensure the contents of Environmental Protection and Natural Resources Management and implement environmental protection and management in practice, the following sub-decrees were issued.

- Sub-decree on the Environmental Impact Assessment Process (1999)
- Sub-decree on Water Pollution Control (1999)
- Sub-decree on Solid Waste Management (1999)
- Sub-decree on Air and Noise Pollution Control (2000)

Relevant environmental laws and regulation in Cambodia are listed in the following table.

Table AH-1.1.1 Related Laws , Sub-decrees and Regulations

Title	Provisions
Basic Law	
Law on Environmental Protection and Natural Resources Management (1996)	Development of national and regional environmental plans; environmental impact assessments; natural resources management; environmental protection; monitoring and inspection; public participation and information disclosure; environmental endowment funds; and penalties.
Institution	
Sub-decree on Organization and Functions of Ministry of Environment (1997)	National Environmental Plan and Regional Environmental Plans are required to be drawn up, reviewed and revised once every five years..The functions and the structure of MOE and the function of each of the seven departments. Each provincial level authority and district is to establish a department of environment and a district agency of environment respectively.
Declaration on the Organization of the Provincial and Municipal Environment Department (1999)	Provincial and municipal responsibilities in environmental management. Illegal activities carried out in national protected areas, inspection and monitoring of pollution sources, environmental education programs and data management.
Environmental Impact Assessment	
Sub-decree on the Environmental Impact Assessment Process (1999)	The project owner shall conduct an IEIA for a project to determine whether an EIA is required. If a project requires a full-scale EIA report as judged by the MOE, a project owner shall conduct and submit the EIA report. MOE has the responsibility to evaluate and review the IEIA/EIA reports.
Guideline for conducting Environmental Impact Assessment Report (Draft)	The project's owners should prepare an EIA report with at least the following contents; (1) Project summary, (2) Introduction, (3) Purpose of SPPIDRIP, (4) Project Description, (5) Description of Environmental Resources, (6) Public Participation, (7) Environmental Impact Analysis, (8) Environmental Impact Mitigation Measures, (9) Economic Analysis and the Environmental Value, (10) Environmental Management Plan, (11) Institutional Capacity, (12) Conclusions and Recommendations, (13) References.
Pollution Control	
Sub-decree on Water Pollution Control (1999)	Standard for effluent discharge from any source of pollution and public water is stipulated. MOE has responsibility for monitoring of the pollution sources and the situation of the water pollution in public water bodies.

Title	Provisions
Sub-decree on Solid Waste Management (1999)	MOE shall establish guidelines on household waste management and hazardous waste management. The authorities of the provinces and cities shall establish the waste management plan and have the responsibility for the collection, transport, storage, recycling, minimizing and dumping of waste.
Sub-decree on Air and Noise Pollution Control (2000)	Maximum allowable concentration of hazardous substances in ambient air; maximum allowable standard of pollution substance for immobile sources in the ambient air; ambient air quality standard; and maximum permitted noise level in public areas.
Land	
Constitution (1993)	Based on the right to ownership of all persons, individually or collectively, the right to confiscate (land) possession from any person shall be exercised only in the public interest as provided for under the law with fair and just compensation in advance.
Land Law (2001)	Some provisions relevant to land ownership and property rights, land acquisition for public works, resettlement aspects and a legal requirement for compensation for land lost.
Expropriation Law (2010)	This law is based on existing Cambodian laws such as the constitution, land laws, and other regulations relevant to resettlement issues.
Sub-decree on Social Land Concession (2003)	The sub-decree defines the criteria, procedures, and mechanism for granting and transferring state private land to the poor residential and/or family farming purpose. The sub-decree not only provides land; it includes provision of basic infrastructure and services in order to improve the living standards and livelihood of recipient families.
Guideline for conducting Environmental Impact Assessment Report (Draft)	The project's owners should prepare an EIA report with at least the following contents; (1) Project summary, (2) Introduction, (3) Purpose of SPPIIDRIP, (4) Project Description, (5) Description of Environmental Resources, (6) Public Participation, (7) Environmental Impact Analysis, (8) Environmental Impact Mitigation Measures, (9) Economic Analysis and the Environmental Value, (10) Environmental Management Plan, (11) Institutional Capacity, (12) Conclusions and Recommendations, (13) References.
Protected Area	
Decree on Creation and Designation of Protected Areas (1993)	National protected areas, which are managed and supervised for the development and protection of natural areas by the Secretariat of Environment, are classified into four categories; (1) National parks, (2) Wildlife sanctuaries, (3) Protected landscapes, and (4) Multiple use areas.
Declaration No.1033 on Protected Areas (1994)	Prohibited activities include hunting, deforestation, exploitation of minerals, water pollution activities within the protected areas.

Source: JICA Survey Team based on relevant laws and regulations

AH-1.2 Environmental Impact Assessment

(1) Fundamental Law and Regulations

(a) Law on Environmental Protection and Natural Resource Management (1996)

It is the fundamental law of environment in Cambodia in which chapter III stimulates Environmental Impact Assessment (EIA). Article 6 in this chapter stimulates that EIA shall be conducted on every project and activity of the private or public, and shall be approved by MOE before being submitted to the Royal Government of Cambodia (RGC) for decision. It also stipulates that this assessment shall also be conducted for existing activities that have not yet been assessed for environmental impact.

(b) Sub-decree on Environmental Impact Assessment Process (1999)

This sub-decree stipulates the definition of "EIA", obligation of submission of EIA Report, target project types and public participation. Sub-decree stipulates the criterion of necessity of EIA in Cambodia as type of project and their size and capacity.

(c) Prakas (Declaration) on Guideline for Conducting Environmental Impact Assessment Reports (2000)

This Declaration stipulated first that Department of Environmental Impact Assessment (DEIA) in MOE is the unit in charge of EIA.

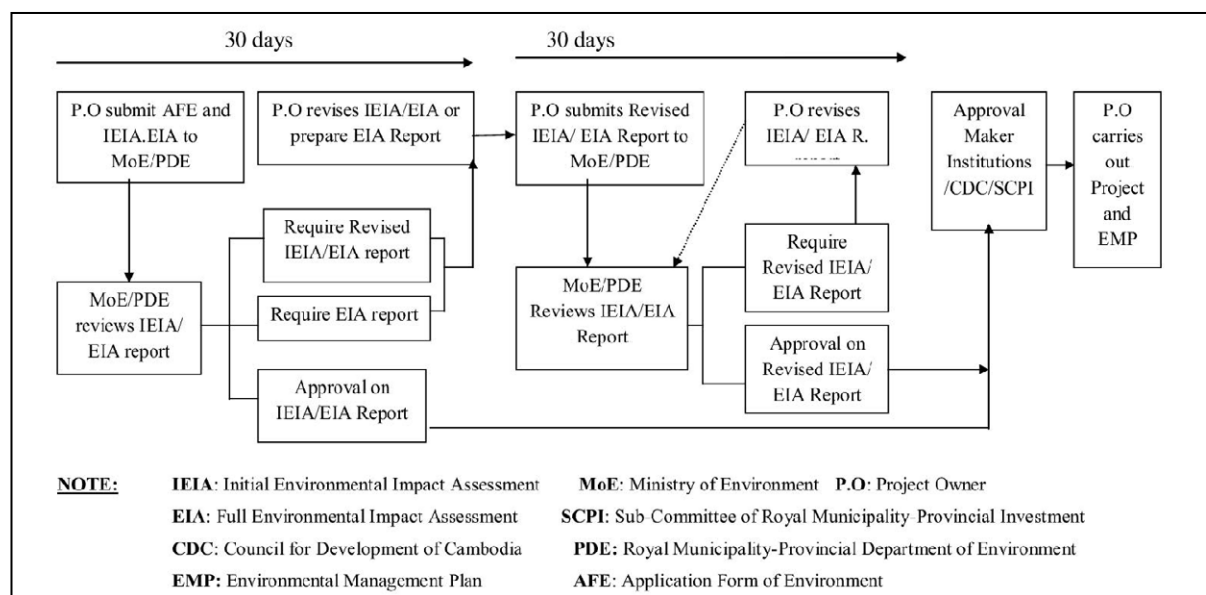
(d) Prakas (Declaration) on General Guideline for Conducting Initial and Full Environmental Impact Assessment Reports (2009)

This Declaration stipulates the approval procedure of IEIA/EIA of project each on national level and municipality/provincial level (Figure 14.1.1) and detail instruction of application form and documents which should be attached. Also Declaration allows a project owner to hire consultant company, which must be registered in Ministry of Commerce (MOC) and be recognized by MOE beforehand, to prepare IEIA/EIA report with.

(2) EIA Process

The procedure of EIA is shown in Figure AH-1.2.1. A project owner (PO) shall submit Initial Environmental Impact Assessment (IEIA) report to MOE. MOE examines the report. If MOE requires PO to revise it or to prepare full EIA report, PO has to follow and submit again. If the requirement is fulfilled, revised IEIA or EIA report is approved by MOE.

When an IEIA/EIA report is submitted to MOE, MOE organizes a review team consisting of experts concerned from the relevant ministries and agencies to examine it.



Source: PRAKAS (Declaration) on General Guideline for Conducting Initial and Full Environmental Impact Assessment Report

Figure AH-1.2.1 EIA Process for Proposal Project

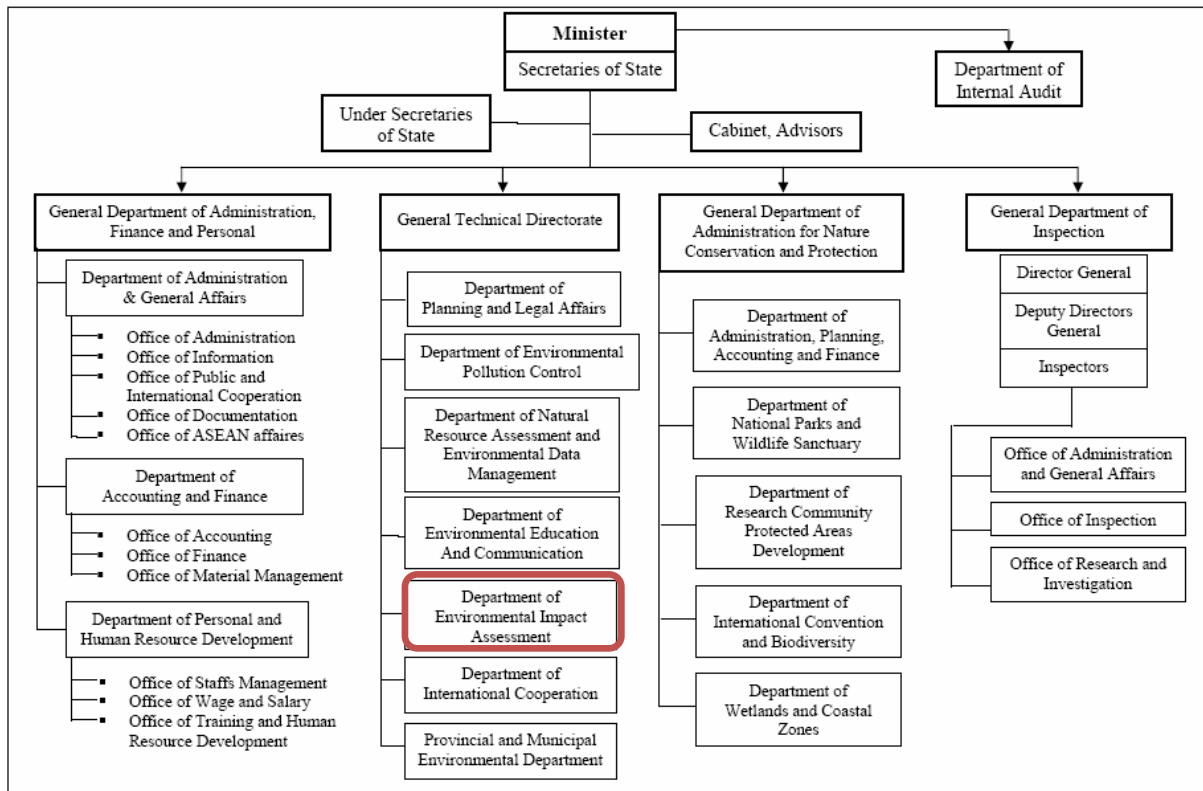
(3) Organization in Charge of EIA/IEIA

DEIA is a structure of the MOE since its establishment in 1994. However, the declaration of its organization and functioning has been adopted only on December 2005. This department is set under the General Technical Department. Its main role and responsibility is focused on reviewing the EIA/IEIA report and monitoring the environmental management plan of both public¹ and private development projects. It works according to the application of the 1996 Law on Environmental Protection and Natural Resource Management and the 1999 Sub-decree on Environmental Impact Assessment Process. Under DEIA 5 offices share the responsibilities for projects of national level, which are Office of Administration and Accounting, Office of Planning and Statistics, Office of

Note: 1 Definition of "public" by MOE is:
 Line ministries, the Council for Development of Cambodia (CDC), etc.; -Provincial Environmental Departments;-Local government authorities: Provincial, district, commune and village authorities;-NGOs -The Project Proponents (Government, Private Sectors, Joint-Ventures, Consultant Companies);-Local communities and local people in and surrounding the project site.

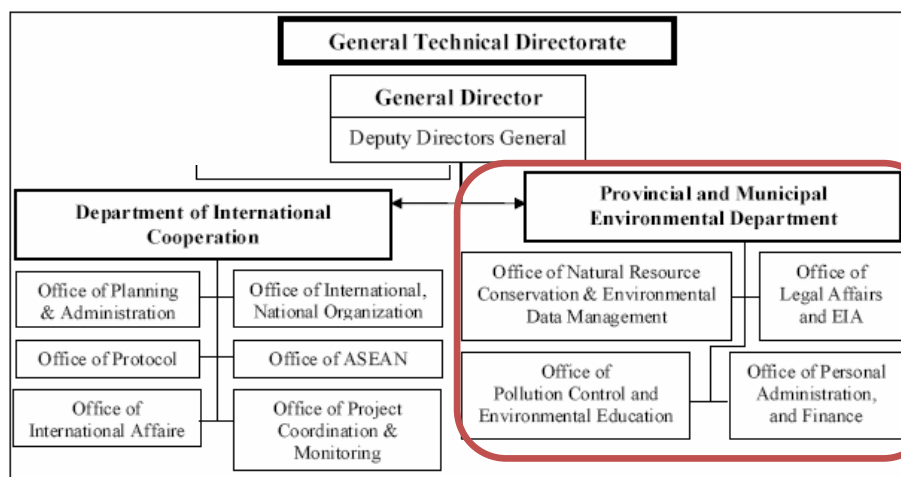
Project Review, Office of Project Monitoring, and Office of Disputed Legislative and International Cooperation. Growing importance of works, the Department's personal has been increased from 16 staff in 1998 to 49 staff in 2011.

Provincial and Municipal Environment Department (PMED) is in charge of projects on regional level.



Source: Department of Environmental Impact Assessment, Ministry of Environment

Figure AH-1.2.2 Organization of DEIA



Source: Department of Environmental Impact Assessment, Ministry of Environment

Figure AH-1.2.3 Organization of PMED

(4) Projects that need EIA

According to the Sub-decree on Environmental Impact Assessment Process (1999), the following 5 types of projects need EIA:

- Newly proposed projects which are approved by the Government or Development Committee of Cambodia

- Newly proposed projects which are implemented and approved by presiding ministries
- Newly proposed projects which are approved by provincial or city governments
- Existing projects which are approved by presiding ministries
- Existing projects which are approved by provincial or city governments

AH-1.3 Pollution Control Relevant Standards

(1) Water Quality Standard

The Sub-decree on Water Pollution Control enacted in 1999 prescribes effluent discharge permits, maximum allowable level of effluent waste water to be discharged to public water, water quality standard in public water bodies, such as rivers, lakes and reservoirs and coastal water, and bio-diversity conservation and water quality standards in public water bodies for public health protection. The following table shows the water quality standard for rivers, lakes, and reservoirs for bio-diversity conservation.

Table AH-1.3.1 Water Quality Standard in Public Water Bodies for Bio-diversity Conservation

No.	Parameters	Unit	Standard Value
Rivers			
1	pH		6.5-8.5
2	BOD	mg/l	1 - 10
3	Suspended Solids	mg/l	25 - 100
4	Dissolved Oxygen	mg/l	2.0 - 7.5
5	Coliform	MPN/100ml	< 5,000
Lakes and Reservoirs			
1	pH		6.5-8.5
2	COD	mg/l	1 - 8
3	Suspended Solids	mg/l	1 - 15
4	Dissolved Oxygen	mg/l	2.0-7.5
5	Coliform	MPN/100ml	< 1,000
6	Total Nitrogen	mg/l	0.1 - 0.6
7	Total Phosphorus	mg/l	0.005 - 0.05

Source: Sub-decree on Water Pollution Control

(2) Ambient Air Quality Standard

Air quality standard is specified in the Sub-decree on Air and Noise Control enacted in 2000 as shown below.

Table AH-1.3.2 Ambient Air Quality Standard

	Parameter	1 hour average (mg/m ³)	8 hours average (mg/m ³)	24 hours average (mg/m ³)	1 Year average (mg/m ³)
1	Carbon Monoxide (CO)	40	20		
2	Nitrogen dioxide (NO ₂)	0.3		0.1	
3	Sulfur dioxide (SO ₂)	0.5		0.3	0.1
4	O ₃ Zone (O ₃)	0.2			
5	Lead (Pb)			0.005	
6	Total Suspended Particulate (TSP)			0.33	0.1

Note:- This standard applies to ambient of air quality and to monitoring of air pollution status.

- Method for analysis of ambient air quality

Source: Sub-decree on Air and Noise Pollution Control

The standard of maximum quality of hazardous substance permitted in the air is specified in the Sub-decree on Air and Noise Control enacted in 2000 as shown below.

Table AH-1.3.3 Maximum Allowance Concentration of Hazardous Substance in Ambient Air

No.	Name Chemical substance	Formula	Maximum Level (mg/m ³)
1	Aniline	C ₆ H ₅ NH ₂	0.03
2	Ammonia	NH ₃	0.2
3	Acetic Acid	CH ₃ COOH	0.2
4	Sulfuric Acid	H ₂ SO ₄	0.3

No.	Name Chemical substance	Formula	Maximum Level (mg/m ³)
5	Nitric Acid	HNO ₃	0.4
6	Ben Zene	C ₆ H ₆	1
7	Ben Zidine	NH ₂ C ₆ H ₄ C ₆ H ₄ NH ₂	
8	Carbondisulfide	CS ₂	0.02
9	Chloroform	CH ₃ Cl ₃	0.01
10	Carbontetracjloride	CCl ₄	3
11	Particle containing Asbestos	-	
12	DDT	C ₈ H ₁₁ Cl ₄	0.5
13	Formaldehyde	HCOH	0.012
14	Hydrogen Arsenic	AsH ₃	0.002
15	Hydrogen Cyanide	HCN	0.01
16	Hydrogen Fluoride	HF	0.002
17	Hydrogen Sulfide	H ₂ S	0.001
18	Phenol	C ₆ H ₅ OH	0.01
19	Styrene	C ₆ H ₅ CHCH ₂	0.003
20	Tetra Chloroethylene	C ₂ Cl ₄	0.1
21	Tetraethyle Lead	Pb(C ₂ H ₅) ₄	0.005
22	Tri Chloroethylene	ClCHCCl ₂	0.2
23	Toluene	C ₆ H ₅ CH ₃	0.4
24	Vinyl Chloride	ClCHCH ₂	0.05
25	Arsenic (Compound organic)	As	0.00001
26	Cadmium (Compound & Oxide)	Cd	0.003
27	Chromiun (Compound & Metal)	Cr	0.0015
28	Nickel (Compound & Metal)	Ni	0.0002
29	Mercury (Compound & Metal)	Hg	0.0001
30	Petrol		5

Source: Sub-decree on Air and Noise Pollution Control

(3) Noise

Maximum permitted noise levels in public areas are described in the Sub-decree on Air and Noise Control enacted in 2000 as shown below.

Table AH-1.3.4 Maximum Standard of Noise Level Allowable in the Public and Residential Areas

(Unit: dB)

No	Area	Period of time		
		6.a.m - 6.p.m.	6.p.m - 10.p.m.	10.p.m.- 6.a.m.
1	Quiet Areas, Hospitals, Libraries, Schools, Kindergartens	45	40	35
2	Residential Areas, Hotels, Administration officers, Houses	60	50	45
3	Commercial and service area and mix	70	65	50
4	Small industrial factories, intermingling in residential areas	75	70	50

Source: Sub-decree on Air and Noise Pollution Control

(4) Solid Waste Management

The purpose of Sub-decree on Solid Waste Management is to regulate the solid waste management with proper technical manner and safe way in order to ensure the protection of human health and the conservation of bio-diversity. This Sub-decree also applies to all activities related to disposal, storage, collection, transport, recycling, dumping of garbage and hazardous waste.

AH-1.4 Laws and Decrees Related to Social Environment

AH-1.4.1 Institutional Framework for Social and Environmental Considerations in Cambodia

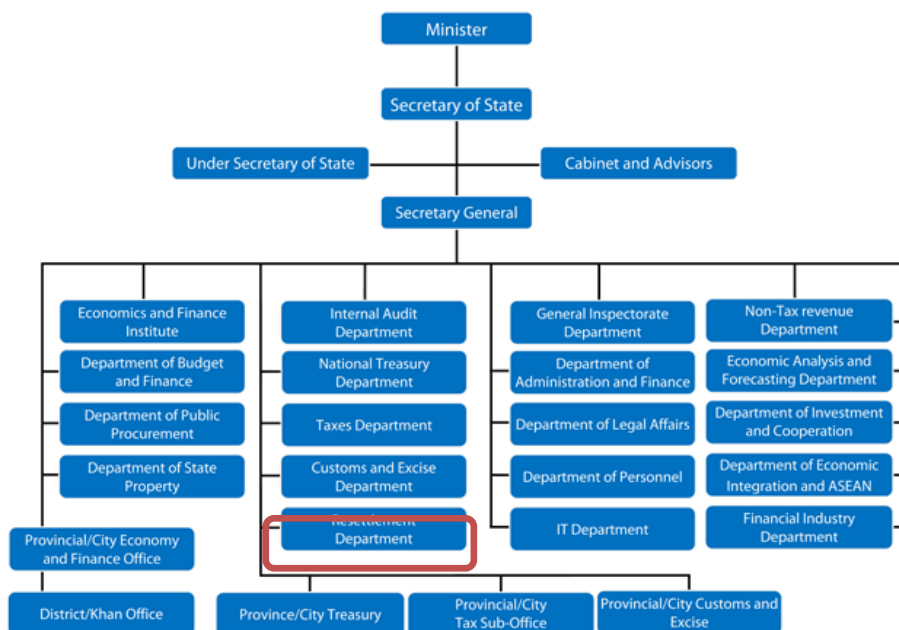
(1) Legislative system on land acquisition and resettlement in Cambodia

Cambodia has experienced severe social, economic, and political turmoil during the last quarter of the century. Before the Khmer Rouge came to power in 1975, private land ownership was widespread as governed by the Cambodia Civil Code of 1920. However, under the Khmer Rouge regime from 1975 to 1979, private property was abolished and all records were destroyed. After the Khmer Rouge regime, the new government introduced usufruct rights to facilitate the orderly occupation of vacant

lands and structures by people returning to the urban areas. However, all lands in Cambodia remained to be properties of the State until private ownership was fully restored in 1989. The current legislation governing land ownership is the Land Law of October 1992 and of August 2001, which recognizes claims to land made after the downfall of the Khmer Rouge in 1979. With this background, the fundamental systems for “resettlement”, which include: i) land management system, ii) policy and system for land acquisition, illegal occupation, and resettlement, and iii) methodology to fill the gap between development partners' (DPs’) policy on resettlement and the Cambodian laws and regulations related to resettlement, are still improving, and therefore, cooperation between them is necessary in terms of dealing with resettlement issues caused by development projects.

(2) Organization in Charge of resettlement

The Resettlement Department of the Ministry of Economy and Finance (MEF) is in charge of matters related to resettlement due to national projects.



Source: Ministry of Economy and Finance, Cambodia

Figure AH-1.4.1.1 The Organizational chart of the Ministry of Economy and Finance

Furthermore, Decision No. 13 and Prakas No. 98 (1997) has created the Inter-ministerial Resettlement Committee (IRC), which is chaired by the MEF with members coming from MOWRAM; and the governors or vice-governors of the affected provinces. The Government of Cambodia later decided to extend the tenure of the IRC to cover all infrastructure projects funded by the government and DP agencies. The IRC plays a dominant role in all resettlement activities for both planning and implementation.

(3) Fundamental Law and Regulations

(a) Constitution (1993)

The September 1993 Constitution of the Kingdom of Cambodia includes provisions that are relevant to involuntary resettlement. Based on the right to ownership of all persons, individually or collectively, the right to confiscate (land) possession from any person shall be exercised only in the public interest as provided for under the law with fair and just compensation in advance (Article 44), although there are no further supporting procedures or regulatory frameworks that have been developed.

(b) Land Law (2001)

The Land Law of 2001 (NS/RKM/0801/14, 30 August 2001) governs land and property rights in Cambodia. Based on the provisions of the 1993 Constitution, the regime of ownership of immovable properties that are defined as including land, trees and immovable structures were determined.

The rights and responsibilities of the RGC with respect to eminent domain are specified in this land law. The RGC can acquire private lands for public purposes under the conditions of: (i) fair and just compensation, and (ii) payment in advance. Article 5 of this land law states the following:

“No person may be deprived of his ownership, unless it is in the public interest. An ownership deprivation shall be carried out in accordance with the forms and procedures provided by law and regulations and after the payment of fair and just compensation in advance.”

The following are other provisions in the Land Law that are relevant to land acquisition, compensation and resettlement:

- Legal possession as defined by the law is the sole basis for ownership, and all transfers or changes of rights of ownership shall be carried out in accordance with the required general rules for sale, succession, exchange and gift or by court decision. (Article 6)
- Any regime of ownership of immovable property prior to 1979 shall not be recognized. (Article 7)
- State public land includes, among other categories, any property that is made available for public use such as roads, roads’ right-of-way (ROW). (Article 15)
- The following are null and void and cannot be made legal in any form whatsoever:
- Any entering into possession of public properties of the State and public legal entities and any transformation of possession of private properties of the State into ownership rights that was not made pursuant to legal formalities and procedures that had been stipulated prior to that time, irrespective of the date of the creation of possession or transformation. (Article 18)
- Persons that illegally occupy possess, or claim title to State public land cannot claim any compensation. This includes land established by the RGC as public ROW for roads and railways. Moreover, failure to vacate illegally occupied land in a timely manner is subject to fines and/or imprisonment. (Article 19)
- Persons with legally valid possession of land for five years (at the time the law came into effect) are allowed to be registered as owner of the land. (Article 30)
- Persons who (at the time the law came into effect) held legal possession but had not yet completed the five years were allowed to remain in possession until they were eligible to be registered as the owner. (Article 31)
- However, temporary possession claims made by persons after the law comes into effect will not be recognized, rescinding a previous right under the 1992 Land Law for acquiring land by taking possession. (Articles 29 and 34)
- Landless people may apply for land for residential and subsistence farming purposes at no cost, as part of a social land concessions scheme. The concessionaire may obtain ownership of this land after fulfilling conditions set out in the separate Sub-decree on Social Land Concessions. (Articles 50 and 51)

(c) Expropriation Law (2010)

The Expropriation Law has been passed by the National Assembly on 29 December 2009 and promulgated by the King on 4 February 2010. This law is based on existing Cambodian laws such as the constitution, land laws, and other regulations relevant to resettlement issues. It contains eight chapters with 39 articles, and provides clear procedures to acquire people's properties for the purpose of national and public interests. Relevant articles of the law are being used to prepare the sub-decree on resettlement policy. Such relevant articles include the following:

Article 2: This law has the following purpose:

- To ensure reasonable and just deprivation of a legal right to ownership of private property;
- To ensure payment of reasonable and just prior compensation;
- To serve the public and national interests; and
- To develop public physical infrastructure.

Article 5: Public physical infrastructure projects shall include the following:

- Construction or expansion of railways, roads, bridges, airports, ports and accompanying structures, and equipment;
- Construction or expansion of power stations, structures, equipment, transmission lines, and distribution lines;
- Construction or expansion of buildings and equipment for postal, telecommunications and information technology systems;
- Construction or expansion of roads, city spaces, vehicle parking lots, markets, parks, and public squares;
- **Construction or expansion of irrigation systems, clean water supply systems, sewage systems, and public interest spaces;**
- Construction or expansion of buildings for education, training, science, culture, health care, and social security, and stadiums for performances to public audiences;
- Construction or expansion of refineries, treatment plants, buildings and equipment for the protection of nature and the environment;
- Construction or expansion of buildings and equipment for the research and exploitation of mines and other natural resources;
- Construction or expansion of gas systems, fuel pipes, oil refineries, oil rigs, and other systems;
- Construction or expansion of buildings/residences which are seriously destroyed by natural disasters such as earthquakes, floods, fires, landslides, etc., in preparation for resettlement;
- Construction or expansion of buildings for the protection and support of residents;
- Construction or expansion of border-crossing posts;
- Construction or expansion of, or preparation for the necessary structures for national defense and/or security;
- Establishment of new areas for the protection of natural resources, forests, cultural and archaeological sites or protection of the environment; and
- Other public physical infrastructure as required by the nation in accordance with the determination made by the government.

Article 7: Only the State may carry out an expropriation for use in the public and national interests. Expropriation may only be carried out for the implementation of projects stipulated in Article 5 of this law.

Article 8: The State shall accept the purchase of parts of the real property left over from an expropriation at a reasonable and just price at the request of the owner of and/or the holder of right in the expropriated real property who is unable to live near the expropriated scheme or to build a residence or conduct any business.

Article 12: An expropriation committee shall be established and headed by a representative from the MEF and composed of representatives from relevant ministries and institutions. The organization and functioning of the expropriation committee shall be determined by a sub-decree.

(d) Decision No. 13 and Prakas No. 98 (1997)

This legislation created the IRC, which is chaired by the MEF with members coming from MOWRAM; and the governors or vice-governors of the affected provinces. IRC plays a dominant role in all resettlement activities for both the planning and implementation.

(e) Sub-decree on Social Land Concession (2003)

This sub-decree defines the criteria, procedures, and mechanism for the granting and transferring of private State lands to the poor for residential and/or family farming purposes. This sub-decree is specifically intended for the vulnerable groups. The sub-decree not only provides land, but also includes provision of basic infrastructure and services in order to improve the living standards and livelihood of the recipient families. While the sub-decree requires the preparation of a development plan, it does not provide the framework and procedures for the preparation and fulfillment/accomplishment of the plan. Furthermore, the concession lands provided to the people are either small or of no value and far away from the town or urban center. Based on past experience, most of the families abandon such lands and move to places where there are job opportunities.

(f) Resettlement Policies and Guidelines in Cambodia

No resettlement Policies or guidelines has been enacted in Cambodia yet. The draft Sub-decree on Addressing Socio-Economic Impact Caused by Development Project is being prepared as a consultative document in cooperation with ADB to make clear land acquisition and resettlement with project development in 2007. According to Master Plan (2007), the status has been kept from 2007 and RGC doesn't proclaim the Sub-decree in official.

Table AH-1.4.1.1 Related Authority and Institutions, and Laws and Regulations related to Land Acquisition and Resettlement

Authority or Institution In Charge	Laws and Regulations	Function	Remarks
Nation	Constitution (1993)	Fundamental basis for the right to ownership and the right to confiscate (land) possession only in the public interest with fair and just compensation in advance.	The Land Law (2001) and the Law on Expropriation (2011) both support the constitution. However, there is still a need to establish further supporting procedures or regulatory frameworks such as sub-decrees.
Prime Minister's Office (PMO)	- Sechkdey Prakas No. 6: Measure to Crack Down on Anarchic Land Grabbing and Encroachment (1999)	- The first regulation to set the ROW. - Compulsory acquisition with public enforcement	- The government, however, failed to adequately inform the public about the ROW - Prior to the issuance of the Prakas, the width of the ROW was not legally defined

Authority or Institution In Charge	Laws and Regulations	Function	Remarks
			<ul style="list-style-type: none"> - Does not provide how to acquire land from those who are living within the set ROW before its issuance - Article about land ownership with five years peaceful occupancy is reiterated in Land Law 2001. This land law is silent on whether or not this applies to ROW land, but it does not specifically state that it does not apply. Nevertheless, the government is enforcing this article selectively.
Ministry of Economy and Finance (MEF)	<ul style="list-style-type: none"> - Decision No. 13 and Prakas No. 98 (1997), - MEF Prakas No. 961 (2000), - Sub-decree on Socio-Economic Impact Caused by Development Project (Draft, 2008), - Law on Expropriation (2011) 	<ul style="list-style-type: none"> - It created the IRC, which is chaired by the MEF - It disallows any payment to be drawn from the national budget for structures and other assets located within the ROW - This sub-decree follows the safeguard policies of the ADB - The policy, mechanism and procedure of land expropriation from the legitimate land owner 	<ul style="list-style-type: none"> - The IRC plays a major role in the planning and implementation of resettlement - Not entitled to any compensation or social support, regardless of their being an affected people (AP) or a member of vulnerable groups - Does not govern any expropriation regulated in any agreement or memorandum on supporting investment between the RGC and DP countries. In case of no such agreement and memorandum or they do not deal with expropriation, any expropriation shall be governed under this law.
Ministry of Land Management, Urban Planning, and Construction (MLMUPC)	<ul style="list-style-type: none"> - Land Law (2001 and 1992), - Sub-decree on Social Land Concessions (2003) 	<ul style="list-style-type: none"> - Individual's rights to ownership and compensation - The criteria, procedures, and mechanism for the granting and transferring of private State lands to the poor for residential and/or family farming purposes with development plan 	<ul style="list-style-type: none"> - The mechanisms and standards for land acquisition or for determining levels of compensation are not clearly defined. - While the sub-decree requires the preparation of a development plan, it does not provide the framework and procedures for the preparation and fulfillment/accomplishment of the plan. - With this reason, the guidelines of DPs in development projects are followed.

Source: JICA Study Team

AH-1.4.2 Resettlement policy gap

(1) Requirements of the New JICA Guidelines

The following items are requested to be achieved in the new JICA guidelines:

- Effective measures to minimize the impacts and compensate for the losses, including AP's livelihood that shall be restored to at least in the same or better condition as compared to the pre-project level, if involuntary resettlement is inevitable.
- People who will be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated in a timely manner. Compensation for lost assets should be made in full amount at a replacement cost reflecting the current market price and paid in advance.
- Project proponents must exert efforts to enable the people affected by a project to improve their standard of living, income opportunities and production levels, or at least to restore them to

pre-project levels. A grievance redress system must be formulated, and it should function appropriately.

- Participation of AP and their communities shall be promoted in the planning, implementation and monitoring of involuntary resettlement plans and measures against the loss of their means of livelihood.

The establishment of a support system for socially vulnerable groups will provide assistance to restore and improve living standards, enhancement of public participation in the planning and implementation of resettlement plans, compensation for land acquisition with replacement cost, and support for legal possession.

(2) Comparison and Verification between the Cambodian System and the New JICA Guidelines

Under the Land Law (2001), those who have occupied the ROW or public properties are not entitled to any compensation or social support, regardless of them being an AP or coming from a vulnerable group. Prakas No. 961 reiterates this legal position. In contrast, the position of international DP agencies is that the absence of a formal legal title to land by APs should not be a bar to compensation, and that all APs should be assisted to at least restore their pre-project social and economic status. In addition, vulnerable AP should be assisted to improve their status. Moreover, the current land law provides that persons having assets on roads and railways' ROWs will be punished more heavily if their failure to relocate results in delays in works of public interest. On the other hand, international DP agencies believe that if it is not feasible to avoid resettlement, resettlement activities should be conceived and executed as a sustainable development program, providing sufficient investment resources to enable AP to have a share in project benefits. Furthermore, AP should be fully informed and meaningfully consulted, and should have opportunities to participate in the planning and implementation of the resettlement programs. Regarding claims for compensation of lands taken, Article 5 of the Land Law (2001) states that no person will be "deprived of their ownership unless this action is for the public interest consistent with formalities and procedures provided by law...and after just and fair compensation". It does not provide compensation for other types of losses. Also, Article 44 of the Constitution (1993) states that the right to confiscate (land) possession from any person shall be exercised only in the public interest as provided for under the law and shall require fair and just compensation in advance. In contrast, JICA and the World Bank's policies require that compensation for lost assets should be made in full amount at replacement cost reflecting the current market price. The Government has no clear policy or procedure to restore the livelihood of AP, while JICA and the World Bank's policies aim to ensure that the quality of life of AP should be restored to at least pre-project level. The policies on involuntary resettlement pay special attention to vulnerable groups, including ethnic minorities. In this regard, JICA's policy requires that vulnerable groups be assisted to improve their status. The Constitution (1993) and Land Law (2001) do not address socially vulnerable groups.

Table AH-1.4.2.1 Comparison and Verification between Cambodian System and New JICA Guidelines

	Item	New JICA Guidelines Policy	Regulation in Cambodia (officially promulgated)	Dissipating the dissociation between Cambodian System and the New JICA guideline
1	Establishment of support system for socially vulnerable groups	Socially vulnerable groups tend to be exposed to environmental and social impacts. In addition, they have limited access to a process of decision making. Thus, it is necessary to give appropriate consideration to them.	The Constitution (1993) and the Land Law (2001) do not address socially vulnerable groups.	The Project will comply with new JICA guidelines' policy. Socially vulnerable groups will be paid appropriate consideration by the Project owner.

	Item	New JICA Guidelines Policy	Regulation in Cambodia (officially promulgated)	Dissipating the dissociation between Cambodian System and the New JICA guideline
2	Provide assistance to restore and improve living standards	Living standards and income opportunities, and production levels of project AP should be improved or at least restored to their pre-project levels.	The government has no clear policy or procedure to restore the livelihood of AP.	This Project is rehabilitation projects for existing irrigation system. Therefore, almost APs will enjoy significant benefits from SPPIDRIP. In addition, SPPIDRIP will propose assistance to restore and improve living standard of APs, if necessary.
3	Enhancement of public participation in planning and implementation of resettlement plans	Appropriate participation by the AP and their communities should be promoted in the planning, implementation and monitoring of involuntary resettlement plans and measures taken against the loss of their means of livelihood.	It is clearly declared in the Sub-decree on Social Land Concession.	SPPIDRIP will carry out in compliance with new JICA environmental guidelines and Cambodian law.
4	Compensation for land acquisition with replacement cost	Compensation will be done with replacement cost according to OP 4.12 of the World Bank on Involuntary Resettlement. This means that the compensation for lost assets must be made in full amount at replacement cost and at current market price.	<ul style="list-style-type: none"> - For legal ownership, “No person shall be deprived of their ownership unless this action is for the public interest consistent with formalities and procedures provided by the law and after just and fair compensation”. Therefore, compensation is not provided for other types of losses. - Compensation should be fair and just in advance. 	SPPIDRIP will comply with new JICA guidelines' policy. In SPPIDRIP, compensation for land acquisition will be made in full amount at replacement cost and at current market price.
5	Providing support for illegal occupants	People to be resettled involuntarily and people whose means of livelihood will be hindered or lost should be sufficiently compensated and supported by a project proponents at the appropriate time.	Those who have occupied the ROW or public properties are not entitled to any compensation or social support, regardless of them being an AP or coming from a vulnerable group.	SPPIDRIP will carry out in compliance with new JICA environmental guidelines and Cambodian law.
5	Providing support for illegal occupants	People to be resettled involuntarily and people whose means of livelihood will be hindered or lost should be sufficiently compensated and supported by a project proponents at the appropriate time.	Those who have occupied the ROW or public properties are not entitled to any compensation or social support, regardless of them being an AP or coming from a vulnerable group.	SPPIDRIP will carry out in compliance with new JICA environmental guidelines.
6	Grievance redress system	A grievance redress system must be formulated and it should function appropriately.	Grievance redress system is stipulated in the Law on Expropriation (2011).	SPPIDRIP will carry out in compliance with new JICA environmental guidelines and Cambodian law.

Source: JICA Study Team

AH-1.5 Protected Area

AH-1.5.1 Royal Decree on the Creation and Designation of Protected Areas

The Royal Decree on the Creation and Designation of Protected Areas was promulgated on 1st of November 1993. The Royal Decree established 23 Protected Areas in Cambodia with a total area of 3,273,200 ha, accounting for 18% of the country's surface area. The Classification of Protected Areas in Cambodia is shown in Table AH-1.5.1.1

Table AH-1.5.1.1 Classification of Protected Areas in Cambodia

Category	Definition	IUCN equivalent
Wildlife Sanctuary	Natural areas where nationally significant species of flora and fauna, natural communities, or physical features require specific intervention and their perpetuation.	Category I: Strict Nature Reserve/Wilderness Area: Protected area managed mainly for science or wilderness protection.
National Park	Natural and scenic areas of significance for their scientific, educational, and recreational values.	Category II: National Park: Protected area managed mainly for ecosystem protection and recreation.
Protected Landscape	Nationally significant natural and semi, natural landscapes which must be maintained to provide opportunities for recreation and tourism.	Category V: Protected Landscape / Seascape: Protected area managed mainly for landscape/seascape conservation and recreation.

Category	Definition	IUCN equivalent
Multiple Use Management Area	The areas which provide for the sustainable use of water resources, timber, wildlife, fish, pasture and recreation with the conservation of nature primarily oriented to support these economic activities.	Category VI: Protected area managed mainly for the sustainable use of natural ecosystems.

Source: Royal decree (1993) on the Creation and Designation of Protected Area, IUCN Commission on National Parks and Protected Area (1994), and IUCN (1994a & b)

AH-1.5.2 Protected Areas

(1) General

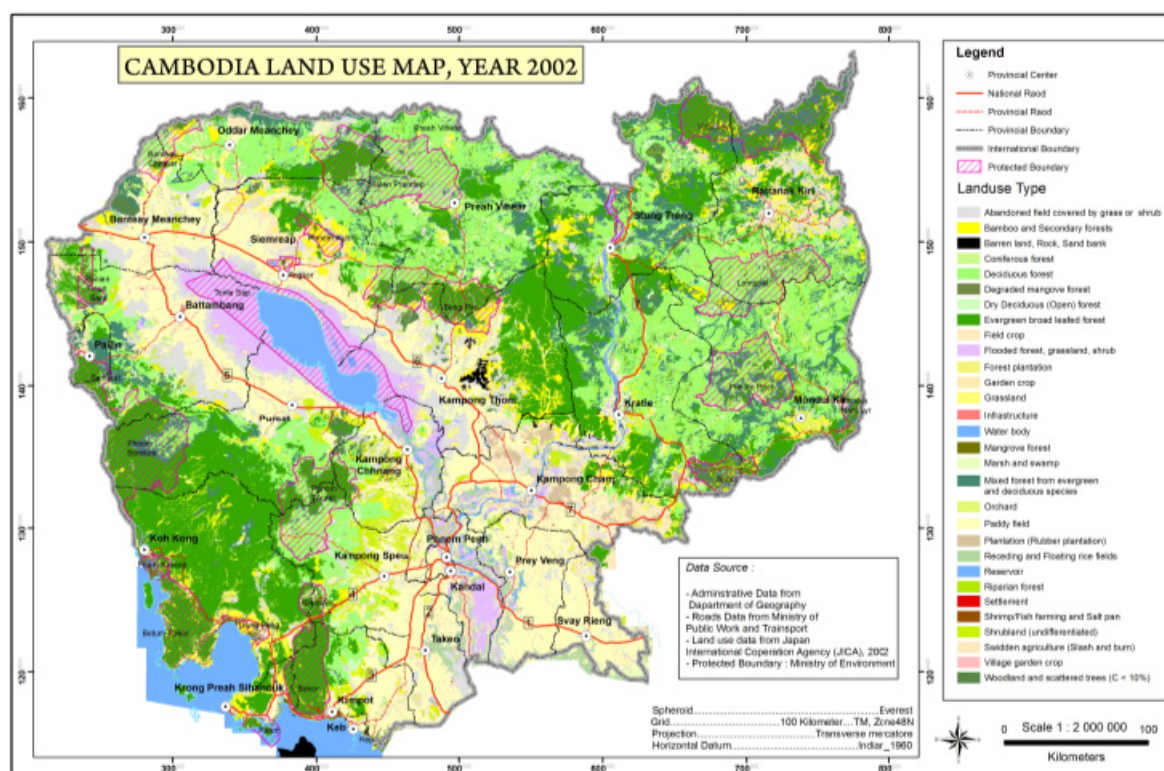
Cambodia has 33 protected areas (under MOE 23 areas, and under MAFF 10 areas). The Protected Natural Areas are under the jurisdiction of MOE amounting to 18% of Cambodia's total area. In addition, by 2002 the Forest Administration of the Ministry of Agriculture, Forest and Fisheries (MAFF) had defined an additional 1,346,225 ha or 7.5% of the country as Conservation Areas. Therefore, the total Protected Areas had increased to 25.5% of the country. In 2003, there was an amendment to the Protected Natural Areas (under MOE), reducing their total area to 3,194,471 ha. Table AH-1.5.2.1 shows Cambodia's Protected Areas (under MOE) after the amendment in 2003.

Table AH-1.5.2.1 Protected Areas of Cambodia (under jurisdiction of MOE)

Protected Area	Total Size (ha)	Characteristics
Kirirom National Park	35,000	High elevation pine forest with large mammals including elephants.
Phnom Bokor National Park	140,000	High elevation sphagnum bogs, Podocarpus forest with large mammals including tigers, elephants, and sun bear.
Kep National Park	5,000	Secondary lowland evergreen forest.
Preah Sinanouk (Ream) National Park	15,000 now 21,000	Secondary lowland evergreen forest with some mangrove forest plus two islands.
Botum-Sakor National Park	171,250	Lowland evergreen forest heavily degraded by illegal logging, mangrove forest, and the only coastal Dacrydium/Podocarpus swamp forest in Cambodia.
Virachey National Park	332,500	High altitude forest in northeast Cambodia with a different set of biogeographic influences than in the southwest. An important habitat for several threatened species, including tigers, elephants and douc langur.
Koulen National Park	37,500	Located in the catchment area of Siem Reap stream. It is an important historic area.
Airal Wildlife Sanctuary	253,750	Highest mountain (1743 m) in Cambodia with a wide diversity of vegetation ranging from dry Dipterocarpus/ Podocarpus forest to medium altitude evergreen forest.
Peam Krasop Wildlife Sanctuary	23,740	Most important mangrove forests in Cambodia and possibly the most extensive within the Gulf of Thailand.
Phnom Samkos Wildlife Sanctuary	333,750	High altitude area with a wide diversity of forest types. Supports a range of threatened birds in the area.
Ronien Daun Sam Wildlife Sanctuary	178,750 now 40,021	Lowland evergreen and semi-evergreen forest of unknown condition.
Kulen Promtep Wildlife Sanctuary	402,500	The largest area in the protected areas system intended to protect wildlife. The principal habitats are lowland evergreen / semievergreen forest, and the largest swamp in northern Cambodia. Very important for large waterbirds such as Giant Ibis and Sarus Cranes.
Boengper Wildlife Sanctuary	242,500	A previous wildlife sanctuary, it reportedly has good populations of wild cattle and deer. The area has some important archaeological sites.
Lomphat Wildlife Sanctuary	250,000	The area comprises mostly evergreen forest on basaltic soils, grassy glades, open deciduous forest, mixed deciduous forest, pockets of evergreen/semi-evergreen forest, riverine habitats and small wetlands. Banteng and Asian wild dog are present and elephants migrate into the area at certain times of the year. Also a breeding ground for Sarus Crane.
Phnom Prich Wildlife Sanctuary	222,500	The habitats in this area are similar to those at Lomphat – mostly evergreen forest on basaltic soils. Grassy glades, and open deciduous forest. Mixed deciduous forest, riverine habitats and small wetlands.
Phnom Namlear Wildlife Sanctuary	47,500	Mainly evergreen forest which harbors the Green Peafowl, Germain's Peacock Pheasant, and Great Hornbill.
Snuol Wildlife Sanctuary	135,000	Consists mostly of logged evergreen forest on a heavily dissected plateau.
Angkor Protected Landscape	10,800	This mostly forested area includes the Angkor temple complex, perhaps the single-most important archaeological/cultural site in southeast Asia.

Protected Area	Total Size (ha)	Characteristics
Banteay Chhmar Protected archaeological culturallandscape	81,200	The area includes an important temple site.
Preah Vihear Protected landscape	5,000	The area was included for its archaeological/cultural value, it includes an important temple.
Dong Peng Multiple-Use Area	27,700	Lowland coastal wetlands – mostly mangrove and melaleuca swamp forest.
Samlaut Multiple Use Area	60,000	An evergreen forest area within the watershed of the Sangke River. It has been denuded by mining operations causing severe erosion and increased sedimentation of the river, which flows into Tonle Sap Lake.
Tonle Sap Multiple Use Area	316,250	Long-standing ichthyological (aquatic) reserve. Great biological, hydrological and cultural / economic importance.
Total Area	3,194,471	17.64%

Source: State of Environment Report, 2004



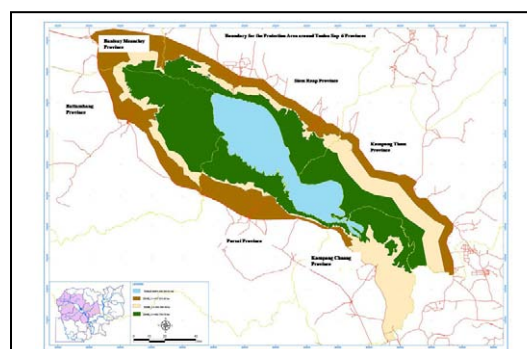
*Land Use: 2002, National Road: 2007

Source: Dept. of Natural Resource Assessment & Environmental Data Management, Ministry of Environment

Figure AH-1.5.2.1 Natural Protected Area in Cambodia

(2) Tonle Sap Multiple Management Use Area

Tonle Sap Multiple Use Management Area, 316,250ha, is long standing ethological reserve. Great biological, hydrological and cultural diversity are observed with economic importance in the region. As classification of Protected Area in Cambodia, Tonle Sap is classified as “Multiple Use Management Area” which is the areas to provide for the sustainable use of water resources, timber, wildlife, fish, pasture and recreation with the conservation of nature primarily oriented to support these economic activities, as Category VI:



Source: Tonle Sap Authority

Figure AH-1.5.2.2 Land Use Classification of Tonle Sap Multiple Management Use Area

Protected area managed mainly for the sustainable use of natural ecosystems as IUCN equivalent. This area allows to be used as sustainable use without disturbing economic activities in this region.

Also Tonle Sap Authority classified Tonle Sap Area as three landuse classification as Figure left on its own accord.

Zone 1 (Brown): Human habitation and irrigation activity are allowed.

Zone 2 (Beige): No activity is allowed except irrigation activity.

Zone 3 (Green): Strictly protected area.

AH-1.6 Natural Resources

AH-1.6.1 Flora

Forest in Cambodia tends to be located around the periphery in the areas as opposed to the lowland areas where paddy rice is the norm. Forest is one of the important natural resources for the country.

Moreover, forest sector is the source of various non-timber products such as wildlife, fuel wood and medical plants. It is also the source of employment particularly in harvesting operation. Forests make up a major part of the country's natural resources. In 1960 Cambodia's forests covered 73% of the total land area of the country. By 1998 the forest cover had decreased to 58% and at least until the mid-2000s. The protected areas, which share 18.08% (3,273,200 ha) of the total country's area, are covered by good forests that are important for wildlife habitats. There are 23 protected areas including 7 national parks, 10 wildlife sanctuaries, 3 protected landscapes and 3 multiple use areas. The 7 additional protected forest share 7.36% (1,332,218 ha) of the total land area were established by Forestry Administration, Ministry of Agriculture, Forestry and Fisheries later 1996.

The RCHRSP and USISRSP Areas have been already developed as the agricultural lands, and there are few trees.

AH-1.6.2 Fauna

According to the 4th ASEAN SOE Report 2009, the following figures of species live in Cambodia. In addition, number of species of fresh water fishes is about 874. (ASEAN Centre for Biodiversity, 2008)

Table AH-1.6.2.1 Inventory of Recorded Species (as of 2008)

Country	Amphibians	Birds	Butterflies	Dragonflies	Mammals	Plants	Reptiles	Total
Cambodia	63 ^a	545 ^a	38	43	123 ^a	2,308 ¹	88 ¹	3,208

Based on data found in the country's Fourth National Report to the Convention on Biological Diversity

Source: ASEAN Centre for Biodiversity (ACB database of ARCBC Species Database 2004 and species recently added in the 2007 IUCN Red List of Endangered Species)

AH-1.6.3 Biodiversity

Cambodia has rich and unique ecosystem represented by Tonle Sap ecosystem. Cambodia is home to an estimated 2,300 plant species, some of which are very important for local communities e.g. medical plants that are used for treatment. Meanwhile, due to its richness in natural resources and forest cover,

the forest area in Cambodia is home to 130 mammals. There are over 500 bird species mainly living in the wetland areas. Mekong River and its tributaries are home to about 500 species of freshwater fish in Cambodia. (IUCN, 2004)

Red List of Threatened Species mentions 197 species in Cambodia considered at risk of extinction, endangered, critically endangered, or vulnerable. Many of these are found in the Tonle Sap ecosystem. Of the 197 species mentioned by IUCN, 24 are critically endangered, 39 are endangered, and 53 are vulnerable. In the Tonle Sap ecosystem, five critically endangered species (2 fish species, 2 bird species, and the Siamese crocodile) are potentially still present. In addition, 22 species are classified as data deficient. This could mean that some of these species are threatened, though data are insufficient to assess their condition in full.

CHAPTER AH-2 SOUTHWEST PHNOM PENH IRRIGATION AND DRAINAGE REHABILITATION AND IMPROVEMENT PROJECT

AH-2.1 Roleang Chrey Headworks Rehabilitation Sub-project

AH-2.1.1 Description of Sub-project

(1) Principal Features

The Roleang Chrey Regulator and the Andong Sla Intake and its approach channel for the North Main Canal were constructed in 1974, aiming to irrigate 35,000 ha on the left riparian area of the Prek Thnot River. Presently, these facilities are severely deteriorated and do not function well at present. None of the gates of the Roleang Chrey Regulator could be easily closed after being opened one time. The downstream side slope protection of the Regulator is severely eroded. In addition, above two intakes also are totally damaged. Therefore, effective water control of the Prek Thnot River cannot be executed.

The current conditions of the Roleang Chrey Regulator, Andong Sla Intake and Vat Krouch Intake are so serious as mentioned above, and if left as they are, it is sure that the water supply to each command area would be difficult, or rather, impossible, and then the strategic target for M/P, improvement of agricultural productivity centering on rice, could not be implemented by 2015. To ensure a stable water supply and also to achieve the said strategic target, improvement of these facilities is needed urgently.

Objectives of the proposed components of RCHRSP are tabulated as follows:

Table AH-2.1.1.1 Principal Features of RCHRSP

No.	Description	Quantity
1.	Sub-project area (Model Area)	16,920 ha (350 ha)
2.	Roleang Chrey Headworks	
	- Roleang Chrey Regulator	Regulator gates - Fixed wheel gates, 5 sets, 12.5 m (W) × 6.7 m (H) Civil works - Construction of the downstream river bed protection - Rehabilitation of the downstream river bank protection - Construction of river outlet structure
	- Andong Sla Intake	Intake gates - Radial gates, 2 sets, 4.0 m (W) × 2.7 m (H) Civil works - Curtain walls and operation deck, - Protection of up & downstream of intake - Rehabilitation of approach channel
	- Vat Krouch Intake	Intake gates - Radial gates, 2 sets, 4.0 m (W) × 2.7 m (H) Civil works - Upstream & downstream transitions - Gate pier and box culvert and protection of canal beds, - Rehabilitation of approach channel
	- River outlet structure	Inlet gates - Slide gates, 4 sets, 1.0 m (W) × 1.0 m (H) Outlet gates - Slide gates, 2 sets, 1.25 m (W) × 1.4 m (H)
3.	NMC and SMC	2 no. Design discharge: NMC 10.4 m ³ /sec at beginning point SMC 16.3 m ³ /sec at beginning point
	- Total length	18.9 km (NMC = 9.1 km and SMC = 9.8 km)
	- Structures to be rehabilitated/reconstructed	Check structures : 3 nos. Turnout : 18 nos. Bridge : 7 nos. Spillway : 3 nos. Drainage gate : 11 nos.

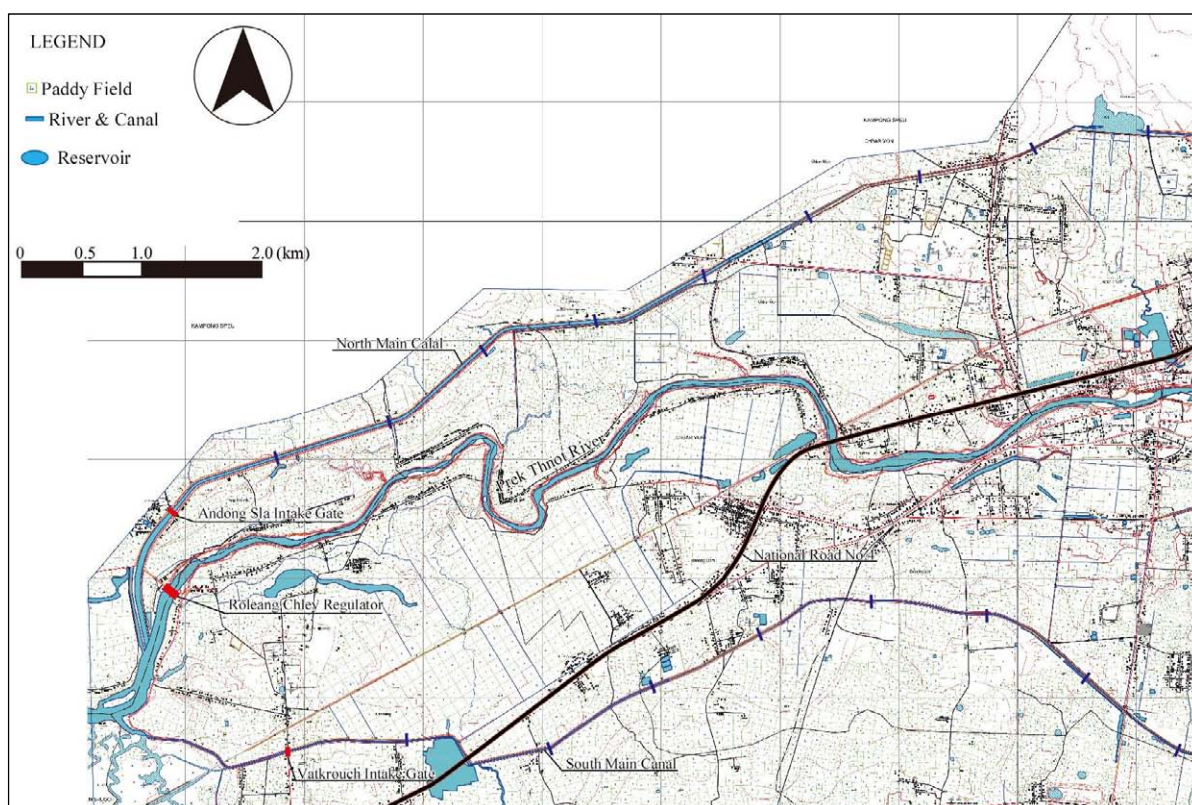
No.	Description	Quantity
4.	Secondary Canals	12 nos.
	- Total length	16.9 km
	- Structures to be rehabilitated/reconstructed	Check structures : 45 nos. Turnout : 53 nos. Culvert : 32 nos. Drain inlet : 4 nos.
5.	Tertiary Canal System	
	- Area	350 ha

Source: JICA Survey Team

(2) Location

The Regulator in RCHRSP is located on the Prek Thnot River, about 100 km upstream from its confluence with the Bassac River. The Andong Sla and Vat Krouch Intakes are respectively provided at the heads of the North Main Canal and South Main Canal branched off from the Prek Thnot River upstream from the regulators. The regulators are located in Tumpung Village, Khaeng Commune, Samaraong Tong District, Kampong Speu Province.

The right bank of the Regulator is at an elevation of 39.651m. The longitudinal survey shows that the longitudinal slope of the upstream of Prek Thnot River where the Roleang Chrey Regulator is located midway, is 1/2,720, which is slightly steeper than the 1/3,000 average from the confluence with the Bassac River to Peam Khley (113,400 m in distance). The project location map is shown as below.



Source: JICA Survey Team

Figure AH-2.1.1.1 Location Map of RCHRSP

(3) Time Schedule

Implementation time schedule of RCHRSP are shown as follows:

Work Item	Year									
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
1. Loan Agreement (L/A)										
2. Procurement of Consultant										
3. Consulting Services										
3-1 Detailed Design										
3-2 Assistance for procurement of Contractor										
3-3 Construction supervision for Main Canal System										
4. Construction of Roleang Chrey Headworks Rehabilitation Sub-project										
4-1 Preparatory works										
4-2 Temporary works										
(1) Temporary spillway										
(2) Temporary diversion channel & coffer dams for headworks										
(3) Temporary coffer dams for intake										
(4) Temporary diversion channel for Vat Krouch intake										
4-3 Construction works										
(1) Roleang Chrey Headworks Improvement Works										
Design, approval, fabrication and transportation of gates										
(a) Improvement works for hydro-mechanical works										
(b) Improvement works for Andong Sla intake of NMC										
(c) Improvement works for Vat Krouch intake of SMC										
(d) Construction of river outlet structure										
(e) Construction of river protection including ground sill										
(2) Rehabilitation works for North and South Main Canals										
(a) Rehabilitation works for North Main and Secondary Canals (28.35km)										
(b) Rehabilitation works for South Main and Secondary Canals (28.50km)										
(c) Drainage canals (3,000 m in total)										
(3) Construction of Tertiary Canal System for model area (350 ha)										
(4) Construction of building for Sub-project office										

Source: JICA Survey Team

Figure AH-2.1.1.2 Implementation Time Schedule for Main System of RCHRSP

(4) Examination of Alternatives

RCHRSP is the rehabilitation works to maintain water supply to its command area. The current conditions of the Roleang Chrey Regulator and its appurtenant structures are so serious as mentioned above, and if left as they are, it is sure that the water supply to the command area would be difficult in the near future. It is difficult to consider effective alternative of RCHRSP is other than originally proposed plan in the survey. If zero option is considered for RCHRSP, irrigation water will not be ensured in the command area. Since farmers will have to depend only on rainfed cultivation, crop production will be drastically decreased.

Based on above discussion, zero option cannot be considered, instead implementation of RCHRSP based on proposed plan in the Survey is put priority for its command area.

AH-2.1.2 Description of Environment

AH-2.1.2.1 Physical Resources

Kampong Speu Province is located in the west of Phnom Penh. It borders Kampong Chhnang and Pursat to the North, Phnom Penh to the East, Kampot and Takeo to the South and Koh Kong to the West. The area of the province is 7,017 km².

(1) Climate

Climate of RGC is dominated by the tropical rainy season and dry season. The southwest monsoon brings the rainy season from mid-May to mid-September or early October, while the northeast monsoon's flow of drier and cooler air lasts from early November to March. Temperatures are fairly uniform at around 27 degrees Celsius. Average annual rainfall is between 1,300 and 1,900 millimeters, with the heaviest amount in the southeast.

(2) Topography and Soil

The topography of RCHRSP is rather flat by the adjacent floodplain.

The soil of Cambodia have developed under a humid to sub-humid tropical climate with alternate wet-dry conditions, from the decomposition of acid or basic rocks, colluvial outwash from either or both of these rocks, recent or old alluvial materials and from coastal accretion (Crocker, 1962). The general soil clarification of Cambodia has 16 types of soil. The three types of soil; (i) Latosols, (ii) Red Yellow Podsoles, (iii) Planosols are distributed on Kampong Speu Province.

Table AH-2.1.2.1.1 General Soil Clarification of Kampong Speu Province

No.	Type of Soil	Agricultural Potential Remarks
1	Latosols	Generally good: Soil need protection from erosion and fire. Composition phosphate and organic fertilizers (Rock phosphate)
2	Red Yellow Podsoles	Poor Soil: Structure easily destroyed. Soil rapidly leached, lacking fertilizes elements.
3	Planosols	Good Soil: Enough for rice when prepared and irrigated.

Source: Sustainable Land Management 2006

(3) Surface Water

There are several surface water sources within Kampong Speu Province. The major one is Prek Thnot River, and other water resources are Ou Anlong Rumlich River, Ou Bat Khmeng River, Ou Sambuor Thum River, Ou Peam River, Ou Kchcheay River, Prek Santung River, Ou Chheu Teal Kramum River, Ou Prey ROUNG River, and Rumlich Lake, Ou Veng Stream and Reservoir.

(4) Groundwater

According to 'Project Report on CCOP-GSJ/AIST Groundwater Phase II Kick-off Meeting, 1-2 October 2009', the report had noticeably stated the following groundwater information in Kampong Speu Province. As for well distribution, 2,171 wells are distributed among 1,016 villages in Kampong Speu Province meaning that there are 2.1 wells per village. On the other hand, groundwater quality in Cambodia is generally good, but high level of manganese ion concentration is common. In Kampong Speu Province, most groundwater samples contain high Ca and HCO₃.

AH-2.1.2.2 Pollution Control

(1) Air Quality

Some of factors such as SO_x, NO_x, CO, Leads, TSP and other substances were measured for air quality acceptance. Even the sub-decree on Air Pollution and Noise Disturbance Control came into effect in 2000, neither air pollution that caused by industrial activities, generators, transportations, dusts, and biomass fuels nor other roots as well has been seriously reported at Kampong Speu Province.

(2) Noise and Vibration

No secondary data of noise and vibration is available in Kampong Speu Province.

(3) Water Quality

Water quality degradation of Stung Kampong Speu in June 2005 was sole incident in Kampong Speu Province caused by solid and liquid waste as the main sources of water pollution in the stream, the major source of local water supply.

The water quality of the stream had degraded caused by improper disposal of solid waste and sewers from the town. Stung Kampong Speu is located in Kampong Speu town area where population density is high with the crowded various business sectors. Due to the insufficient sanitation system and waste management, some solid wastes and sewers are discharged into the watercourse, which is one of the main reasons of pollution with high concentration of nitrogen at that time. Since then, neither

information related to water pollution nor publication has been publicized or recorded by Water Environment Partnership in ASIA.

(4) Soil Erosion

Out of some provinces of Cambodia, Siem Reap, Kampong Thom, Battambang and Kratie as examples, Kampong Speu Province also encountered with soil erosion due to the reduction of ecological services from diminishing forest cover as an evident in agricultural landscapes.

AH-2.1.2.3 Natural Resources

(1) Flora, Fauna and Biodiversity

As mentioned above, Cambodia has rich ecosystem, such as Tonle Sap ecosystem. However, the RCHRSP Area is already developed as agriculture land and human residential area.

(2) Protected Area

The RCHRSP Area does not encompass any Protected Area.

(3) Land Use

RCHRSP relates to the following three districts: (i) Samraong Tong, (ii) Kong Pisei, (iii) Chbar Mon. The information of land use in each district is shown in the following table.

Table AH-2.1.2.3.1 Land Use of three districts in related district

District	Total Land Area (Ha)	Forest Land Area (Ha)		Cultivation Land Area (Ha)	Construction Land Area (Ha)	Other Land Area (Ha)
		Total	Flooded			
Samraong Tong	54,519	14,101	0	18,756	2,229	19,433
Korng Pisei	29,006.66	6,703.59	0	16,593.63	2,875.8	2,833.64
Chbar Mon	4,738	943	0	2,782	758	255

Source: Compiled from Samraong Tong, Korng Pisei and Chbar Mon District Data Books 2009

AH-2.1.2.4 Social Resources

(1) Population

Number of communes affected by RCHRSP is 14 in total in abovementioned three districts. Total affected population is 140,514, and average male-to female ratio is 92.6. There are no ethnic minorities living in those districts. Only small numbers of Khmer Islamic, Vietnamese, Laos and Chinese are recorded.

Table AH-2.1.2.4.1 Existing social status of Project affected Communes

No.	Commune	Population	Male-to-Female ratio
Chbar Morn District			
1	Chbar Morn	8,358	95.5
2	Rokar Thom	7,257	96.3
3	Kandaol Dom	15,223	92.5
4	Svay Krorvan	7,841	91.0
Korng Pisei District			
1	Roka Kaoh	7,326	90.7
2	Veal	9,116	89.8
Samraong Tong District			
1	Tropaeng Korng	14,840	85.2
2	Tang Kroch	8,598	96.6
3	Vor Sor	13,650	91.4
4	Sambour	8,232	93.3
5	Kahaen	7,087	93.1
6	Roleang Chork	8,693	92.2
7	Roleang Kreul	12,051	92.3
8	Saen Dei	12,242	94.6
Total of population / Average of M-to-F ratio		140,514	92.5

Source: Compiled from Samraong Tong, Korng Pisei and Chbar Mon District Data Book 2009

(2) Economic Status

The rural households relied on agriculture and its related sub-sectors in Cambodia and Kampong Speu Province is not left out. Major economic activities are basically rice farming, fruit cropping and fishery in Kampong Speu Province.

(3) Heritage and Religion Site

The RCHRSP Area is not located in the popular heritage and religion site.

(4) Water Supply and Sewage System

Sources of drinking water are piped water, pumping water, well water, rainwater and natural water surface in affected communes. In addition, those commune people use sewage pipe system.

Table AH-2.1.2.4.2 Water and Sanitation, by commune in the RCHRSP

Commune Name	Ratio of People to wells (%)		Ratio of People to wells (%)						Families using safe and unsafe water sources in dry season (%)		Families filtering or regularly boiling water (%)	
	Total wells	Year round wells	Pipe water	Pump or mixed wells	Ring wells	Pond water	Rain water	River, lake, stream water	Clean/safe sources	Unsafe sources	Water filter	Regularly boiled water
Chbar Morn												
Chbar Mon	54	73	28.4	35.8	10.7	2.7	1.5	20.9	53.2	46.8	10.0	74.7
Kandaol Dom	57	75	23.0	17.1	12.8	7.4	0.5	39.1	61.8	38.2	6.8	72.8
Rpkar Thum	113	142	75.1	10.8	2.5	5.9	0.4	5.3	79.7	20.3	15.0	51.3
Svay Kravan	54	66	48.1	18.1	9.6	2.7	4.8	16.7	71.9	28.1	17.0	57.2
Kong Pisei												
Rokar Koh	61	85	0	67.3	19.0	13.7	0	0	55.2	44.8	3.9	46.6
Veal	81	149	0	36.2	22.0	41.9	0	0	30.5	69.5	2.3	66.4
Samraong Tong												
Trapeang Korng	19	27	2.9	48.0	18.6	9.8	2.2	18.5	57.7	42.3	10.6	49.4
Tang Kroch	68	90	0	70.1	16.2	8.8	0.2	4.7	75.9	24.1	12.0	44.7
Vor Sar	42	60	11.6	39.6	6.4	13.1	1.5	27.8	58.4	46.6	14.0	60.5
Sambuor	28	44	0	65.3	13.9	17.7	2.9	0.1	69.6	30.4	7.6	57.0
Kahaen	59	82	0	46.9	16.7	4.6	2.4	29.4	63.8	36.3	4.4	79.2
Roleang Chork	38	53	0	70.8	20.7	6.1	1.2	1.2	75.4	24.6	11.5	39.1
Roleang Kreul	37	45	0	61.2	27.5	9.2	1.0	1.0	37.3	62.7	2.0	40.7
Saen Dei	56	87	0	64.5	12.3	20.8	1.4	1.1	69.6	30.4	2.5	51.0

Source: Compiled from Chbar Mon, Kong Pisei and Samraong Tong District Data Books 2009

AH-2.1.3 Result of Scoping**AH-2.1.3.1 Environmental Scoping for RCHRSP**

Environmental scoping for RCHRSP, which clarifies conceivable environmental and social impacts due to proposed projects activities, was conducted. The major environment and social impact assessment studies are presented in the following scoping matrix and checklist. It is noted that the evaluation in the matrix is made by considering a degree of conceivable impacts in the case any adequate mitigation measure is not conducted and also common to RCHRSP. The evaluation was utilized for preparation of specifications of detailed study in the next chapter.

Table AH-2.1.3.1.1 Result of Environmental Scoping for RCHRSP

No.	Likely Impact	Project-related Activities				
		Overall Rating	Planning / Design Phase	Construction Phase	Operation Phase	
Pollution Control	1	Air pollution	B-	-	B-	-
	2	Water pollution	B-	-	B-	-
	3	Soil contamination	-	-	-	-
	4	Waste	B-	-	B-	-
	5	Noise and vibration	B-	-	B-	-

No.	Likely Impact	Project-related Activities			
		Overall Rating	Planning / Design Phase	Construction Phase	Operation Phase
6	Ground subsidence	-	-	-	-
7	Offensive odor	-	-	-	-
8	Bottom sediment	-	-	-	-
9	Disaster	-	-	-	-
10	Topography and geographical features	-	-	-	-
11	Soil erosion	B-	-	B-	B-
12	Groundwater	-	-	-	-
13	Hydrological situation	C-	-	-	C-
14	Coastal zone	-	-	-	-
15	Flora, fauna and biodiversity	-	-	-	-
16	Meteorology	-	-	-	-
17	Landscape	-	-	-	-
18	Global warming	-	-	-	-
19	Involuntary resettlement	-	-	-	-
20	Local economy such as employment and livelihood, etc.	A+	-	B+	A+
21	(Surrounding) Land use and utilization of local resources	B-/B+	B-	-	A+
22	Social institutions (including regional severance)	-	-	-	-
23	Existing social infrastructures and services	B-	-	B-	-
24	Socially vulnerable groups such as the poor, indigenous and ethnic people (including gender matter)	B+	-	-	B+
25	Misdistribution of benefit and damage	-	-	-	-
26	Historical and cultural heritage (including religious matters)	-	-	-	-
27	Water usage or water rights and rights of common	A+	-	-	A+
28	Local conflict of interests	-	-	-	-
29	Sanitation	B-	-	B-	-
30	Hazardous (risk) infectious diseases such as HIV/AIDS	B-	-	B-	-
31	Accident	B-	-	B-	-

Source: JICA Survey Team

<Rating>

A-: Serious impact is expected, if any measure is not implemented to the impact.

B-: Some impact is expected, if any measure is not implemented to the impact.

C-: Extent of impact is unknown (Examination is needed. Impact may become clear as study progresses.)

-: No impact is expected.

A+: Remarkable effect is expected due to the project implementation itself and environmental improvement caused by SPPIDRIP.

B+: Some effect is expected due to the project implementation itself and environmental improvement caused by SPPIDRIP.

Overall rating: Highest rate will be the overall rating among the rating of relevant project-related activities for negative and positive ratings, respectively. (e.g. Even only one "A-" is included in an environmental item, overall rating of the environmental item becomes "A-".)

AH-2.1.3.2 Checklist of Environmental Scoping

Checklist of environmental scoping for RCRHSP is prepared as described in Table AH-2.1.3.2.1.

Table AH-2.1.3.2.1 Checklist of Environmental Scoping for RCHRSP

No	Likely Impacts	Rating Over all	Explanation on Potential Impacts (Project-related activity is shown in the parenthesis"<>".)
Pollution			
1	Air pollution	B-	<Operation of construction equipment and vehicles> <Rehabilitation work of regulator, canals/drainages and other related facilities> Emission of exhaust gas from construction equipment and vehicles and dust pollution due to operation of the construction equipment and vehicles would cause air pollution in and around the construction sites during the construction. However, the impact is limited and temporality.
2	Water pollution	B-	<Operation of construction equipment and vehicles> <Rehabilitation work of regulator, canals/drainages and other related facilities> <Utilization of irrigation water> Muddy water from construction site and soil spill from construction equipment and vehicles would cause water pollution in the Prek Thont River/existing canals in and around the construction site.
3	Soil contamination	-	SPPIDRIP does not have any factor which may cause the soil contamination in terms of project location and construction method.

No	Likely Impacts	Rating Over all	Explanation on Potential Impacts (Project-related activity is shown in the parenthesis"<>".)
4	Waste	B-	<Operation of construction equipment and vehicles> <Rehabilitation work of regulator, canals/drainages and other related facilities> Construction waste including residue soil and concrete waste would be produced by construction work.
5	Noise and vibration	B-	<Operation of construction equipment and vehicles> <Rehabilitation work of regulator, canals/drainages and other related facilities> Vibration caused by such construction works would cause damage to residential people, the existing house and other kinds of building structures.
6	Ground subsidence	-	RCHRSP does not have any factor which may cause the ground subsidence in terms of project location and construction method.
7	Offensive odor	-	RCHRSP does not have any factor which may cause the offensive odor in terms of project location and construction method.
8	Bottom sediment	-	RCHRSP does not have any factor which may cause the bottom sediment in terms of project location and construction method.
9	Disaster	-	RCHRSP does not have any factor which may cause the disaster in terms of project location and construction method.
Natural Environment			
10	Topography and geographical features		RCHRSP does not have any factor which may cause the disaster in terms of project location and construction method because project site is already developed as paddy field, crop field and habitat for local people.
11	Soil erosion	B-	<Operation and Maintenance of regulator and canals/drainage> Soil erosion was found in some sections of existing canals/drainage. After rehabilitation of these canals, soil erosion will occur without adequate maintenance.
12	Groundwater	-	RCHRSP does not have any factor which may cause the groundwater in terms of project location and construction method because RCHRSP does not utilize groundwater.
13	Hydrological situation	C-	<Rehabilitation work of regulator, canals/drainages and other related facilities> <Operation and Maintenance of regulator and canals/drainage> New regulator and canals/drainage in some sections would affect hydrological situation in project area without adequate control of maintenance of those structures. Detailed hydrological analysis undertaken in this study.
14	Coastal zone	-	RCHRSP does not have any factor which may cause the c in terms of project location.
15	Flora, fauna and biodiversity	-	Almost existing status of the ROW and work sites are agriculture field and old canals /drainage site.
16	Meteorology	-	RCHRSP does not have any factor which may affect and/or be related to the meteorology.
17	Landscape	-	RCHRSP does not have any factor which may cause the groundwater in terms of project location and construction method.
18	Global warming	-	RCHRSP does not have any factor which may cause the global in terms of project location and construction method because RCHRSP is only rehabilitation and improvement project and not including new development.
Social Environment			
19	Involuntary Resettlement	-	It is expected that no involuntary resettlement will be caused by RCHRSP.
20	Local economy such as employment and livelihood, etc.	A+	<Rehabilitation work of regulator, canals/drainages and other related facilities> During construction phase, RCHRSP will make more employment and business opportunities for local residents. <Operation of new regulator and canals > After operation of the RCHRSP, regional farmers around the RCHRSP would have positive impact due to improved irrigation water provision.
21	Land use and utilization of local resources	B-/A+	<Rehabilitation work of regulator, canals/drainages and other related facilities> Temporary and permanent land acquisition will be requested by RCHRSP for diversion channels and new drainages. <Operation of new regulator and canals > After operation of the RCHRSP, regional farmers around the RCHRSP would have positive impact due to improvement of irrigation water availability.
22	Social institutions	-	RCHRSP does not have any factor which may cause social institution in terms of project location and construction method.
23	Existing social infrastructures and services	B-	<Operation of construction equipment and vehicles> <Rehabilitation work of regulator, canals/drainages and other related facilities> Construction work and traffic restriction would disturb access to the existing social infrastructures and services around the RCHRSP Area.
24	Socially vulnerable groups such as the poor, indigenous and ethnic people	B+	<Rehabilitation work of regulator, canals/drainages and other related facilities> After operation of the RCHRSP, local people including vulnerable groups around RCHRSP would have positive impact due to improved irrigation water provision.
25	Misdistribution of benefit and damage	-	RCHRSP does not have any factor which may cause social institution in terms of project location and construction method because RCHRSP. Because the RCHRSP purpose is maintenance of the status quo.

No	Likely Impacts	Rating Over all	Explanation on Potential Impacts (Project-related activity is shown in the parenthesis"<>".)
26	Historical and cultural heritage (including religious matters)	-	RCHRSP does not have any factor which may affect and/or be related to the meteorology.
27	Water usage or water rights and rights of common	B-/A+	<Rehabilitation work of regulator, canals/drainages and other related facilities> During rehabilitation works of regulator and intakes, flow of Prek Thnot River and main canals will be partially stopped during dry season intensively. People living around regulator and canals will be faced with limitation/nothing canal water as domestic use during the period. <Operation of new regulator and canals/drainage > After operation of the RCHRSP, regional farmers around the RCHRSP would have positive impact due to improved irrigation water provision.
28	Local conflict of interests	-	RCHRSP does not have any factor which may cause social institution in terms of project location and construction method because the RCHRSP purpose is maintenance of the status quo of irrigation system.
29	Sanitation	B-	<Operation of construction equipment and vehicles> <Rehabilitation work of regulator, canals/drainages and other related facilities> Sanitary issues would occur in labor camp and neighboring area in the case sanitary facility is not adequately installed such as toilet and septic tank.
30	Hazardous (risk) infectious diseases such as HIV/AIDS	B-	<Operation of construction equipment and vehicles> <Rehabilitation work of regulator, canals/drainages and other related facilities> Risk of infectious diseases by labors would be expected during construction due to the inflow of the construction workers from outside.
31	Accident	B-	<Operation of construction equipment and vehicles> <Rehabilitation work of regulator, canals/drainages and other related facilities> Some accidents are inevitable during construction.

Note: * Regarding the impacts on "Gender" and "Children's Right", might be related to all criteria of Social Environment.

<Rating>

A-: Serious impact is expected, if any measure is not implemented to the impact.

B-: Some impact is expected, if any measure is not implemented to the impact.

C-: Extent of impact is unknown (Examination is needed. Impact may become clear as study progresses.)

-: No impact is expected. Therefore, EIA is not required.

A+: Remarkable effect is expected due to the project implementation itself and environmental improvement caused by RCHRSP.

B+: Some effect is expected due to the project implementation itself and environmental improvement caused by RCHRSP.

Overall rating: Highest rate will be the overall rating among the rating of relevant project-related activities for negative and positive ratings, respectively. (e.g. Even only one "A-" is included in an environmental item, overall rating of the environmental item becomes "A".)

Source: JICA Survey Team

AH-2.1.4 Anticipated Impact of Environment

In accordance with the examination, the mitigation measures against impacts anticipated are proposed as follows:

(1) Pollution Control

(a) Air pollution and Noise and Vibration (Construction Phase)

1) Activity

- Operation of construction equipment and vehicles
- Rehabilitation works of regulator, canals/drainages and other related facilities

2) Affected Area

- In and around construction area

3) Expected Potential Impact

During the construction phase, transportation of heavy equipment would cause air pollution, noise and vibration. Transportation of construction vehicles and transportation/operation of heavy equipment, such as dump truck, excavator, bulldozer, roller compactor and watering lorry, would exhaust emission gasses including nitrogen dioxide (NO₂) and suspended particulate matter (SPM). And also, such heavy equipment would cause noise and vibration.

- 4) Related Regulation
 - Sub-decree on Air and Noise Pollution Control

- 5) Conclusion of Examination

Because most of the construction works are small scale, numbers of heavy equipment and construction vehicles for the works will be limited. Therefore, the impact to air quality, noise and vibration by construction works will be insignificant if proper mitigation measures are carried out.

- (b) Water Pollution by Construction Works (Construction Phase)

- 1) Activity

- Operation of construction equipment and vehicles
- Rehabilitation works of regulator, canals/drainages and other related facilities

- 2) Affected Area

- Downstream of Prek Thnot River, NMC and SMC

- 3) Expected Potential Impact

Muddy water from construction site and soil spilt from construction machinery would cause water pollution of the Prek Thnot River/existing canals. In addition, alkalified water caused by the concrete works will be another concern during construction phase.

- 4) Related Regulation

- Sub-decree on Water Pollution Control

- 5) Conclusion of Examination

Since the amount of concrete to be used is not large, alkalified water from the concrete works in the canals might be diluted by canal water. However, it is necessary to establish adequate treatment system if large quantity of alkalified water is observed during construction time.

- (c) Waste Management by Construction Works (Construction phase)

- 1) Activity

- Operation of construction equipment and vehicles
- Rehabilitation works of regulator, canals/drainages and other related facilities

- 2) Affected Area

- In and around construction area

- 3) Expected Potential Impact

Concrete and other construction waste would be produced by the construction works. In addition, rehabilitation works of NMC and SMC will create soil disposal.

- 4) Related Regulation

- Sub-decree on Solid Waste Management (1999)

- 5) Conclusion of Examination

As most of the construction works are small scale and therefore construction waste is very limited. The impact of waste by construction works will not be serious if appropriate management and mitigation measures are provided.

- (d) Water Pollution (Operation Phase)

- 1) Activity

- Utilization of irrigation water

2) Affected Area

- Downstream of Prek Thnot River, NMC and SMC

3) Expected Potential Impact

Increased irrigation water might encourage farmers to use more agro-chemicals and fertilizers to carry out intensive farming.

4) Related Regulation

- Sub-decree on Water Pollution Control (April 6, 1999)

5) Conclusion of Examination

The command area of Roleang Chrey Regulator has been already developed with farming, however, socio-economic survey disclosed that usage of agro-chemicals and fertilizer would be limited at present due to those high cost. However, after regulators is rehabilitated and operated, nutrient load or chemical contamination may increase affecting downstream areas because of increase of agro-chemicals and fertilizer usage. In addition, since canal water is partly utilized for drinking and domestic use during dry season, careful consideration also needs to be given to maintain water quality.

(2) Natural Environment

(a) Soil Erosion

1) Activity

- Operation and maintenance of regulator and canals/drainage

2) Affected Area

- NMC and SMC

3) Expected Potential Impact

Soil erosion was found in some sections of existing canals/drainage at present. After the rehabilitation, soil erosion will occur if adequate maintenance works are provided.

4) Conclusion of Examination

Soil erosion is not only man-cause but also natural-cause. Although it is difficult to completely prevent canals from erosion, adequate design and maintenance of canals would alleviate soil erosion to some degree.

(b) Hydrological Situation

1) Activity

- Operation and maintenance of regulator and canals/drainage

2) Affected Area

- Area of the RCHRSP

3) Expected Potential Impact

Hydrological situation of the RCHRSP Area will be affected by rehabilitation work of Roleang Chrey Regulator.

4) Conclusion of Examination

After the rehabilitation work, hydrological situation will change RCHRSP Area. However, RCHRSP is rehabilitation work, and hydrological situation will return previous status when past irrigation system functioned. Therefore, the impact is very limited if proper mitigation measures are carried out.

(3) Social Environment

The implementation of the Sub-project may cause some adverse social impacts during the planning/designing and construction phases and the pollution of river water during the construction phase. Among other things, the following two issues need to be particularly considered in the implementation of RCHRSP.

(a) Land Use and Utilization of Local Resources (Construction Phase)

1) Activity

- Rehabilitation works of regulator, canals/drainages and other related facilities

2) Affected Area

- Areas surrounding the Roleang Chrey Regulator

3) Expected Potential Impact

The lands for the temporary diversion channels, construction office and other related facilities need to be temporarily acquired for about two years in the construction stage. Further land acquisition is required for the 3 km extension of the existing drainage canal. However, there is no land acquisition expected for rehabilitation of NMC and SMC since its related works are only rehabilitation of existing structures.

4) Related regulation

- Land law (2001)

5) Conclusion of Examination

Land acquisition process should be conducted carefully from design phase. Average holding size of agricultural land is only 0.84 ha per household in RCHRSP Area. Even through area to be acquired is small, it might not be small impact to the affected people. The impact of temporary land acquisition also would be sensitive issues to local people. Therefore, this matter may have a high risk of social problem for project implementation if proper measures are not carried out.

(b) Water Usage or Water Rights and Rights of Common (Construction Phase)

1) Activity

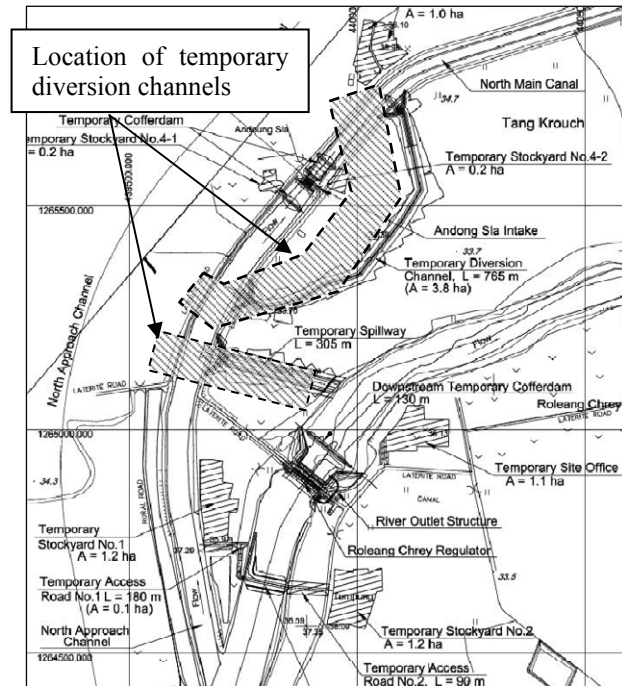
- Rehabilitation works of regulator, canals/drainages and other related facilities

2) Affected Area

- Areas surrounding the Roleang Chrey Regulator

3) Expected Potential Impact

The water flow of the river will be stopped for rehabilitation of SMC and secondary canals during the construction phase. The stoppage of the flow will be done in the dry season in principle to lessen the



Source; JICA Survey Team

Figure AH-2.1.4.1 Location of Required Temporary Land Acquisition

impact on farm production in the area. Nevertheless, it would affect a total of about 12,000 people who have used the river water for domestic purposes during the dry season. Furthermore, some rehabilitation works may be conducted even during the wet season, which is the main cropping season in the area. In such cases, agricultural production in some areas might be adversely affected by the Sub-project.

4) Related Regulation

- None

5) Conclusion of Examination

Due consideration shall be given to this issue, especially the current use of river water during the dry season, since approximately 12,000 people are expected to be affected by the rehabilitation works of SMC as reported by the feasibility study on the Sub-Project. The proposed mitigation measures shall be approximately taken even in the planning/designing phase as specified above.

(c) Sanitation/Hazardous (risk) Infectious Diseases such as HIV/AIDS (Construction Phase)/Accident

1) Activity

- Operation of construction equipment and vehicles
- Rehabilitation works of regulator, canals/drainages and other related facilities

2) Affected Area

- In and around the RCHRSP Area

3) Expected Potential Impact

Due to inflow of construction workers from outside of the community during construction phase, the anticipated impacts are (i) deterioration of sanitation condition, (ii) deterioration of public security, (iii) increase of risk of diseases including AIDS/HIV, (iv) accident, and (v) local conflict among people and workers. Although construction scale is not large and duration is at most 36 months, these issues need to be taken into consideration.

4) Related regulation

- Labor Law (2001)

5) Conclusion of Examination

Since the people in and around RCHRSP Area is not familiar to the construction workers, a great attention should be paid to management of construction workers and construction sites. However, taking into consideration work scale, the number of construction workers will not be large. Therefore, serious negative impacts are not envisaged if proper mitigation measures are provided.

AH-2.1.5 Mitigation Measures

In accordance with the above examination, the mitigation measures against negative impacts anticipated are proposed as follows:

(1) Pollution Control

(a) Air Pollution and Noise and Vibration (Construction Phase)

- To educate construction workers on minimizing idling of construction machinery
- To restricted construction time, e.g. during daytime only
- To hold stakeholder meetings to build consensus about the construction time

- To stipulate environmental consideration measures in the technical specification of the construction works
- (b) Water Pollution by Construction Works (Construction Phase)
 - To dilute or neutralize alkalified water from concrete mixer trucks by pooling in regulating pond before discharging
 - To pool discharging water from the concrete plant for dilution or neutralization
 - To install adequate treatment system for muddy and alkalified water in construction site such as installation of water tank to collect water from concrete works for neutralization
 - To stipulate environmental consideration measures in the technical specification of the construction works
- (c) Waste Management by Construction Works (Construction Phase)
 - To comply with relevant laws pertaining to the management and disposal of solid waste, hazardous waste and re-waste.
 - To arrange suitable sites for disposal of solid waste prior to the construction works,
 - To avoid dumping in the area of private property without written consent of the owner
 - To carry out recycle use of disposed soil as much as possible
- (d) Water Pollution (Operation Phase)
 - To conduct support programs regarding appropriate agricultural management
 - To introduce composting activity to the farmers
 - To introduce check system among the FWUC members regarding agricultural management
 - To monitor water quality and agricultural activities regularly
- (2) Natural Environment
 - (a) Soil Erosion
 - To implement maintenance of canals by adequate methods and appropriate timing
 - To design main canal and related structures to consider alleviation of soil erosion
 - (b) Hydrology
 - To ensure the amount of river maintenance water particularly in the dry season
- (3) Social environment
 - (a) Land Use and Utilization of Local Resources (Construction Phase)
 - To design temporary diversion channels, other temporary related facilities and drainage canals by minimizing land acquisition as much as possible during D/D;
 - To conduct a detailed socio-economic survey of potentially-affected families/persons in the project preparatory stage to assess all losses that would result from the land acquisition;
 - To fairly compensate all affected families/persons, including those without a title to land, for all their losses at reasonable rates or replacement rates, if any; and
 - To properly restore the affected area after construction works.
 - (b) Existing Social Infrastructures and Services
 - To provide a temporary bridge during 2 years
 - To hold a series of public consultation meetings for surrounding people in order to explain, discuss and find the way of passage restriction
 - To educate construction workers for adequate traffic rule of construction vehicles
 - To post a bill to inform impassable duration to commune council, village chief by means of,

such like, social facilities including schools, pagodas and hospitals, after the work schedule is fixed with people's consensus

(c) Water Usage or Water Rights and Rights of Common (Construction Phase)

- To set a work schedule to complete construction works during the dry season so as not to impact farm production;
- To intensively manage the construction works and keep to the schedule to complete the works during the fallow period;
- To hold a series of stakeholder meetings when preparing a detailed schedule for the construction works to build consensus among stakeholders including affected people;
- To examine the possibility of developing an alternative water source like a pump well for drinking and domestic purposes for those who would be affected by the stoppage of the river to avoid their additional burden; and
- To distribute water for drinking and domestic use by water tanker for the affected people during construction phase

(d) Sanitation/ Hazardous (risk) Infectious Diseases such as HIV/AIDS (Construction phase)/Accident

- To improve sanitary condition of workers by proper arrangement of accommodation, installation of toilets and proper water supply
- To implement education programs for workers about sanitation, security and rules/discipline of daily activities
- To implement safety education and training for construction workers
- To implement periodical patrol of workers in order to avoid both occurrence of local conflict and epidemics of diseases
- To hold a series of stakeholder meetings for surrounding people in order to explain construction works and its schedule.
- To stipulate environmental consideration measures in the technical specifications of the construction works

AH-2.1.6 Conclusion and Recommendation

MOWRAM came with official letter which Confirmation of Need of EIA and IEIA for RCHRSP and USISRSP on 20 October, 2011. The letter mentioned that MOWRAM has an honor to inform that based on the Sub-decree on EIA process dated 11th August 199 of the Royal Government of Cambodia, the two Sub-Projects; RCHRSP and USISRSP, are not required to conduct the EIA or IEIA as their command area is less than 5,000 ha and they area existing irrigation systems.

From an environmental view point, in particular, land acquisition for temporary diversion channels and other temporary related facilities will be one of the most important determinant factors to implement RCHRSP in time. MOWRAM is highly requested to arrange agreement with land owners for the use of area for the construction phase. In addition, the proposed area for those temporary facilities is currently utilized as paddy field. Therefore, restitution of the area needs to be properly undertaken after the construction works.

AH-2.2 Upper Slakou Irrigation System Rehabilitation Sub-project

AH-2.2.1 Description of Sub-project

(1) Principal Features

Principal features of USISRSP are tabulated as follows:

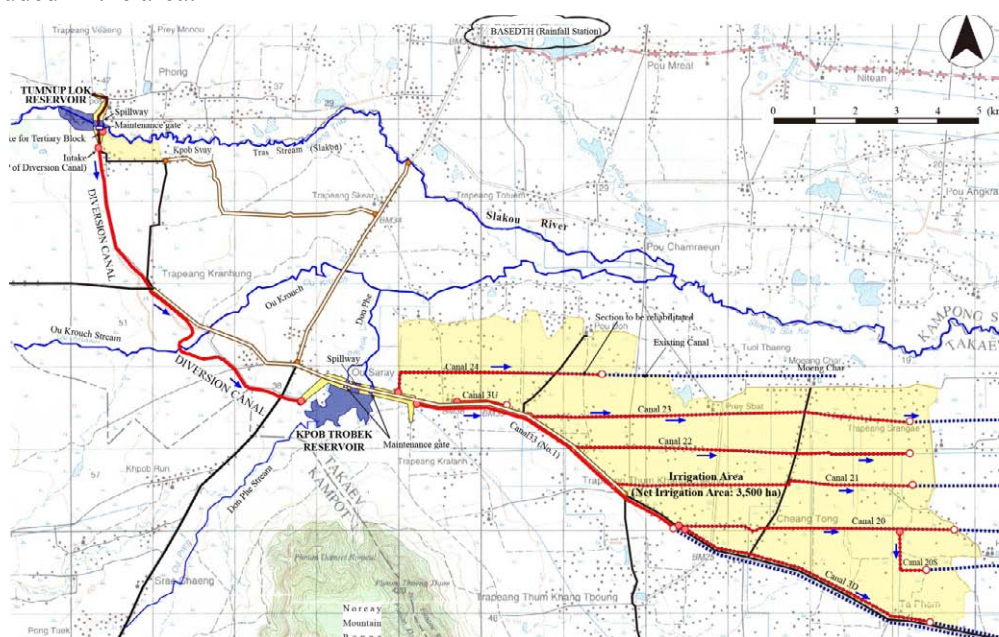
Table AH-2.2.1.1 Principal Features of USISRSP

No.	Description	Quantity
1	Sub-project Area	3,500 ha
2	Water resource facilities	
	- Reservoir-1	Tumnap Lok Reservoir on the Slakou River (CA=332 km ³), Ve= 1.0 MCM, Re-construction of dike, spillway, intake and maintenance facilities
	- Reservoir-2	Kpob Trobek Reservoir on the Don Phe River (CA=137 km ³), Ve= 2.6 MCM Supplemental improvement and repair of dike and spillway gates which were rehabilitated by MOWRAM in 2005
	- Diversion canal	Connecting the above two reservoirs, 9.4 km, Design discharge: 3.5 m ³ /sec
3	Main Canal	1 no. Design discharge: 3.2 m ³ /sec
	- Length	7.3 km
	- Off-takes	6 nos.
	- Diversion structure	5 nos.
4	Secondary Canals	7 nos.
	- Total length	44.7 km
	- Off-takes	102 nos.
	- Diversion structure	66 nos.
5.	Tertiary Canal System	
	- Total length	110 km

Source: JICA Survey Team

(2) Location

The USISRSP Area (3,500 ha) is located on the right bank of the Slakou River between 104°30' to 104°40' east longitude, and 11°00' to 11°05' north latitude. The elevation of the area ranges from 15 m to 35 m with a slope of 1/200 to 1/1000 from west to east. The approximate distance to Takeo town from the area is about 15 to 35 km. The USISRSP Area (3,500 ha) administratively belongs to Basedth District of Kampong Speu and Tram Kak District of Takeo Province. Five communes and 32 villages are included in the area.



Source: JICA Survey Team

Figure AH-2.2.1.1 Location Map of USISRSP

(3) Time Schedule

Implementation time schedule of USISRSP are shown as follows:

Work Item	Year									
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
1. Loan Agreement (L/A)										
2. Procurement of Consultant										
3. Clearance of Mines and UXOs										
4. Land Acquisition										
5. Consulting Services										
5-1 Detailed design for water resources facilities and canal system										
5-2 Assistance for procurement of ICB Contractor										
5-3 Construction supervision										
6. Rehabilitation Work										
6-1 Preparatory Work										
6-2 Rehabilitation and construction works										
(1) Partial rehabilitation of Tumnup Lok Reservoir										
(2) Partial rehabilitation of diversion canal (9.4km)										
(3) Partial rehabilitation of Kpob Trobek Reservoir										
(4) Full rehabilitation of Main Canal 33 system (7.3km)										
(5) Partial rehabilitation of secondary canal system (44.7km)										
(6) Partial rehabilitation and new construction of tertiary canal system (3,500 ha)										
(7) New construction of Sub-project office										

Figure AH-2.1.1.2 Implementation Time Schedule for Main System of USISRSP

(4) Examination of Alternatives

According to M/P (2002), twelve development alternatives for combination of water resources were examined in terms of cost and development scale, technical soundness, and negative impact as mentioned below. It was planned that the benefit area of USISRSP would be fed irrigation water by two main canals (Canal 33 and Koh Kaek Canal) and Canal 24 starting at Kpob Trobek Reservoir and their secondary canals. As a result, Alternative 3-1 (Kpob Trobek- 39 m + Tumnup Lok- 43 m) was selected as the best development alternative, which is the largest development scale of 3,500 ha with the lowest development cost per ha, and less risk against flood damages and adverse impacts to the environment.

Table AH-2.2.1.2 Development Alternatives in Master Plan

Alternative	Combination of Reservoirs and Dike Top Elevation			Irrigation area (ha)	Contribution of O Saray reservoir*	Evaluation for dike raising**	Construction cost (US\$ /ha)	Remarks
	Kpob Trobek	O Saray	Tumnup Lok					
Alt 1-1	39m	-	-	800			5,190	
Alt 1-2	40m	-	-	950		Excluded for flood risk		Not applicable
Alt 2-1	39m	40.5m	-	1,100	Irrigation area is significantly increased (300 ha or 38%)		6,119	
Alt 2-2	40m	40.5m	-	1,350	Irrigation area is significantly increased (400 ha or 42%)	Excluded for flood risk		Not applicable
Alt 3-1	39m	-	43m	3,500			3,483	Selected alternative
Alt 3-2	39m	-	44m	4,000		Excluded for negative impacts		Not applicable
Alt 3-3	40m	-	43m	4,000	No significant increase in irrigation area (200 ha or 6%)	Excluded for flood risk		Not applicable
Alt 3-4	40m	-	44m	4,500	No significant increase in irrigation area (100 ha or 2%)	Excluded for flood risk and negative impacts		Not applicable
Alt 4-1	39m	40.5m	43m	3,700	No significant increase in irrigation area (100 ha or 2%)			Not applicable
Alt 4-2	39m	40.5m	44m	4,100	No significant increase in irrigation area (100 ha or 2%)	Excluded for negative impacts		Not applicable
Alt 4-3	40m	40.5m	43m	4,100	Irrigation area is significantly increased (300 ha or 38%)	Excluded for flood risk		Not applicable
Alt 4-4	40m	40.5m	44m	4,600	Irrigation area is significantly increased (400 ha or 42%)	Excluded for flood risk and negative impacts		Not applicable

-: not included in the alternative

*: The results show that O Saray Reservoir contributes to an increase in irrigable area in Alternative series 2, but little in Alternative series 4.

** : Dike raising plans by 1.0 m (high dike plan) were excluded from the risk of floods damage to the village downstream the Kpob Trobek reservoir and negative impacts such as compensatory work for the village road and increment of submergence area for the Tumnup Lok reservoir

Source: Volume I Main Report, the Study on the Rehabilitation and Reconstruction of Agricultural Production System

AH-2.2.2 Description of Environment

AH-2.2.2.1 Physical Resources

Takeo Province covers an area of 3,563 km², consisting of 10 districts, 100 communes and 1,116 villages. It is located in the south of the country bordering to the north and east with Kandal, to the west with Kampong Speu and Kampot and to the south with Vietnam.

(1) Climate

The climate of Takeo Province can be divided into two seasons: the rainy and dry seasons. The annual rainfall of the province varies from 800 to 1220 mm. The rainy season generally runs from May to November. During this period of the year, most of the farmers are very busy with their crops. In general, during the rainy season, there are frequently periods without rain, lasting for one or two weeks, especially in June or in July, and sometimes in August. The rainfall is highest during the month of October.

(2) Topography and Soil

The geographical features of Takeo Province are mostly plain regions, which are suitable for growing rice: rainy and dry season rice, deep-water rice and other subsidiary crops. The central plain is between 10 to 15 m above mean sea level. The western part is a mountainous area, where the peak is about 500 m high.

The general soil clarification of Cambodia has 16 types of soil. The four types of soil (i) Alluvias (Alluvials and Alluvials Uthosols), (ii) Red Yellow Podsoles, (iii) Regurs are distributed on Takeo Province. Alluvials and Alluvials Uthosols covered almost Takeo Province. These soils are good condition and recommend colmatage canals, cultivation and others.

Table AH-2.2.2.1.1 General Soil Clarification of Takeo Province

No	Type of Soil	Agricultural Potential Remarks
1	Alluvials LLUVIALS (Alluvials Ushosols)	Good Soil: Potential acidity: Recommend colmatage canals. Cultivation concordance with the water regime. Green manure, phosphate, and potash (avoid the use of sulphate fertilizers)
2	Regurs	Rich Soil: Basaltic regurs: Cultivation to be encouraged;
		With irrigation, rice, sugar cane, pineapple, banana, seasonal crops etc.
3	Red Yellow Podsoles	Calcic (Limestone) regurs: corn, beans, banana, cotton, sugar cane
		Poor Soil: Structure easily destroyed. Soil rapidly leached, lacking fertilizes elements.

Source: JICA Survey Team

(3) Surface Water

There are several surface water sources within Takeo Province. The major surface water resource are Prek Don Phe River, Stueng Tras River, Stueng Slakou River, Stueng Svay Prey River, Ou Romlech Thom River, Ou Trapeang Kul River, Boeng Kanlaeng Chak River, Boeng Krachab River, Boeng Tonle Bati River, Tonle Bati Prek Roka River, Boeng Saba River, and Stoeng Touch River.

(4) Groundwater

There are 2,046 wells distributed among 744 villages while it means wells per village are 2.8 in number in Takeo Province. Groundwater quality in Cambodia is generally good, but high level of manganese ion concentration is common.

AH-2.2.2.2 Pollution Control

(1) Air Quality

Some of factors such as SO_x, NO_x, CO, Leads, TSP and other substances were measured for air quality acceptance. Even the sub-decree on Air Pollution and Noise Disturbance Control came into effect in 2000, neither air pollution that caused by industrial activities, generators, transportations, dusts, and biomass fuels nor other roots as well has been seriously reported at Takeo Province.

(2) Noise and Vibration

No secondary data of noise and vibration on Kampong Speu Province.

(3) Water Quality

Within the conclusions made by the Assessment of the Chemical Quality of Drinking Water in Cambodia of Journal of Water and Health, of WHO 2007 described that, in the study area, Takeo, of Cambodia's drinking water sources had reasonably good chemical quality, while bacteriological contamination remains the primary water quality concern from a health perspective.

(4) Soil Erosion

Takeo Province encountered with soil erosion due to the reduction of ecological services from diminishing forest cover as an evident in agricultural landscapes.

AH-2.2.2.3 Natural Resources

(1) Flora, Fauna and Biodiversity

As mentioned above, Cambodia has rich ecosystem such as Tonle Sap ecosystem. However, the USISRSP Area has been already developed with agriculture land and human residential area.

(2) Protected Area

The USISRSP Area does not include any Protected Area.

(3) Land Use

USISRSP is located in Tramkak District. The information of land use of the district is shown in the following table.

Table AH-2.2.2.3.1 Land Use of three districts in

District	Total Land Area (Ha)	Forest Land Area (ha)		Cultivation Land Area (ha)	Construction Land Area (ha)	Other Land Area (ha)
		Total	Flooded			
Tramkak	54,694	2,160	0	35,677	6,618	10,239

Source: Compiled from Samraong Tong, Konrng Pisei and Chbar Mon District Data Books 2009

AH-2.2.2.4 Social Resources

(1) Population

In O Saray Commune, Tramkak District, population is 11,993 (2008), and average male-to female ratio is 96.9. In addition, there are no ethnic minorities living in those districts, but only small number of Khmer Islamic, Vietnamese, Laos and Chinese were recorded.

Table AH-2.2.2.4.1 Existing Social status of O Saray commune

District	Commune	Population	Male-to-Female ratio
Tramkak	O Saray	11,993	96.9

Source: 2008 Cambodia Population Census

(2) Economic Status

Major economic activities of rural area in Takeo Province are agriculture and its related sub-sectors particularly rice farming, fruit cropping and fishery.

(3) Heritage and Religion Site

Takeo Province is characterized as rich cultural and historical site. *Tonle Bati Resort* (a place of worship and features two ancient temples, Ta Promh and Yeay Peov, and a pagoda, Wat Tonle Bati, which was built in 1576.). *Phnom Tamao*, the land area covered with two ancient temples – Ta Mao Temple was built in 11th century during the reign of the king, Soryak Varman I dedicated to Brahmanism, and Thmor Dos Temple was built in 11th century too. *Ta Prohm Temple* was built by King Jayavarman VII. This edifice was constructed in the Angkor era temple. It is enlisted as a historical site and about 45 km from the provincial town. *Neang Khmao Temple* was built by King Jayavarman IV (AD 921-941) in the 10th century for the worship of Brahmanism. It is also known as the temple of the Black Virgin. According to legends, this temple might once have been the haven to Kali, the Dark Goddess of Destruction.

Phnom Chissor is a historical site was built in the early 11th century by King Suryavarman I (AD1002-1050), who practiced Brahmanism. It is constructed of sandstone and other stones.

Phnom Da is one of the ancient historical places in Cambodia. Earlier it was the old capital of Nor Kor Kouk Thlork of Kouk Thlork commune situated at Angkor Borey district in Takeo region. It was built in the 6th century by the King Rut Trak Varman. *Phnom Ba Yang Resort* was built between AD 615 and 635 by King Pavavarman II on the top of Phnom Bayong, a 313-meterhigh mountain. Chup Pol Temple is a sacred site and one such structure that throws sufficient light on the historical and cultural aspect of the place.

The USISRSP Area is not located in and near popular heritage and religious areas.

(4) Water Supply and Sewage System

Main sources of water supply are pumping water, non-covered well water and natural water surface (Spring/River/Creek/ Natural pond.ect) in Takeo Province, especially, in rural area, people do not use piped water. In addition, many farmers use ring /open dug wells and pond as water resource in Trankak District.

Table AH-2.2.2.4.2 Source of Water Supply in 2008 on Takeo Province

Main sources of water supply	Total (%)	Urban area (%)	Rural area (%)
Piped water	4.39	61.72	3.54
Pumping water	25.10	11.98	25.30
Digging well water with cover	5.02	2.23	5.07
Non-covered well water	19.27	0.33	19.55
Rainwater	1.63	0.15	1.65
Spring/River/Creek/ Natural pond.ect	40.78	17.22	41.13
Purchasing water	2.91	6.18	2.86
Other water sources	0.89	0.19	0.90
Total	100	100	100

Source: Cambodia Census 2008, Takeo Province

Table AH-2.2.2.4.3 Source of Potable Water for Households, over 3 years on Trankak District

Water sources	2006 %	2007 %	2008	
			%	Number
Families using water from purification system	2	3	3	1,137
Families using water from pump, mixed wells	35	35	35	12,135
Families using water from ring wells and open dug wells	23	22	23	8,093
Families using water from pond	32	33	32	11,142
Families using water from rain water storage	2	2	1	459
Families using water from rivers, lakes, natural ponds and reservoir	6	4	5	1,663

Note: Calculated as a percentage of the total number of families.

Source: Trankak District Data Book 2009

AH-2.2.3 Result of Scoping

AH-2.2.3.1 Environmental Scoping for USISRSP

Environmental scoping for USISRSP, which clarifies conceivable environmental and social impacts due to proposed projects activities, was conducted. The major environment and social impact assessment studies are presented in the following scoping matrix and checklist. It is noted that the evaluation in the matrix is made by considering a degree of conceivable impacts in the case any adequate mitigation measure is not conducted and also common to USISRSP. The evaluation will be utilized for preparation of specifications of detailed study in the next chapter.

Table AH-2.2.3.1.1 Result of Environmental Scoping for USISRSP

No.	Likely Impact	Project-related Activities				
		Overall Rating	Planning / Design Phase	Construction Phase	Operation Phase	
Pollution Control	1	Air pollution	B-	-	B-	-
	2	Water pollution	B-	-	B-	B-
	3	Soil contamination	-	-	-	-
	4	Waste	B-	-	B-	-
	5	Noise and vibration	B-	-	B-	-
	6	Ground subsidence	-	-	-	-
	7	Offensive odor	-	-	-	-
	8	Bottom sediment	-	-	-	-
	9	Disaster	-	-	-	-
Natural Environment	10	Topography and geographical features	-	-	-	-
	11	Soil erosion	B-	-	-	B-
	12	Groundwater	-	-	-	-
	13	Hydrological situation	C-	-	-	C-
	14	Coastal zone	-	-	-	-
	15	Flora, fauna and biodiversity	B-	-	-	B-
	16	Meteorology	-	-	-	-
	17	Landscape	-	-	-	-
	18	Global warming	-	-	-	-
Social Environment	19	Involuntary resettlement	B-	-	-	B-
	20	Local economy such as employment and livelihood, etc.	B-/A+	A-	B+	A+
	21	Land use and utilization of local resources	B-/B+	-	-	B-/B+
	22	Social institutions (including regional severance)	-	-	-	-
	23	Existing social infrastructures and services	B-	-	B-	B-
	24	Socially vulnerable groups such as the poor, indigenous and ethnic people (including gender matter)	B+	-	-	B+
	25	Misdistribution of benefit and damage	B-	B-	-	-
	26	Historical and cultural heritage (including religious matters)	-	-	-	-
	27	Water usage or water rights and rights of common	A+	-	-	A+
	28	Local conflict of interests	B-	-	B-	B-
	29	Sanitation	B-	-	B-	-
	30	Hazardous (risk) infectious diseases such as HIV/AIDS	B-	-	B-	-
	31	Accident	B-	-	B-	-

Source: JICA Survey Team

<Rating>

A-: Serious impact is expected, if any measure is not implemented to the impact.

B-: Some impact is expected, if any measure is not implemented to the impact.

C-: Extent of impact is unknown (Examination is needed. Impact may become clear as study progresses.)

-: No impact is expected.

A+: Remarkable effect is expected due to the project implementation itself and environmental improvement caused by RCHRSP.

B+: Some effect is expected due to the project implementation itself and environmental improvement caused by RCHRSP.

Overall rating: Highest rate will be the overall rating among the rating of relevant project-related activities for negative and positive ratings, respectively. (e.g. Even only one "A-" is included in an environmental item, overall rating of the environmental item becomes "A-".)

AH-2.2.3.2 Checklist of Environmental Scoping

Checklist of environmental scoping for USISRSP is prepared as described in Table AH-2.2.3.2.1.

Table AH-2.2.3.2.1 Checklist of Environmental Scoping for USISRSP

No	Likely Impacts	Rating Over all	Explanation on Potential Impacts (Project-related activity is shown in the parenthesis"<>".)
Pollution			
1	Air pollution	B-	<Operation of construction equipment and vehicles> <Rehabilitation of existing Main canal and secondary canals and other facilities> <Rehabilitation of existing dike and construction of the reservoir facilities (Tumnup Lok Reservoir)> Emission of exhaust gas from construction equipment and vehicles and dust pollution due to operation of the construction equipment and vehicles would cause air pollution in and around the construction sites during the construction. However, the impact is limited and temporary.
2	Water pollution	B-	<Operation of construction equipment and vehicles> <Rehabilitation of existing Main canal and secondary canals and other facilities> <Rehabilitation of existing dike and construction of the reservoir facilities (Tumnup Lok Reservoir)> Muddy water from construction site and oil spill from construction equipment and vehicles would cause water pollution in the existing canals in and around the construction site.
3	Soil contamination	-	USISRSP does not have any factor which may cause the soil contamination in terms of project location and construction method.
4	Waste	B-	<Operation of construction equipment and vehicles> <Rehabilitation of existing Main canal and secondary canals and other facilities> <Rehabilitation of existing dike and construction of the reservoir facilities (Tumnup Lok Reservoir)> Construction waste including residue soil and concrete waste would be produced by construction work.
5	Noise and vibration	B-	<Operation of construction equipment and vehicles> <Rehabilitation of existing Main canal and secondary canals and other facilities> <Rehabilitation of existing dike and construction of the reservoir facilities (Tumnup Lok Reservoir)> Vibration caused by such construction works would cause damage to residential people, existing houses and other kinds of building structures.
6	Ground subsidence	-	USISRSP does not have any factor which may cause the ground subsidence in terms of project location and construction method.
7	Offensive odor	-	USISRSP does not have any factor which may cause the offensive odor in terms of project location and construction method.
8	Bottom sediment	-	USISRSP does not have any factor which may cause the bottom sediment in terms of project location and construction method.
9	Disaster	-	USISRSP does not have any factor which may cause the disaster in terms of project location and construction method.
Natural Environment			
10	Topography and geographical features		USISRSP does not have any factor which may cause the disaster in terms of project location and construction method because project site is already developed as .
11	Soil erosion	B-	<Control of Maintenance of canals and drainage> Rehabilitation work canals/drainage would cause soil erosion in some sections.
12	Groundwater	-	USISRSP does not have any factor which may cause the groundwater in terms of project location and construction method because USISRSP does not utilize groundwater.
13	Hydrological situation	C-	<Rehabilitation of existing Main canal and secondary canals and other facilities> <Rehabilitation of existing dike and construction of the reservoir facilities (Tumnup Lok Reservoir)> Rehabilitation work canals/drainage in some sections would affect hydrological situation in project area without adequate control of maintenance of those structure. Detailed hydrological analysis undertaken in this study.
14	Coastal zone	-	USISRSP does not have any factor which may cause the c in terms of project location.
15	Flora, fauna and biodiversity	B-	<Rehabilitation of existing dike and construction of the reservoir facilities (Tumnup Lok Reservoir)> After Rehabilitation work, Tumnup Lok Reservoir will occurred upstream Slakou River. If water flow of downstream, downstream ecosystem will be affected.
16	Meteorology	-	USISRSP does not have any factor which may affect and/or be related to the meteorology.
17	Landscape	-	USISRSP does not have any factor which may cause the groundwater in terms of project location and construction method.
18	Global warming	-	USISRSP does not have any factor which may cause the groundwater in terms of project location and construction method because USISRSP is only rehabilitation and improvement project and not including new development.
Social Environment			
19	Involuntary Resettlement	B-	It is expected that small involuntary resettlement will be caused belong to 3D canals area.

No	Likely Impacts	Rating Over all	Explanation on Potential Impacts (Project-related activity is shown in the parenthesis"<>".)
20	Local economy such as employment and livelihood, etc.	B-/A+	<Design of Main canal and secondary canals and other facilities > <Rehabilitation of existing Main canal and secondary canals and other facilities> <Rehabilitation of existing dike and construction of the reservoir facilities (Tumnap Lok Reservoir)> - Overall, the construction of USISRSP will make more employment and business opportunities for local residents during construction. - After operation of USISRSP, regional formers around USISRSP would have positive impact due to improvement irrigation water availability.
			<Rehabilitation of existing Main canal and secondary canals and other facilities> <Rehabilitation of existing dike and construction of the reservoir facilities (Tumnap Lok Reservoir)> - USISRSP will cause loss of paddy field (illegal use) on Tumnap Lok Reservoir - USISRSP will cause loss of structure (house, shop and other facilities) along main and secondary canals (illegal use)
21	Land use and utilization of local resources	B-/B+	<Rehabilitation of existing Main canal and secondary canals and other facilities> <Rehabilitation of existing dike and construction of the reservoir facilities (Tumnap Lok Reservoir)> USISRSP will cause loss of accessibility from road to residential houses and shops along main and secondary Canals.
			<Operation of Main canal and secondary canals and other facilities > After operation of the RCHRSP, regional formers around the USISRSP would have positive impact due to improved irrigation water availability
22	Social institutions	-	USISRSP does not have any factor which may cause social institution in terms of project location and construction method.
23	Existing social infrastructures and services	B-	<Land acquisition> Land acquisition for the Sub-project, involving relocation of public and/or community facilities, would affect local communities to some extent.
			<Operation of construction equipment and vehicles> <Rehabilitation of existing Main canal and secondary canals and other facilities> <Traffic restriction in construction area> Construction work and traffic restriction would disturb access to the existing social infrastructures and services.
24	Socially vulnerable groups such as the poor, indigenous and ethnic people	B+	<Operation of new regulator and canals > After operation of the USISRSP, all regional Project Affected Persons (PAPs) around the USISRSP would also have positive impact due to improved irrigation water provision.
25	Misdistribution of benefit and damage	B-	<Design of Main canal and secondary canals and other facilities > <Rehabilitation of existing Main canal and secondary canals and other facilities> <Rehabilitation of existing dike and construction of the reservoir facilities (Tumnap Lok Reservoir)> Local farmers will benefit from USISRSP directly. Meanwhile people live along main canal and secondary canal will be affected by USISRSP, will not benefit from USISRSP directly. It will be occurred misdistribution of benefit and damage without adequate mitigation measure.
26	Historical and cultural heritage (including religious matters)	-	USISRSP does not have any factor which may cause historical and cultural heritage in terms of project location and construction method.
27	Water usage or water rights and rights of common	A+	<Operation of Main/Secondary canal/ drainage and other faicilitates > After operation of the USISRSP new regulator and canals/drainage will provide a substantial improvement in irrigation water provision without adequate water resource management.
28	Local conflict of interests	B-	<Design of Main canal and secondary canals and other facilities > <Rehabilitation of existing Main canal and secondary canals and other facilities> <Rehabilitation of existing dike and construction of the reservoir facilities (Tumnap Lok Reservoir)> Local farmers will benefit from USISRSP directly. Meanwhile people live along main canal and secondary canal will be affected by USISRSP, will not benefit from USISRSP directly. It will be occurred local conflict of interests between farmers and non-farmers without adequate mitigation measure.
			<Operation of construction equipment and vehicles> <Rehabilitation of existing Main canal and secondary canals and other facilities> <Rehabilitation of existing dike and construction of the reservoir facilities (Tumnap Lok Reservoir)> Sanitary issues would occur in labor camp and neighboring area in the case sanitary facility is not adequately installed such as toilet and septic tank.
29	Sanitation	B-	<Operation of construction equipment and vehicles> <Rehabilitation of existing Main canal and secondary canals and other facilities> <Rehabilitation of existing dike and construction of the reservoir facilities (Tumnap Lok Reservoir)> Sanitary issues would occur in labor camp and neighboring area in the case sanitary facility is not adequately installed such as toilet and septic tank.
30	Hazardous (risk) infectious diseases such as HIV/AIDS	B-	<Operation of construction equipment and vehicles> <Rehabilitation of existing Main canal and secondary canals and other facilities> <Rehabilitation of existing dike and construction of the reservoir facilities (Tumnap Lok Reservoir)> Risk of infectious diseases by labors would be expected during construction due to the inflow of the construction workers from outside.

No	Likely Impacts	Rating Over all	Explanation on Potential Impacts (Project-related activity is shown in the parenthesis"<>".)
31	Accident	B-	<Operation of construction equipment and vehicles> <Rehabilitation of existing Main canal and secondary canals and other facilities> <Rehabilitation of existing dike and construction of the reservoir facilities (Tumnup Lok Reservoir)> Some accidents are inevitable during construction.

Source: JICA Survey Team

Note: * Regarding the impacts on "Gender" and "Children's Right", might be related to all criteria of Social Environment.

<Rating>

A-: Serious impact is expected, if any measure is not implemented to the impact.

B-: Some impact is expected, if any measure is not implemented to the impact.

C-: Extent of impact is unknown (Examination is needed. Impact may become clear as study progresses.)

-: No impact is expected. Therefore, EIA is not required.

A+: Remarkable effect is expected due to the project implementation itself and environmental improvement caused by USISRSP.

B+: Some effect is expected due to the project implementation itself and environmental improvement caused by USISRSP.

Overall rating: Highest rate will be the overall rating among the rating of relevant project-related activities for negative and positive ratings, respectively. (e.g. Even only one "A-" is included in an environmental item, overall rating of the environmental item becomes "A-".)

AH-2.2.4 Anticipated Impact of Environment

(1) Pollution Control

(a) Air pollution and Noise and Vibration (Construction Phase)

1) Activity

- Operation of construction equipment and vehicles
- Rehabilitation of main and secondary canals/drainages and other related facilities
- Rehabilitation of the existing dike and construction of the reservoir (Tumnup Lok Reservoir)

2) Affected Area

- In and around construction area

3) Expected Potential Impact

Expected Potential Impact is similar to that in RCRHSP.

4) Related Regulation

- Sub-decree on Air and Noise Control

5) Conclusion of Examination

As most of the construction works are small scale, the number of both heavy equipment and construction vehicles for the work will be limited. Therefore, the impact to air quality, noise and vibration by construction works will not be serious if proper management and mitigation measures are carried out.

(b) Water Pollution by Construction Works (Construction Phase)

1) Activity

- Operation of construction equipment and vehicles
- Rehabilitation main and secondary canals/Drainages and other related structures
- Rehabilitation of the existing dike and construction of the reservoir facilities (Tumnup Lok Reservoir)

2) Affected Area

- Downstream of Slakou River, main and secondary canals

3) Expected Potential Impact

Muddy water from construction site and soil spilt from construction machinery would cause water pollution in the Slakou River/existing canals in and around the construction site. In addition, alkalified water caused by the concrete works will be another concern during construction phase.

4) Related Regulation

- Sub-decree on Water Pollution Control

5) Conclusion of Examination

Because the amount of concrete to be used is not large, alkalified water from the concrete works in the canals might be diluted by canal water. However, it is necessary to install adequate treatment system if large quantity of alkalified water is observed during construction.

(c) Waste Management by Construction Works (Construction Phase)

1) Activity

- Operation of construction equipment and vehicles
- Rehabilitation main and secondary canals/Drainages and other related facilities
- Rehabilitation of the existing dike and construction of the reservoir (Tumnup Lok Reservoir)

2) Affected Area

- In and around construction area

3) Expected Potential Impact

Concrete waste and other construction waste would be produced by construction works.

4) Related Regulation

- Sub-decree on Solid Waste Management

5) Conclusion of Examination

Because most of the construction works are small scale and construction waste is very limited. Therefore, the impact of waste by construction works will not be serious if appropriate management and mitigation measures are provided.

(d) Water Pollution (Operation Phase)

1) Activity

- Utilization of irrigation water

2) Affected Area

- Downstream of the Slakou River, main and secondary canals

3) Expected Potential Impact

Increased irrigation water might encourage farmers to use more agrochemicals and fertilizer to carry out intensive farming.

4) Related Regulation

- Sub-decree on Water Pollution Control

5) Conclusion of Examination

The command area of USISRSP is already irrigated area. Although socio-economic survey disclosed that agrochemicals and fertilizer use by local farmers is limited, nutrient load or chemical contamination may increase affecting downstream areas by the increase of agro-chemicals and fertilizer usage after USISRSP. Therefore, careful consideration needs to be given to maintain water quality to downstream areas including Slakou River.

(2) Natural Environment

(a) Soil Erosion

1) Activity

- Operation of maintenance of canals/drainage

2) Affected Area

- Command area of USISRSP

3) Expected Potential Impact

Soil erosion was found in some sections of existing canals/drainage at present. After the rehabilitation, soil erosion will occur if adequate maintenance works are provided.

4) Conclusion of Examination

Soil erosion is not only man-cause but also natural-cause. Although it is difficult to completely prevent canals from erosion, adequate design and maintenance of canals would alleviate soil erosion to some degree.

(b) Hydrological situation

1) Activity

- Operation and maintenance of regulator and canals/drainage

2) Affected Area

- Area of USISRSP

3) Expected Potential Impact

Hydrological situation of the USISRSP Area will be affected by rehabilitation work of the Roleang Chrey Regulator.

4) Conclusion of Examination

After the rehabilitation work, hydrological situation will change the RCHRSP Area. However, RCHRSP is rehabilitation work, and hydrological situation will return previous status when past irrigation system functioned. Therefore, the impact is very limited if proper mitigation measures are carried out.

(c) Flora, Fauna and Biodiversity

1) Activity

- Rehabilitation of the existing dike and construction of the reservoir (Tumnu Lok Reservoir)

2) Affected Area

- Downstream of the Slakou River

3) Expected Potential Impact

Proposed Tumnu Lok Reservoir will store river water so that it will give effect to decrease released discharge to the downstream of the reservoir, which will be the concern to give negative impact to ecosystem of downstream area of the river.

4) Conclusion of Examination

Development plan of USISRSP considers constant volume of water to be released as river maintenance water. Therefore, it is assumed that negative impact is not significant if such river maintenance flow is properly maintained during operation stage.

(3) Social Environment

(a) Local Economy such as Employment and Livelihood

1) Activity

- Rehabilitation main and secondary canals/Drainages and other related structures
- Rehabilitation of existing dike and construction of the reservoir (Tumnup Lok Reservoir)

2) Affected Area

- Area along main and secondary canals
- Area of Tumnup Lok Reservoir

3) Expected Potential Impact

Many houses, shops and other buildings stand along main and secondary canals. A part of some buildings and fences, canal crossings (bridges and landfills) need to be removed to rehabilitate canals. In actuality, the proposed canal areas are the government property and the people living there have already recognized this matter. More than 40 shops including both temporary and permanent structures will be affected by the rehabilitation works. In addition, proposed Tumnup Lok Reservoir area is used as paddy field by local farmers illegally. After implementation of USISRSP, this paddy field will be totally submerged.

4) Related Regulation

- Land Law (2001)

5) Conclusion of Examination

Livelihood of some people will be affected by the rehabilitation works, especially shops' owners along the canals and farmers using proposed Tumnup Lok Reservoir area. MOWRAM needs to consider compensation policy together with joint committee for affected people.

(b) Land Use and Utilization of Local Resources (Planning /Design Phase)

1) Activity

- Rehabilitation canals/drainages and other related facilities
- Rehabilitation of the existing dike of Tumnup Lok Reservoir)

2) Affected Area

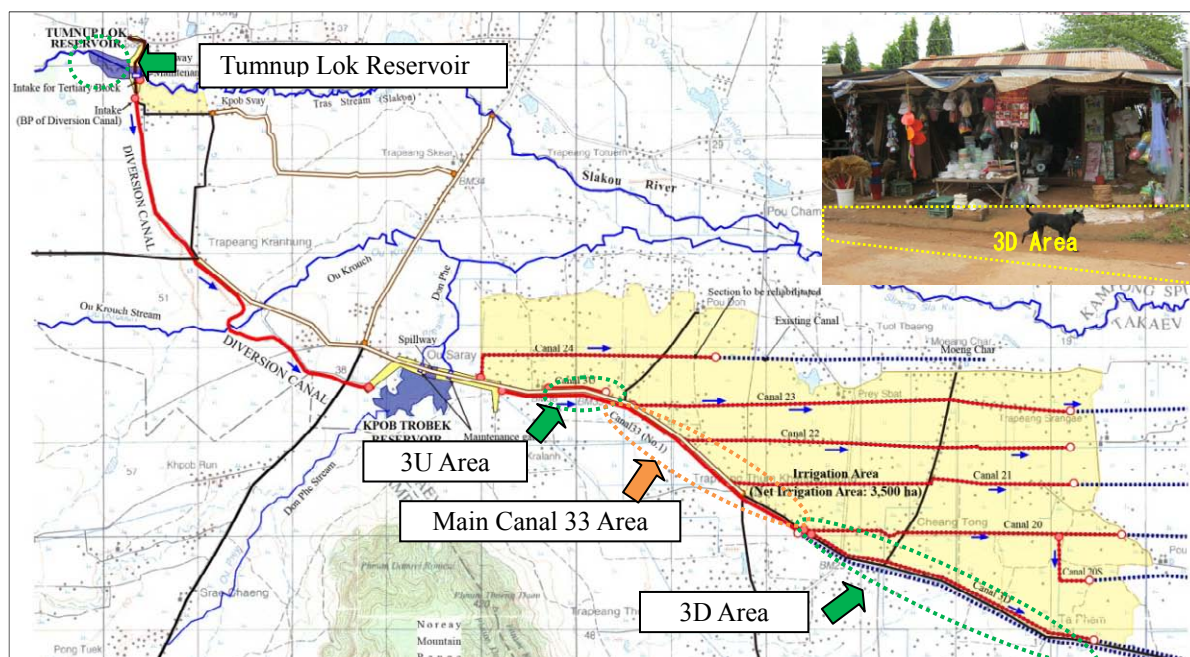
- Areas along canals/drainages,
- Area of the Tumnup Lok Reservoir

3) Expected Potential Impact

Expected potential impact by each proposed canal alignment is shown below. The number of affected house, related facilities and area are just in round number from the field visit. Socio-economic and inventory of losses survey reveal the exact number.

Secondary Canal 3D Area (3D)

There are permanent and temporary houses, shops and other buildings located along 3D as shown below.



Source: JICA Survey Team

Figure AH-2.2.4.1 Location Map of Social Environmental Issues on USISRSP

Table AH-2.2.4.1 Number of Affected Buildings and Other Facilities on 3D Area (Sept.2011)

Objectives	Number	Total	Remarks
Shop	Permanent	7	33
	Temporary	26	
House (not residential)	Permanent	4	15
	Temporary	11	
Other facilities		40	Fences, Gates
Canal crossing		122	Constructed for crossing canals
Total		210	-

Source: JICA Survey Team

All the canal crossings and part of some buildings are currently located in the proposed alignment of 3D and its right of way. They need to be removed and/or relocated when the rehabilitation works start.

Secondary Canal 3U Area and Main Canal 33 Area

The rehabilitation of 3U and Main Canal 33 would face a similar situation to that 3D would. A preliminary site investigation carried out by the preparatory survey team reveals that about eight houses and about 20 houses might be affected by the rehabilitation of 3U and Main Canal 33, respectively, and all the houses are not for residential use.

Tumnap Lok Reservoir

At present, there are about 20 houses residing within the potential inundation area of the proposed reservoir using about 130 ha of the area as paddy fields. Such paddy fields will be totally submerged by the construction of Tumnap Lok Reservoir, although their houses are located in the areas topographically higher than the designed water level of the proposed reservoir. Regarding paddy field inside the reservoir area, following issues have been confirmed during F/S. In the F/S report, the characteristics of such households and paddy fields were analyzed as follows:

- No farmer had legitimate right to use the reservoir area for paddy production since the areas were registered as the state property in accordance with the regulations. All the 20 families were aware of their illegality;
- MOWRAM had already explained this matter to those staying inside the reservoir area;

- The families showed their willingness to continue farming in the reservoir area at their own risk if MOWRAM allowed them to do so; and
- MOWRAM should prepare a land acquisition policy in consideration of the above-mentioned issues.

(d) Related Regulation

- Constitution (1993)
- Land law (2001)
- Expropriation Law (2010)
- Sub-decree on Social Land Concession (2003)
- (draft) Sub-decree on Addressing Socio-Economic Impacts caused by Development Projects (2007)

(e) Conclusion of Examination

The process of land acquisition should be carefully and properly conducted from the design phase as USISRSP might affect more than 200 buildings/facilities, such as houses, shops, fences, and canal crossings (small bridges and landfills) on canals, as described above. Although the Land Law (2001) provides MOWRAM with legal bases for evicting encroachers without compensation or reimbursement for losses of immovable property in the state lands, the JICA guidelines strongly require the recipient countries (i.e., MOWRAM) to give any affected families/people, including non-title holders, the right to claim compensation for any losses or expenses for restoration/maintenance of their property.

The Resettlement Unit of MOWRAM (MOWRAM-RU), with the assistance of JICA survey team, conducted a socio-economic and inventory of losses survey and finalized the draft resettlement framework (DRF) in March 2012, survey result summary of DRF is shown Table AH-2.2.4.2. DRF defines non-title holders as a target group for compensation and incorporates special consideration for vulnerable groups into the framework. It also proposes examining the new alignment of some parts of the main canals to minimize the potential negative impact on local people as a result of public consultations. DRF is shown in ANNEX J.

Table AH-2.2.4.2 Number of Affected Buildings and Other Facilities

Asset Area	Land		Number of Assets						Affected HHs	
	Rice Land (m ²)	Residential Land (m ²)	House	Stall/Shop	Other facilities*	Economic Tree	Concrete Fence (m)	Steel Fence (m)	Number of APs (HHs)	Vulnerable Group HHs
Area along canals	42,200	31,368	23	51	125	5,410	402	217	1,951 (368)	63
Tumnup Lok Reservoir	1,470,314	27,025	-	-	-	338	-	-	193	46

Source: Upper Slakou Irrigation System Rehabilitation Sub-project in Takeo Province of Cambodia Draft resettlement framework (2012)

*Other facilities: Latrine, Grange, Dug well, Hand pump Well, Pond, Culvert, Concrete bridge, Wooden bridge, Place of concrete slab, Cemetery, Wooden stair, Concrete stair, Balcony, Fuel station

(c) Existing social infrastructures and services

1) Activity

- Operation of construction equipment and vehicles
- Rehabilitation main and secondary canals/drainages and other related facilities
- Rehabilitation of existing dike and construction of reservoir (Tumnup Lok Reservoir)

2) Affected area

- In and around construction area, especially along Main Canal 33, 3D and 3U

3) Expected Potential Impact

During construction time, operation of construction equipment and vehicles will affect life of people in USISRSP area. After the rehabilitation works, people living along canals will lose easy accessibility to residential houses and shops since all the canal crossings on the canals need to be removed. Some canal crossings will be constructed under USISRSP, however, not necessarily all structures are recovered.

4) Conclusion of examination

Most of the construction works are small scale, therefore construction period is limited. The impact by the construction works will not be significant if proper management and mitigation measures are carried out. On the other hand, some canal crossings will be re-constructed under USISRSP, however, not necessarily all the structures are recovered. MOWRAM and PDOWRAM are required to prepare rules for the community people to construct crossing structures by themselves without deterioration of canal functions.

(d) Misdistribution of benefit and damage/Local conflict of interests (Planning / Design phase)

1) Activity

- Rehabilitation main and secondary canals/drainages and other related facilities
- Rehabilitation of the existing dikes of Tumnup Lok Reservoir

2) Affected Area

- Areas in and around the construction sites of the above-mentioned facilities, especially along Main Canal 33, 3D and 3U

3) Expected Potential Impact

USISRSP will contribute to the stabilization of agricultural production in the command area by providing stable irrigation water, while the Sub-Project will force farmers who illegally stay and use the construction sites, particularly the areas along Main Canal 33, 3D and 3U, need to give up their farms following the land acquisition process. Different results among local families/people, where on the one hand some families are benefited by the Sub-project but at the same time some other families lose their farm lands, would course social conflict among/between community members.

4) Conclusion of Examination

To minimize a feeling of unfairness and potential for social conflict among community members, MOWRAM shall conduct a series of meetings with all the stakeholders, especially those affected by the Sub-Project, to facilitate their understandings about both positive and negative impacts on them. In particular, the compensation policy shall be clearly explained to those who would be negatively affected by the Sub-project, so that they would have a sense of unfairness as well as a sense of distrust of the Sub-Project.

(e) Sanitation/ Hazardous (risk) infectious diseases such as HIV/AIDS (Construction Phase)/Accident

1) Activity

- Rehabilitation main and secondary canals/drainages and other related facilities
- Rehabilitation of existing dike and construction of reservoir (Tumnup Lok Reservoir)

2) Affected area

In and around the USISRSP Area

3) Expected Potential Impact

Due to inflow of construction workers from outside during construction phase, the anticipated impacts are (i) deterioration of sanitation condition, (ii) deterioration of public security, (iii) increase of risk of diseases including AIDS/HIV, (iv) accident, (v) local conflict among people and workers. Although construction scale is not large and duration is at most 36 months, these issues need to be considered.

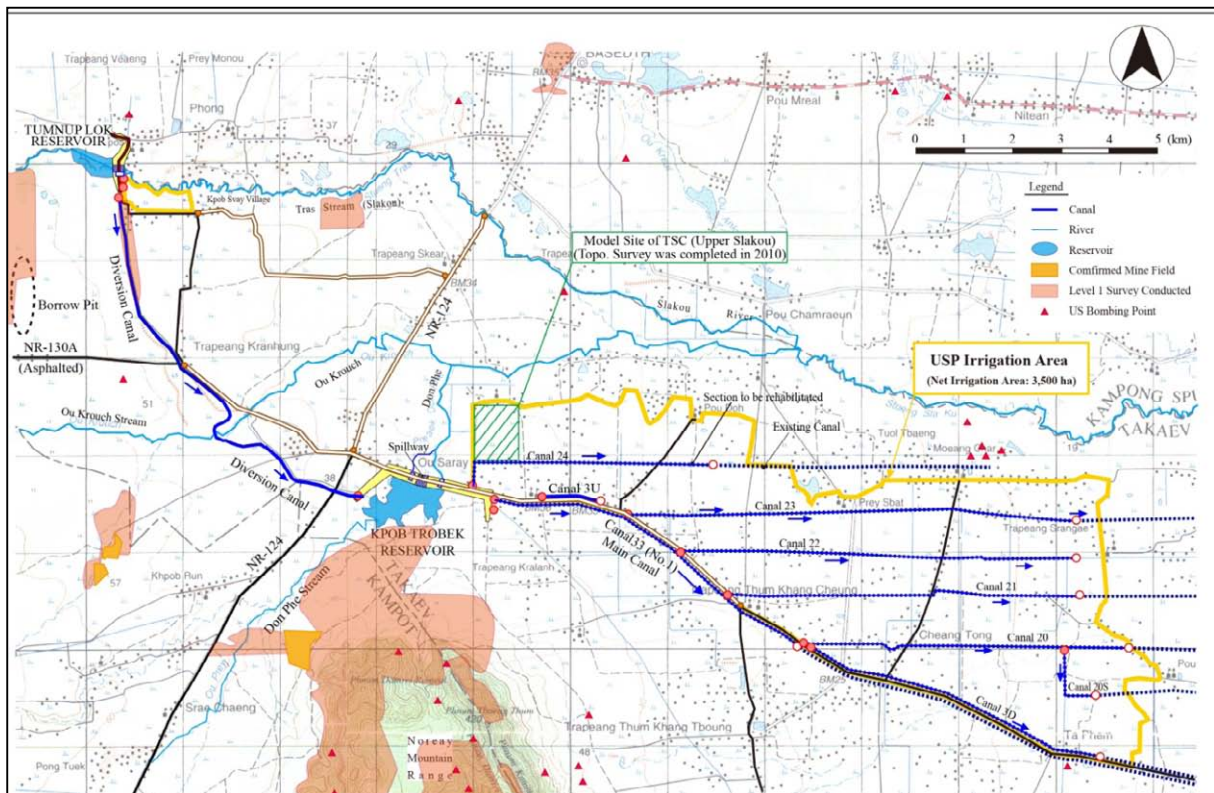
In addition, it is required scrupulous attention to landfill works since there is a possibility that land mines and duds of Khmer Rouge Regime have been buried in the earth. MINE/UXO Contamination Map of USISRSP Area is shown in Figure AH-2.2.4.2.

4) Related regulation

- Labor Law (1997)

5) Conclusion of examination

Because the people in and around the USISRSP Area is not familiar with the construction workers from other areas, a great attention should be paid to management of construction workers and construction sites. However, taking into consideration work scale, the numbers of construction workers will not be large. Therefore, serious negative impacts are not envisaged if proper mitigation measures are provided. And also, the USISRSP Area where has possibility of land mines and duds should be conducted removal work of these dangerous material in the KSBISRSP Area as necessary before construction phase.



Source: Cambodian Mine Action Center

Figure AH-2.2.4.2 MINE/UXO Contamination Map in USISRSP Area

AH-2.2.5 Mitigation Measures

In accordance with the above examination, the mitigation measures against negative impacts anticipated are proposed as follows:

(1) Pollution Control

(a) Air pollution, Noise and vibration (Construction phase)

- To educate construction workers for minimizing idling of construction machinery
- To limit construction time, e.g. during daytime only
- To hold stakeholder meetings to build consensus about the construction time
- To stipulate environmental consideration measures in the technical specification of the construction works

(b) Water pollution by construction works (Construction phase)

- To dilute or neutralize alkalified water from concrete mixer trucks by pooling regulating pond, before discharging
- To pool discharging water from the concrete plant for dilution or neutralization
- To install adequate treatment system for muddy and alkalified water in construction site such as installation of water tank to collect water from concrete work
- To stipulate environmental consideration measures in the technical specification of the construction works

(c) Waste management by construction works (Construction phase)

- To comply with relevant laws pertaining to the management and disposal of solid waste, hazardous waste and e-waste.
- To arrange suitable sites for disposal of solid waste before commencement of the construction works,
- To avoid dumping in the area of private property without written consent of the owner
- To carry out recycle use of waste soil as much as possible
- To stipulate environmental consideration measures in the technical specification of the construction works

(d) Water pollution (Operation Phase)

- To conduct support programs regarding appropriate agricultural management
- To introduce composting activity to the farmers
- To introduce check system among the FWUC members regarding agricultural management
- To monitor water quality and agricultural activities regularly

(2) Natural Environment

(a) Soil erosion

- To implement maintenance of canals by appropriate methods and frequency
- To design main canal structure for relocation of soil erosion

(b) Hydrology

- To ensure the amount of river maintenance water particularly in the dry season

(c) Flora, fauna and biodiversity

- To ensure the amount of river maintenance water particularly in the dry season

(3) Social Environment

(a) Local Economy such as Employment and Livelihood

- To design canals to minimize negative impact as much as possible during D/D

- To conduct detailed socio-economic survey of affected people during early stage of project preparation to identify all losses from land acquisition
 - To establish joint committee as decision making body to implement land acquisition process, members of which consist of (i) executing agencies (MOWRAM, MAFF, PDOWRAM, PDA), (ii) related agencies (Provincial Department of Land Management, Urban Planning and Construction PDLMUPC etc.) and (iii) local authorities (commune council, village chief, etc)
 - To conduct stakeholder meetings with farmers including affected people on: (i) project purpose, (ii) compensation measures, and (iii) support programs to build consensus among the people especially the affected people through involvement of village chief
 - To compensate affected persons, including those without title to land.
 - To prepare adequate and realistic schedule of land acquisition through joint committee and inform affected people early
 - To monitor the life condition of the affected people and the community
- (b) Land Use and Utilization of Local Resources (Planning /Design phase)
- To conduct detailed socio-economic survey of affected people during early stage of project preparation to identify all losses from land acquisition
 - To establish joint committee as decision making body to implement land acquisition process, consisting of executing agencies, related agencies and local authorities
 - To conduct stakeholder meetings with local people including affected people by USISRSP
 - To decide compensation policy among joint committee and affected people
 - To prepare adequate and realistic schedule of land acquisition through joint committee and inform affected people early
- (c) Existing social infrastructures and services
- To educate construction workers for adequate traffic rule of construction vehicles
 - To limit construction time, e.g. at daytime only
 - To conduct stakeholder meetings to obtain consensus about the construction time with surrounding people
 - To design and re-construct canal crossing to minimize negative impact as much as possible
 - To enact the local rules to construct new canal crossings by themselves
- (d) Misdistribution of benefit and damage /Local conflict of interests (Planning / Design phase)
- To conduct a detailed socio-economic survey of the affected families/people in the beginning of the planning/design stage to identify all losses resulting from land acquisition
 - To organize/hold stakeholder meetings with local families/people including affected ones to explain and discuss the Sub-project outlines and expected impacts
 - To develop compensation policy through consultation among the joint committee together with affected families/people
 - To prepare a realistic schedule of land acquisition and inform the affected families/people of the schedule well in advance
- (e) Sanitation/Hazardous (risk) infectious diseases such as HIV/AIDS (Construction phase)/Accident
- To improve sanitary condition of workers by proper arrangement of accommodation, installation of toilets and proper water supply

- To implement education program for workers about sanitation, security and rules/discipline of daily activities
- To implement safety education and training for construction works
- To implement periodical patrol of workers in order to avoid both occurrence of local conflict and epidemics of diseases
- To hold a series of stakeholder meetings for surrounding people in order to explain construction works and its schedule
- To stipulate environmental consideration measures in the technical specification of the construction works
- To conduct detailed field survey of land mines and duds
- To conduct elimination of landmines and duds before construction work

AH-2.2.6 Conclusion and Recommendation

MOWRAM came with official letter which Confirmation of Need of EIA and IEIA for RCHRSP and USISRSP on 20 October, 2011. The letter mentioned that MOWRAM has an honor to inform that based on the Sub-decree on EIA process dated 11th August 199 of the Royal Government of Cambodia, the 2 Sub-projects; RCHRSP and USISRSP, are not required to conduct the EIA or IEIA as their command area is less than 5,000 ha and they area existing irrigation systems.

The Survey has identified that large involuntary resettlement will not be caused by USISRSP. However, large number of people will be negatively affected by USISRSP, such as loss of paddy field on Tumnap Lok Reservoir and loss of properties (houses, shops and other facilities) along main and secondary canals even if being illegally occupied. MOWRAM is required to prepare the policy for voluntary land acquisition through stakeholder meeting with affected people and inform the policy to all of them.

In this regard, MOWRAM has the Resettlement Unit (RU) composing of 3 permanent staff. The Unit has experiences of preparation of RAP and implementation of land acquisition for similar irrigation projects in Cambodia. According to their experiences, USISRSP is required to prepare an abbreviation RAP based on close discussion with affected people for the success of voluntary land acquisition. The Unit will be in charge of the preparation of abbreviation RAP for USISRSP and undertake necessary socio-economic survey.

AH-2.2.7 Summary of Draft Resettlement Framework by MOWRAM-RU

MOWRAM-RU prepared DRF for USISRSP with support for field survey of the JICA Survey Team during December 2011 to March 2012. The DRF is only draft framework, will be required to readjustment in keeping with progress of USISRSP step by step. The draft

AH-2.2.7.1 Scope of Draft Resettlement Framework

DRF provides a detailed and time-bound plan and budget for project affected households (AHs) losing land and other assets caused by rehabilitation works of Main Canal 33, 3U, 3D and structures of Tumnap Lok Reservoir. The survey was conducted in five meters width from existing canal mouth. The resettlement survey was made in 2 cases, this proposed plan is proposed by MOWRAM-RU refer to affected people's opinion in Stakeholder meeting.

(1) Original Plan (JICA Survey Team proposed plan)

Main Canal 33 (L=7,730 m), 3U (L=1,510 m) and 3D (L= 8,530 m)

(2) Proposed Plan (New alignment by MOWRAM-RU)

Main Canal 33 (L=8,888 m) 3D (L=7,615 m)

As the survey results, impact of proposed plan is smaller than original plan. The results of comparison between the original plan and proposed plan are shown table AH-2.2.7.1.1 and Tumnap Lok Reservoir area are shown table AH-2.2.7.1.2.

Table AH-2.2.7.1.1 Comparison between Original Plan and Proposed Plan (Main/Secondary Canal)

Privately-Held Land & Fixed Assets		Original Plan	Proposed Plan	
Main/secondary Canal Area	Land	Rice Land (m ²)	39,352	42,200
		Residential Land (m ²)	40,761	31,368
	Assets	House	89	23
		Stall/ Shop	71	51
		Latrine	1	1
		Grange	4	6
		Dug Well	4	5
		Hand Pump Well	8	6
		Pond	1	2
		Concrete Fence (m)	866	402
		Steel Fence (m)	238	217
		Culvert (m)	44	13
		Concrete Bridge (m)	442(Number=26)	823(Number=36)
		Wooden Bridge (m)	79 (Number=6)	79 (Number=6)
		Place of concrete Slab (m)	2,402(Number=48)	1,800(Number=31)
		Cemetery	2	2
		Wooden Stair	4	4
		Concrete Stair	2	2
		Balcony (m)	696(Number =12)	573(Number=11)
		Fuel Station	1	0
Economic Tree	5,717	5,410		
Commune Health Center	0	0		
Affected HHs	Number of Affected HHs (Number of APs)	412 (2,150)	368 (1,951)	
	Vulnerable Group HHs	67	63	

Source: JICA Survey Team

Table AH-2.2.7.1.2 Survey Result of Affected Area in Tumnap Lok Reservoir

Contents		Affected Area
Tumnap Lok Reservoir	Agriculture land(m ²)	1,470,314
	Residential land (m ²)	27,025
	Economic Tree (number)	338
	APs (number of person)	193 (VGHHs = 46)

Source: JICA Survey Team

Also, the delivery of compensation and other entitlements will be carried out within detail design phase of the Sub-project. The income restoration measures for APs losing of their total productive land will also conduct OMS in the same phase. The total cost of resettlement for the original plan is US\$ 1,500,462, for proposed plan is US\$ 441,803, and for Tumnap Lok Reservoir is US\$ 472.571.

AH-2.2.7.2 Entitlement Matrix of USISRSP

(1) Main Entitlement to affected people

The following entitlement matrix will be provided to eligible AP households;

Cash compensation at replacement cost for all affected agricultural and residential lands, houses and other fixed structures, crops, and trees.

A one-time disruption allowance of US\$ 40 to the 368 APs for **proposed plan** and 193 APs for the reservoir.

A one-time cash allowance of US\$ 240 compensated to 63 (**proposed plan**) and 46 (**Tumnup Lok reservoir**) of vulnerability of APs.

For the two (**Proposed plan**) and 185 (**Tumnup Lok**) AP households losing more than 10% of their total agriculture productive lands, each is entitled to the following income restoration measures:

- d1. Short-term employment in USISRSP activities for construction of project infrastructure as dike, canal related hydraulic structures etc.
- d2. Transitional allowance of US\$ 412 per hectare of all land lost in the Sub-project Area for 2 HHs (**Proposed plan**) and 185 HHs (**Tumnup Lok**) who will lose more than 10% of agriculture productive land affected base on rice land with the average yield of rice productivity per year of 1.5 tons per hectare at a current market value of 1100 Riel per kilogram).
- d3. Provide advice to APs to help them find and purchase replacement productive land.

Table AH-2.2.8.2.1 Entitlement Matrix of Draft RAP for USISRSP

Type of Impact	Application	Entitled Person	Entitlements	
1	All AP HHs	All effected household of 368 APs of Main Canal 33, 3U, 3D and the reservoir of 193 APs	Owners with acceptable (recognized) proof or without acceptable of ownership	For the portion or severe impact all kind of land or structure will provide one-time disruption allowance of US\$ 40
2	All Indirect Impact people	All people that living in the surrounding project area	All people in the area	Replacement public facilities that lose by the Sub-project construction: (new construction of) <ul style="list-style-type: none"> - Access roads, culvert and bridges, - Sewerage pipe line in Ang Rokar Market area
3	Agriculture Land	Marginal impact 183 APs of Main Canal 33, 3U, 3D and the reservoir of 8 APs	Owners with acceptable (recognized) proof or without acceptable of ownership	For the portion of the land needed: Cash compensation at replacement land use cost Cash compensation for affected structures, perennials, and crop at replacement cost AP will be given sufficient time to harvest crops on the subject property. If falling in one or more of the categories of vulnerability, one-time cash assistance of US\$ 240 for the categories the AP belongs.
		Severe impact Two APs of Main Canal 33, 3U, 3D and the reservoir of 185 APs	Owners with acceptable proof or without acceptable of ownership	Cash compensation at replacement land use cost for the entire land, or land-for-land with secure tenure AP will be given sufficient time to harvest crops Cash compensation for affected structures, perennials, and crop at replacement cost Eligible to avail of the income restoration measures to be provided by the Project To be advises by Project authorities in looking for replacement land. If falling in one or more of the categories of vulnerability, one-time cash assistance of US\$ 240 for the categories the APs belongs.
4	Residential Land	Marginal impact 216 APs of Main Canal 33, 3U, 3D and the reservoir of 10 APs	Owners with acceptable (recognized) proof or without Acceptable of ownership	For the portion of the land needed: Cash compensation at replacement land use cost Cash compensation for affected structures, perennials, and crop at replacement cost AP will be given sufficient time to harvest crops on the subject property. If falling in one or more of the categories of vulnerability, one-time cash assistance of US\$ 240 for the categories the AP belongs.
5	Residential Land	Severe impact APs of Main Canal 33, 3U, 3D and the reservoir of 3 APs	Owners with acceptable (recognized) proof or without acceptable of ownership	Cash compensation at replacement land use cost for the entire land, or land-for-land with secure tenure AP will be given sufficient time to harvest crops Cash compensation for affected structures, perennials, and crop at replacement cost One tine transport allowance To be advises by Project authorities in looking for replacement land. If falling in one or more of the categories of vulnerability, one-time cash assistance of US\$ 240 for the categories the APs belongs
6	Main Structures	Severe impact 23 APs of Main Canal 33, 3U, 3D and the reservoir of 4 APs	Owners of the structures with or without acceptable proof of ownership over the land; with or without building permit	Cash compensation at replacement cost (i.e., no depreciation and no deduction for salvage materials) for the entire structure. If the affected APs have all kind land will additionally impact, they will entire and point 2, 3 and 4. If falling in one or more of the categories of vulnerability, one-time cash assistance of US\$ 240 for the categories the AP belongs.
7	Other Structures	Loss of, or damage to, affected assets, partially or entirely	All APs	Cash compensation at replacement cost for the affected assets.

Source: JICA Survey Team

(2) Participation, Disclosure and Grievance Redress

Consultations, public meetings and village discussions with APs and local officials will be carried out during the resettlement planning process in the D/D Phase of USISRSP. A draft PIB will be prepared by IRC before conducting OMS. MOWRAM will be responsible for the disclosure of the draft and final resettlement plan to the APs. A grievance mechanism has been designed in a timely and satisfactory manner. APs will be made fully aware of their rights verbally and in writing during consultation, survey, and time of compensation.

(3) Ethnic Minorities and Gender Strategy

USISRSP does not expect to have specific impacts on ethnic minority groups and does not require preparation of an ethnic minority development plan.

(4) Institutional Arrangements and Implementation Schedule

MOWRAM, under the guidance from IRC-MEF, will be responsible for updating, implementing and internal monitoring of resettlement activities. The MEF may recruit NGO for external monitoring during the implementation of the DRP.

AH-2.3 Kandal Stung-Bati Irrigation System Rehabilitation Sub-project

AH-2.3.1 Description of Sub-project

(1) Principal Features

Based on the basic concept for irrigation and drainage development plan, facilities to be rehabilitated and/ or reconstructed under KSBISRSP are shown in the following table.

Table AH-2.3.1.1 List of Irrigation and Drainage Facilities to be rehabilitated under KSBISRSP

No.	Description	Quantity
1	Sub-project area	3,350 ha in total, consisting of 1,750 ha in Kandal Stung and 1,600 ha in Tonle Bati Area
2	Water resource facilities	
	- Diversion weir on Stung Touch River	2 nos. on the Stung Touch river; (one is new headworks and the other is partial improvement of spillway)
	- Replacement of intakes on Stung Touch River	3 nos. on the Stung Touch river; (full replacement for EW-60, EW-58 and NS-82)
	- Pump Station on Lake Tonle Bati	1 no. at Lake Tonle Bati (Full replacement of the existing one, 4 sets of 45 m ³ /min each)
	- Regulator on Prek Thnot River for Stung Touch river	1 no. (Full replacement of Duam Rues Regulator on the Prek Thnot river)
3	Main irrigation canal	4 canals, Q= 5.88 – 0.91 m ³ /sec
	- Length	18.9 km in total, Rehabilitation of canal sections for full stretch consisting 11.3 km for Kandal Stung and 7.6 km in Tonle Bati Area
	- Off-takes	71 nos.
	- Diversion structures	17 nos.
	- Road crossing	29 nos.
4	Secondary irrigation canals	8 canals, Q=0.45 – 0.21 m ³ /sec
	- Length	13.6 km in total, Rehabilitation of canal sections for full stretch consisting 5.0 km for Kandal Stung and 8.6 km in Tonle Bati Area
	- Off-takes	36 nos.
	- Diversion structures	9 nos.
5	Main drainage canals	4 canals, Q=2.24 – 0.88 m ³ /sec
	- Length	18.8 km in total, Rehabilitation of canal sections for full stretch consisting 12.1 km for Kandal Stung and 6.7 km in Tonle Bati Area
	- Structures	73 nos.
6	Other facilities	
	- Connection Canal	3.5 km (Upgrading of NS-82 to Lake Tonle Bati, Q=5.6 m ³ /secec)
	- Spillway of Lake Tonle Bati	1 no. (Full replacement of Kampong Daungkar spillway, Q=197 m ³ /sec)
	- Flood protection dike	Heightening of the existing dike of 2.7 km and replacement of one bridge

No.	Description	Quantity
7	Tertiary canal system - Length	101 km in total, new construction and rehabilitation consisting 53 km for Kandal Stung and 48 km in Tonle Bati area

Source: JICA Survey Team

(2) Location

The Sub-project area of 3,550 ha in total consists of 2 irrigation areas, namely Kandal Stung Area of 1,750 ha and the Tonle Bati Area of 1,600 ha. Kandal Stung Area is situated in Kandal Stung District of Kandal Province about 20 km south of Phnom Penh. And, Tonle Bati Area of 1,600 ha is situated in Bati District of Takeo Province about 30 km south of Phnom Penh. Water resources of irrigation development are: the Prek Thnot River regulated by the Stung Tasal dam under construction, original flow of the Stung Touch River, and regulated flow of the Tonle Bati River by Lake Tonle Bati.

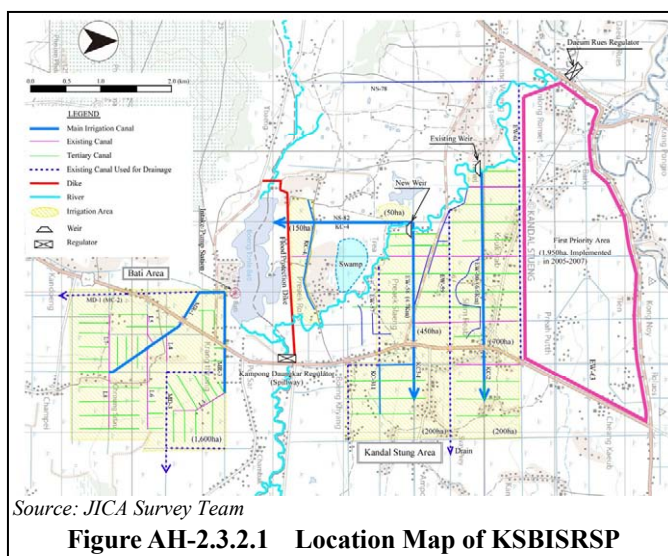


Figure AH-2.3.2.1 Location Map of KSBISRSP

(3) Time Schedule

During rainy season, rehabilitation work will not implement to avoid water pollution in downstream area. Implementation time schedule of KSBISRSP are shown as follows:

Work Item	Year									
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
1. Loan Agreement (L/A)										
2. Procurement of Consultant										
3. Clearance of Mines and UXOs										
4. Land Acquisition										
5. Consulting Services										
5-1 Detailed design for water resources facilities and canal system										
5-2 Assistance for procurement of ICB Contractor										
5-3 Construction supervision										
6. Rehabilitation Work										
6-1 Preparatory works										
6-2 Rehabilitation and construction works										
(1) New construction and partial improvement of diversion weirs										
(2) Full replacement of pumps and house										
(3) Full replacement of regulator for Stung Touch										
(4) Full upgrading of connection canal										
(5) New construction of Kampong Duagkar spillway										
(6) Partial rehabilitation of main canal system (18.9 km)										
(7) Partial rehabilitation of secondary canal system (13.6 km)										
(8) Partial rehabilitation of main drainage canal system (18.8 km)										
(9) New construction of tertiary canal system (3,350 ha)										
(10) New construction of Sub-project office										

Source: JICA Survey Team

Figure AH-2.3.1.2 Implementation Time Schedule for Main Canal System of KSBISRSP

(4) Examination of Alternatives

KSBISRSP is the rehabilitation works of existing canals and water resource facilities were constructed during Khmer Rouge's reign area. The basic concept of KSBISRSP to make both initial construction cost and O&M cost as low as possible with due consideration to maintain sufficient function, durability, and economic viability. Possible alternatives are limited compared to new projects and environmental impact might be small than new developments.

Selected rehabilitation point of canals and related facilities were decided to minimize negative impact by KSBISRSP such as alignment. For example, high potential site canal of soil erosion likely NS-78 was not selected as rehabilitation targets.

AH-2.3.2 Description of Environment

AH-2.3.2.1 Physical Resources

Kandal Stung- Bati Irrigation System Rehabilitation Sub-project is located in the Southeast of Phnom Penh and about 35 km from it. In Takeo it encountered with Bati district while in Kandal with Kandal Stung district. Kandal Stung, one of 10 districts (excluded Takhmao city) of Kandal province, administratively structured consists of 23 communes, while Bati, one of 10 districts of Takeo province, composes of 15 communes.

(1) Climate

Climate of RGC is dominated by the tropical rainy season and dry season. The southwest monsoon brings the rainy season from mid-May to mid-September or early October, while the northeast monsoon's flow of drier and cooler air lasts from early November to March. Temperatures are fairly uniform at around 27 degrees Celsius. Average annual rainfall is between 1,300 and 1,900 millimeters, with the heaviest amount in the southeast.

(2) Topography and Soil

As the Sub-project study site crossing the two said-provinces then topography and soil of them are similar. In Takeo the major soil types are gray, alluvial, red-yellow, acid sulphate soil and eroded rocky soil. These are subdivided into 37 soil mapping units on the basis of topographic position, geological origin, degree of weathering and soil profile development. About 18 percent of the total land area in the province is covered by alluvial soil. It lies along the shallow land near-by the Tonle Bassac River in various districts and along the Takeo river. The group of gray and eroded rocky soils covers almost the whole area of the whole province and is about 66 per cent of the total land. Acid sulphate soil is found in a large area in the south of the province and accounts for about 3-4 per cent of the land in Takeo. The group of red-yellow soils is in the area near the mountain region and also exists in the upland area and covers about 3 per cent of total land.

(3) Surface Water

Both provinces, Kandal and Takeo Province is abundance of water surface in general and even in Bati District where the sub- project included. The Lake Tonle Bati is a permanent reservoir supporting agriculture and other purposes for local villagers. Some other forms of water bodies, natural ponds, lakes, such Trapeang Leuk, also included in the commune and district as well. But most of them are dried up during hot season as they are shallow and/or not connected to the reservoir. Hence not only water for irrigation but also for household use during this period are a problem for people, particularly for whom living away from reservoir. Kandal Stung is also found with surface water bodies, Prek Roka, Boeng Saba, Stung Touch, Prek Slaeng, Trapeang Veng and some are shared border together with its neighboring district that is not only on land border but also water border as well. The Prek Thnot River, the Tonle Bati River, is an example in this sense.

(4) Groundwater

Different forms of groundwater, drilled, mixed and ring wells have been seen in both districts. Many villagers in the affected areas use ground sources during dry season. While some whose settlement located nearby or around where permanent surface water can be accessed they may engage with it rather than the ground source.

AH-2.3.2.2 Pollution Control

(1) Air Quality

Sub-decree on Air Pollution and Noise Disturbance Control came into effect in 2000, has clearly set the ambient air quality standard for six common air pollutants, CO, NO₂, SO₂, O₃, Pb, and TSP by Cambodia Ministry of Environment. Neither data of air quality measurement was found in the Sub-project Area and the district caused by possible human and business activities.

(2) Noise and Vibration

No secondary data of noise and vibration in Bati and Kandal Stung Districts is available.

(3) Water Quality

No secondary data of water quality in Bati and Kandal Stung districts is available.

(4) Soil Erosion

Soil erosion even seen happened especially with the existing canal and some part of reservoir that became shallower, but this information unclear whether it naturally caused or by local people intervention in that issues. It might be also occurred with the result of climate change that posed evidently on bank erosion in particular on settlement along the riverside where in the other district of Kandal province.

AH-2.3.2.3 Natural Resources

(1) Flora, Fauna and Biodiversity

The KSBISRSP Area has been development as paddy fields and other agricultural lands.

(2) Protected Area

The KSBISRSP Area does not encompass any Protected Area.

(3) Land Use

Different types of land use are seen in Kandal Stung and Bati districts from land use and natural resources maps. The following are urban settlement, village settlement, wet season paddy fields, paddy fields with villages, flooded paddy field, cropland, orchard, timber/forest plantation, flooded forest, grassland, abandoned field covered by grass, shrubland, abandoned field covered by shrub, shrubland and scattered trees, lake, reservoir, river and sand bank.

Table AH-2.3.2.3.1 Land Use of Both Districts in Related Districts

District	Total land area (ha)	Forest land area (ha)		Cultivation land area (ha)	Construction land area (ha)	Other land area (ha)
		Total	Flooded			
Kandal Stung	25,065	0	0	13,213.9	10,477.5	1,373.6
Bati	36,126	2,659	1,115	21,375.4	5,633.2	6,458.4

Source: Bati and Kandal Stung District Data Books 2009

(1) Population

Among 23 communes of Kandal Stung District, about 9 of them are located in KSBISRSP Area that is about 30% of total population. The population in the district in 2008 was 100,460 persons which is equivalent to 21,253 families. Bati District where the administrative structure consists of 15 communes, about 5 communes, or 1/3 is felt within KSBISRSP Area. Bati district population was 131,031 which is



Existing Status of KSBISRSP Area

equivalent to 28,100 families. Only small numbers 7 families (36 persons) of Khmer Islamic, minority group were recorded during 2008 district population census. Ethnic minority was not found.

Table AH-2.3.2.3.2 Existing Social Status of Project Affected Districts

No.	Commune	Population	Male-to-Female ratio
Kandal Stung District, Kandal Province			
1	Anlong Romieat	4,250	99.5
2	Barku	5,394	88.5
3	Kuok Trab	4,445	86.5
4	Kong Noy	1,689	91.3
5	Preah Putth	2,077	88.3
6	Roluos	2,878	93.7
7	Siem Reab	4,512	91.8
8	Tean	2,197	88.7
9	Trapeaeng Veang	3,601	94.5
SubTotal/Average		31,043	91.4
Bati District, Takeo Province			
1	Krang Thnong	4,859	96.8
Total		35,902	91.96

Source: 2008 Kandal Province Population Census and 2008 Takeo Province Population Census

(2) Economic Status

Economic activities of Kandal province mainly relies on some sectors such as agricultural sector (paddy, maize, sugarcane, soybean, and many varieties of vegetables and fruits.) This province also supplies fish, meat and vegetables to Phnom Penh and to export markets. Takeo economic activities are famous for being Cambodia's rice bowl. The annual rice harvest feeds one quarter of Cambodia. In addition this province also produces significant quantities of vegetables (7% of Cambodia's total) sugarcane (4% of total) and sweet potato (4%) and 5% inland fish catch, 25 hatcheries producing around 10 million fingerlings per year. Industry sector (garment, footwear and textiles, services, printing house, wood processing, paper and cardboard box manufacturing, sand quarry, etc.) also included in the activity at provincial level (Kandal Province Investment Profile, Oct. 2008)..

Households within both districts mainly relied on rice farming. However, to generate more income they have some other alternative livelihood particularly during dry season while cultivation cannot be done due to waterless in their fields. Cropping of fruit trees, cassava, water melon, sweet potato, etc., industry, garments factory, construction, tourism and fisheries are their business lifestyle.

(3) Heritage and Religion site

Takeo province has 34 ancient temples such as Angkor Borie, Chruos Phaork , Chup Pol Temple, Neang Khmao temple, Phnom Bayang, Phnom Chiso, Phnom Da etc., and all of these are heritage spots.

(4) Water Supply and Sewage System

Water supply and sewage system are normally seen in the provincial cities while down to the district and commune levels are less practice especially within the Sub-project Area.

Table AH-2.3.2.3.3 Water and Sanitation, by Commune in Kandal Stung District

Commune Name	Ratio of People to wells (%)		Ratio of People to wells (%)						Families using safe and unsafe water sources in dry season (%)		Families filtering or regularly boiling water (%)	
	Total wells	Year round wells	Pipe water	Pump or mixed wells	Ring wells	Pond water	Rain water	River, lake, stream water	Clean/ safe sources	Unsafe sources	Water filter	Regularly boiled water
Anlong Romieat	9.0	10.0	0.0	32.5	66.3	0.0	0.0	1.1	69.4	30.6	0.4	98.2
Barku	11.0	11.0	4.0	27.1	62.7	0.0	4.8	1.4	31.6	68.4	2.3	73.0
Kuok Trab	9.0	9.0	0.0	7.4	91.6	0.0	1.0	0.0	54.3	45.7	21.8	70.7
Kong Noy	16.0	18.0	0.0	10.2	47.7	7.4	0.0	34.7	30.7	69.3	2.8	83.2

Commune Name	Ratio of People to wells (%)		Ratio of People to wells (%)						Families using safe and unsafe water sources in dry season (%)		Families filtering or regularly boiling water (%)	
	Total wells	Year round wells	Pipe water	Pump or mixed wells	Ring wells	Pond water	Rain water	River, lake, stream water	Clean/safe sources	Unsafe sources	Water filter	Regularly boiled water
Preah Putth	17.0	17.0	0.0	56.1	41.6	0.0	2.3	0.0	51.3	48.7	2.9	71.6
Roluos	12.0	13.0	3.8	57.5	38.5	0.0	0.2	0.0	50.2	49.8	5.3	51.4
Siem Reab	7.0	7.0	0.0	0.9	98.8	0.2	0.0	0.0	33.9	66.1	8.3	79.7
Tean	16.0	20.0	0.0	91.4	5.7	0.4	1.0	1.4	89.0	11.0	7.8	32.2
Trapeaeng Veaing	21.0	34.0	0.5	48.2	31.0	19.5	0.8	0.0	97.5	2.5	3.9	62.4

Source: Kandal Stung District Data Books 2009

Table AH-2.3.2.3.4 Water and Sanitation, by Commune in Bati District

Commune Name	Ratio of People to wells (%)		Ratio of People to wells (%)						Families using safe and unsafe water sources in dry season (%)		Families filtering or regularly boiling water (%)	
	Total wells	Year round wells	Pipe water	Pump or mixed wells	Ring wells	Pond water	Rain water	River, lake, stream water	Clean/safe sources	Unsafe sources	Water filter	Regularly boiled water
Krang Thnong	177.0	376.0	0.0	6.2	11.9	75.6	0.3	6.1	24.7	75.3	2.7	40.8

Source: Kandal Stung District Data Books 2009

AH-2.3.3 Result of Scoping

AH-2.3.3.1 Environmental Scoping for KSBISRSP

Environmental scoping for KSBISRSP, which clarifies conceivable environmental and social impacts due to proposed projects activities, was conducted. The major environment and social impact assessment studies are presented in the following scoping matrix and checklist. It is noted that the evaluation in the matrix is made by considering a degree of conceivable impacts in the case any adequate mitigation measure is not conducted and also common to KSBISRSP. The evaluation was utilized for preparation of specifications of detailed study in the next chapter.

Table AH-2.3.3.1.1 Result of Environmental Scoping for KSBISRSP

No.	Likely Impact	Project-related Activities				
		Overall Rating	Planning / Design Phase	Construction Phase	Operation Phase	
Pollution Control	1	Air pollution	B-	-	B-	-
	2	Water pollution	B-	-	B-	B-
	3	Soil contamination	-	-	-	-
	4	Waste	B-	-	B-	-
	5	Noise and vibration	B-	-	B-	-
	6	Ground subsidence	-	-	-	-
	7	Offensive odor	-	-	-	-
	8	Bottom sediment	-	-	-	-
	9	Disaster	-	-	-	-
Natural Environment	10	Topography and geographical features	-	-	-	-
	11	Soil erosion	B-	-	B-	B-
	12	Groundwater	-	-	-	-
	13	Hydrological situation	C-	-	-	C-
	14	Coastal zone	-	-	-	-
	15	Flora, fauna and biodiversity	B-	-	-	B-
	16	Meteorology	-	-	-	-
	17	Landscape	-	-	-	-
	18	Global warming	-	-	-	-
Social Environment	19	Involuntary resettlement	B-	B-	-	-
	20	Local economy such as employment and livelihood, etc.	A+	-	B+	A+
	21	(Surrounding) Land use and utilization of local resources	B-/A+	B-	B-	A+
	22	Social institutions (including regional severance)	-	-	-	-
	23	Existing social infrastructures and services	B-	-	B-	-
	24	Socially vulnerable groups such as the poor, indigenous and ethnic people (including gender matter)	B-/B+	B-	-	B+

No.	Likely Impact	Project-related Activities			
		Overall Rating	Planning / Design Phase	Construction Phase	Operation Phase
25	Misdistribution of benefit and damage	-	-	-	-
26	Historical and cultural heritage (including religious matters)	-	-	-	-
27	Water usage or water rights and rights of common	A+	-	-	A+
28	Local conflict of interests	A+	-	-	A+
29	Sanitation	B-	-	B-	-
30	Hazardous (risk) infectious diseases such as HIV/AIDS	B-	-	B-	-
31	Accident	B-	-	B-	-

Source: JICA Survey Team

<Rating>

A-: Serious impact is expected, if any measure is not implemented to the impact.

B-: Some impact is expected, if any measure is not implemented to the impact.

C-: Extent of impact is unknown (Examination is needed. Impact may become clear as study progresses.)

-: No impact is expected.

A+: Remarkable effect is expected due to the project implementation itself and environmental improvement caused by USISRSP.

B+: Some effect is expected due to the project implementation itself and environmental improvement caused by USISRSP.

Overall rating: Highest rate will be the overall rating among the rating of relevant project-related activities for negative and positive ratings, respectively. (e.g. Even only one "A-" is included in an environmental item, overall rating of the environmental item becomes "A-".)

AH-2.3.3.2 Checklist of Environmental Scoping

Checklist of environmental scoping for DPISRSP is prepared as described in Table AH-2.3.3.2.1.

Table AH-2.3.3.2.1 Checklist of Environmental Scoping for KSBISRSP

No	Likely Impacts	Rating Over all	Explanation on Potential Impacts (Project-related activity is shown in the parenthesis"<>".)
Pollution			
1	Air pollution	B-	<Operation of construction equipment and vehicles> <Rehabilitation work of canals/drainages and other related facilities> Emission of exhaust gas from construction equipment and vehicles and dust pollution due to operation of the construction equipment and vehicles would cause air pollution in and around the construction sites during the construction. However, the impact is limited and temporality.
2	Water pollution	B-	<Operation of construction equipment and vehicles> <Rehabilitation work of canals/drainages and other related facilities> Muddy water from construction site and soil spill from construction equipment and vehicles would cause water pollution in existing canals in and around the construction site. <Utilization of irrigation water> Increased irrigation water might encourage farmers to use more agro-chemicals and fertilizers to carry out intensive farming.
3	Soil contamination	-	KSBISRSP does not have any factor which may cause the soil contamination in terms of project location and construction method.
4	Waste	B-	<Operation of construction equipment and vehicles> <Rehabilitation work of canals/drainages and other related facilities> Construction waste including residue soil and concrete waste would be produce by construction work.
5	Noise and vibration	B-	<Operation of construction equipment and vehicles> Vibration caused by such construction works would cause damage to residential people, the existing house and other kinds of building structures.
6	Ground subsidence	-	KSBISRSP does not have any factor which may cause the ground subsidence in terms of project location and construction methods.
7	Offensive odor	-	KSBISRSP does not have any factor which may cause the offensive odor in terms of project location and construction methods.
8	Bottom sediment	-	KSBISRSP does not have any factor which may cause the bottom sediment in terms of project location and construction methods.
9	Disaster	-	KSBISRSP does not have any factor which may cause the disaster in terms of project location and construction methods.
Natural Environment			
10	Topography and geographical features		KSBISRSP does not have any factor which may cause the disaster in terms of project location and construction method because project site is already developed as paddy field, crop field and habitat for local people.
11	Soil erosion	B-	<Operation and maintenance of water resource facilities and canals/drainage> Soil erosion was found in some sections of existing canals/drainage. After rehabilitation of these canals, soil erosion will occur without adequate maintenance.
12	Groundwater	-	KSBISRSP does not have any factor which may cause the groundwater in terms of project location and construction method because KSBISRSP does not utilize groundwater.
13	Hydrological situation	C-	<Rehabilitation work of canals/drainages and other related facilities> <Operation and maintenance of water resource facilities and canals/drainage> New regulator and canals/drainage in some sections would affect hydrological situation in project area without adequate control of maintenance of those structure. Detailed hydrological analysis undertook in this study.

No	Likely Impacts	Rating Over all	Explanation on Potential Impacts (Project-related activity is shown in the parenthesis "<>".)
14	Coastal zone	-	KSBSIRSP does not have any factor which may cause the c in terms of project location.
15	Flora, fauna and biodiversity	B-	<Rehabilitation work of canals/drainages and other related facilities> Almost existing status of the ROW and work sites are development area as agriculture field and old canals /drainage site. However, main canal design will affected small aquatic biodiversity of existing canals since main canals will be cement concrete lining type.
16	Meteorology	-	KSBSIRSP does not have any factor which may affect and/or be related to the meteorology.
17	Landscape	-	KSBSIRSP does not have any factor which may cause the groundwater in terms of project location and construction methods.
18	Global warming	-	KSBSIRSP does not have any factor which may cause the global in terms of project location and construction method because KSBSIRSP is only rehabilitation and improvement project and not including new development.
Social Environment			
19	Involuntary Resettlement	B-	<Design of main/secondary canals, drainages and other water resource facilities > It is expected that a small scale involuntary resettlement (Five houses to be displaced) will be caused by KSBSIRSP.
20	Local economy such as employment and livelihood, etc.	A+	<Rehabilitation work of canals/drainages and other related facilities> During construction phase, KSBSIRSP will make more employment and business opportunities for local residents. <Utilization of irrigation water > After operation of the KSBSIRSP, regional farmers around the KSBSIRSP would have positive impact due to improved irrigation water provision.
21	Land use and utilization of local resources	B-/A+	<Design of main/secondary canals, drainages and other water resource facilities > <Rehabilitation work of canals/drainages and other related facilities> Land acquisition will be requested by KSBSIRSP for main/secondary canal and drainages. <Utilization of irrigation water > After operation of the KSBSIRSP, regional formers around the KSBSIRSP would have positive impact due to improvement of irrigation water availability.
22	Social institutions	-	KSBSIRSP does not have any factor which may cause social institution in terms of project location and construction methods.
23	Existing social infrastructures and services	B-	<Operation of construction equipment and vehicles> Construction work and traffic restriction would disturb access to the existing social infrastructures and services around the KSBSIRSP Areas.
24	Socially vulnerable groups such as the poor, indigenous and ethnic people	B-/B+	<Design of main/secondary canals, drainages and other water resource facilities > It is expected that a small scale involuntary resettlement (Five houses to be displaced) will be caused by KSBSIRSP. The affected families have no title land and they might be under poverty line. <Rehabilitation work of canals/drainages and other related facilities> After operation of the KSBSIRSP, local people including vulnerable groups around KSBSIRSP would have positive impact due to improved irrigation water provision.
25	Misdistribution of benefit and damage	-	KSBSIRSP does not have any factor which may cause social institution in terms of project location and construction method because KSBSIRSP. Because the KSBSIRSP purpose is maintenance of the status quo.
26	Historical and cultural heritage (including religious matters)	-	KSBSIRSP does not have any factor which may affect and/or be related to the meteorology.
27	Water usage or water rights and rights of common	A+	<Utilization of irrigation water > After operation of KSBSIRSP, regional formers around the KSBSIRSP would have positive impact due to improved irrigation water provision.
28	Local conflict of interests	A+	<Operation of new regulator and canals/drainage > Existing situation, local farmers who live in downstream area of Kampong Daungkar Regulator are dissatisfied about inadequate water supply from upstream. After operation of KSBSIRSP, KSBSIRSP would have positive impact due to improved irrigation water provision.
29	Sanitation	B-	<Operation of construction equipment and vehicles> <Rehabilitation work of canals/drainages and other related facilities> Sanitary issues would occur in labor camp and neighboring area in the case sanitary facility is not adequately installed such as toilet and septic tank.
30	Hazardous (risk) infectious diseases such as HIV/AIDS	B-	<Operation of construction equipment and vehicles> <Rehabilitation work of canals/drainages and other related facilities> Risk of infectious diseases by labors would be expected during construction due to the inflow of the construction workers from outside.
31	Accident	B-	<Operation of construction equipment and vehicles> Some accidents might be inevitable during construction phase. <Rehabilitation work of canals/drainages and other related facilities> The command area is required removal of land mines and duds of Khmer Rouge Regime before construction phase.

Source: JICA Survey Team

Note: * Regarding the impacts on "Gender" and "Children's Right", might be related to all criteria of Social Environment.

A-: Serious impact is expected, if any measure is not implemented to the impact.

B-: Some impact is expected, if any measure is not implemented to the impact.

C-: Extent of impact is unknown (Examination is needed. Impact may become clear as study progresses.)

-: No impact is expected. Therefore, EIA is not required.

A+: Remarkable effect is expected due to KSBSIRSP implementation itself and environmental improvement caused by KSBSIRSP.

B+: Some effect is expected due to KSBSIRSP implementation itself and environmental improvement caused by KSBSIRSP.

Overall rating: Highest rate will be the overall rating among the rating of relevant project-related activities for negative and positive ratings, respectively. (e.g. Even only one "A-" is included in an environmental item, overall rating of the environmental item becomes "A-".)

AH-2.3.4 Anticipated Negative Impact of Environment

(1) Pollution Control

(a) Air pollution, Noise and Vibration (Construction Phase)

1) Activity

- Operation of construction equipment and vehicles
- Rehabilitation works of canals/drainages and other related facilities

2) Affected Area

- In and around construction area

3) Expected Potential Impact

During the construction phase, transportation of heavy equipment would cause air pollution, noise and vibration. Transportation of construction vehicles and transportation/operation of heavy equipment, such as dump truck, excavator, bulldozer, roller compactor and watering lorry, would exhaust emission gasses including NO₂ and SPM. And also, such heavy equipment would cause noise and vibration.

4) Related Regulation

- Sub-decree on Air and Noise Pollution Control

5) Conclusion of Examination

Because most of the construction works are small scale, numbers of heavy equipment and construction vehicles for the works will be limited. Therefore, the impact to air quality, noise and vibration by construction works will be insignificant if proper mitigation measures are carried out.

(b) Water Pollution by Construction Works (Construction Phase)

1) Activity

- Operation of construction equipment and vehicles
- Rehabilitation works of canals/drainages and other related facilities

2) Affected Area

- Downstream of construction area

3) Expected Potential Impact

Muddy water from construction site and soil silt from construction machinery would cause water pollution of existing canals. In addition, alkalified water caused by the concrete works will be another concern during construction phase.

4) Related Regulation

- Sub-decree on Water Pollution Control

5) Conclusion of Examination

Large scale construction including earthwork will not implement during the rainy season to avoid water pollution of existing canal water and water use. However, alkalified water from the concrete works in the canals might be occurred by canal water since KSBISRSP include concrete lining work for main canals without adequate water treatment. Therefore, it is necessary to establish adequate treatment system for large quantity of alkalified water during construction phase.

(c) Waste Management by Construction Works (Construction Phase)

1) Activity

- Operation of construction equipment and vehicles
- Rehabilitation works of canals/drainages and other related facilities

2) Affected Area

- In and around construction area

3) Expected Potential Impact

Concrete and other construction waste would be produced by the construction works. In addition, rehabilitation works of canal/drainage will create soil disposal.

4) Related Regulation

- Sub-decree on Solid Waste Management (1999)

5) Conclusion of Examination

As most of the construction works are small scale and therefore construction waste is very limited. The impact of waste by construction works will not be serious if appropriate management and mitigation measures are provided.

(d) Water Pollution (Operation Phase)

1) Activity

- Utilization of irrigation water

2) Affected Area

- Downstream of KSBISRSP command area

3) Expected Potential Impact

Increased irrigation water might encourage farmers to use more agro-chemicals and fertilizers to carry out intensive farming.

4) Related Regulation

- Sub-decree on Water Pollution Control (April 6, 1999)

5) Conclusion of Examination

The command area of KSBISRSP Area has been already developed with farming. According to local farmers, usages of agro-chemicals and fertilizer were limited in command area, they usually composted manure, rice straw and other natural resources. However, after regulators is rehabilitated and operated, nutrient load or chemical contamination would increase affecting downstream areas because of increase of agro-chemicals and fertilizer usage.

(2) Natural Environment

(a) Soil Erosion (Construction Phase, Operation Phase)

1) Activity

- Operation and maintenance of water resource facilities and canals/drainage

2) Affected Area

- Main canals, Secondary canals and drainages

3) Expected Potential Impact

In planning phase, high potential site of soil erosion was not selected as rehabilitation targets, but soil erosion was found in some sections of existing canals/drainages at present. The rehabilitation work will include concrete lining of 75 mm thick is provided for main canals of 18.9 km. Therefore, main canal has low potential of soil erosion, but secondary canals are threatened of soil erosion.

4) Related Regulation

- None

5) Conclusion of Examination

Soil erosion is not only man-cause but also natural-cause. Although it is difficult to completely prevent canals from erosion, adequate design and maintenance of canals would alleviate soil erosion to some degree.

(b) Hydrological Situation (Operation Phase)

1) Activity

- Operation and maintenance of water resource facilities and canals/drainage

2) Affected Area

- In and around of KSBISRSP Area

3) Expected Potential Impact

- Hydrological situation of the command area will be affected KSBISRSP.

4) Related Regulation

- None

5) Conclusion of Examination

After the rehabilitation work, hydrological situation will change KSBISRSP Area. However, KSBISRSP is rehabilitation work, and hydrological situation will return previous status when past irrigation system functioned. Therefore, the impact is very limited if proper mitigation measures are carried out. Detailed water balance analysis of KSBISRSP shown Main report Sub-clause II-2.5.3.2.

(c) Flora, Fauna and Biodiversity (Operation Phase)

1) Activity

- Rehabilitation works of canals/drainages and other related facilities

2) Affected Area

- Main canals (Kandal Stung :11.3 km, Bati : 7.6 km) and around area

3) Expected Potential Impact

The rehabilitation work will include concrete lining of 75 mm thick is provided for main canals of 18.9 km. Concrete lining is effective methods against soil erosion, but biodiversity in the aquatic environment in existing main canals might be affected by KSBISRSP. Negative impact cause by Concrete lining are as follow; i) Lining obstruct amphibian animal to access between canals and fields, ii) Flow rate will be faster than existing canals, and iii) Habitat condition of aquatic plants would be deterioration.

4) Related Regulation

- None

5) Conclusion of Examination

The command area of KSBISRSP area has been already developed as agricultural land or residential land since early times. Therefore, possibility of rare species and important species of Cambodia is low. However, canal design should be considered to these local biodiversity as much as possible.

(3) Social Environment

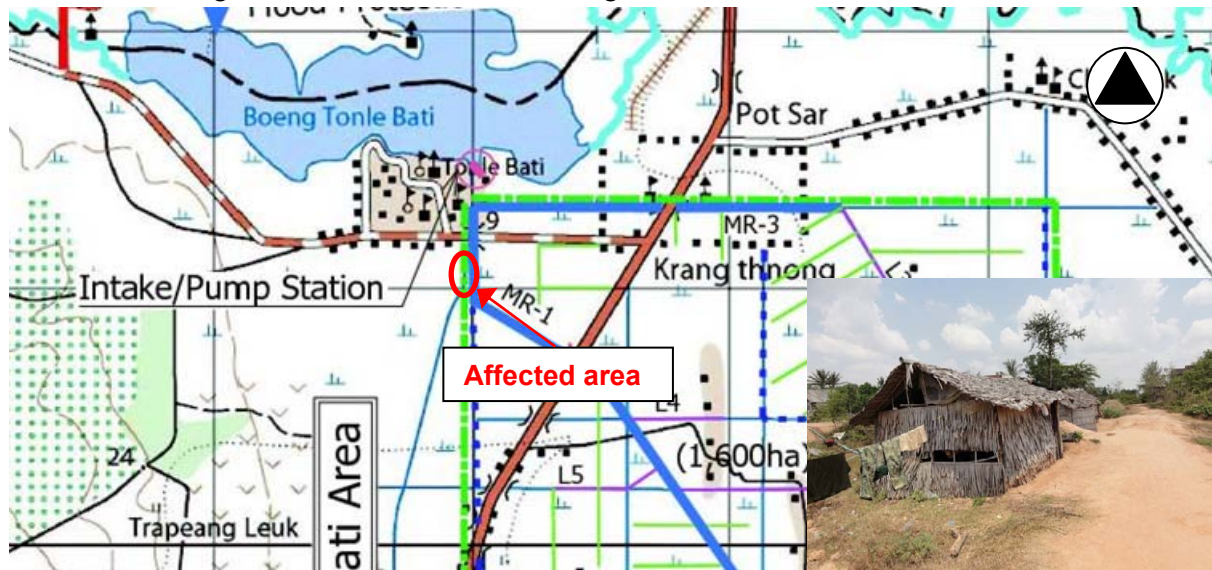
(a) Involuntary Resettlement (Planning/Design Phase)

1) Activity

- Rehabilitation works of canals/drainages and other related facilities

2) Affected Area

- Areas along MD-canal near Tonle Bati village



Source: JICA Survey Team

Figure AH-2.3.4.1 Affected Area by KSBISRSP

3) Expected Potential Impact

It is expected that KSBISRSP will cause a small-scale involuntary resettlement, probably resettlement of five houses (Five households (25 people)) in total, along with the construction of the main canals. Even though the alignment of the main canals were planned and designed to avoid the involuntary resettlement, five families whose houses are located on the dike of the MC-1 canal (near Tonle Bati village) in Bati area need to be relocated.

In order to clarify socio-economic conditions of the five households the JICA preparatory survey team carried out an interview survey as shown in Table AH-2.3.4.1. All of them have no legal land title and are already aware of KSBISRSP since village chiefs briefed them on the Sub-Project. They also show their willingness to relocate their houses along with the Sub-Project on the condition that they would get official support for their relocation as they are conscious of their illegal occupation.

Table AH-2.3.4.1 Result of Interview Survey to Affected Households

Affected house Contents	No.1	No.2	No.3	No.4	No.5
Head of AHs (age)	Male (43)	Male (35)	Female (71)	Male (27)	Male (48)
Number of HHs	5	5	1	4	10
Ethnic Group	Khmer	Khmer	Khmer	Khmer	Khmer
Type of settlement	Temporary living	Permanent living	Permanent living	Temporary living	Permanent living
Year of construction	2009	2010	3-4years ago	2008	2002
Livelihood (Head of AHs)	Construction worker (Motor tax)	Construction worker	No income (Half-paralyzed patient)	Construction worker (Lay off)	Construction worker (Lay off)
Monthly income (US\$)	90	30-80	No income	50-100	0-100
Agreement of the relocation	Agree (with official support)	Agree (with official support)	Agree (with official support)	Agree (with official support)	Agree (with official support)

Source: JICA Survey Team

4) Related Regulation

- Constitution (1993)
- Land law (2001)
- Expropriation Law (2010)
- Sub-decree on Social Land Concession (2003)
- (draft) Sub-decree on Addressing Socio-economic Impacts caused by Development Projects (2007)

5) Conclusion of Examination

MOWRAM should prepare an abbreviated RAP or another document similar to a simplified RAP based on the detailed socio-economic survey and stakeholder meetings. The abbreviated RAP shall include a compensation policy for resettlement with a resettlement schedule and other necessary processes of and procedures for resettlement. .

(b) Land use and utilization of local resources (Planning/Design phase, Operation phase)

1) Activity

- Rehabilitation works of canals/drainages and other related facilities
- Design of main/secondary canals, drainages and other water resource facilities

2) Affected Area

- Area along the main canals, secondary canals and drainages

3) Expected Potential Impact

Land acquisition will be required along the existing canal area to ensure canal/dike width as necessary. It is considered that target of land acquisition are mostly paddy field or other agricultural fields. In addition, temporary land acquisition of construction site will be required in and around command areas the case may be.

4) Related Regulation

- Constitution (1993)
- Land law (2001)
- Expropriation Law (2010)
- Sub-decree on Social Land Concession (2003)

5) Conclusion of Examination

Land acquisition process should be conducted carefully from design phase. Even though area to be acquired is small, it might not be small impact to the affected people. The impact of temporary land acquisition also would be sensitive issues to local people. Therefore, this matter may have a high risk of social problem for project implementation if proper measures are not carried out.

(c) Existing Social Infrastructures and Services (Construction phase)

1) Activity

- Operation of construction equipment and vehicles

2) Affected Area

- Local roads in and around KSBISRSP Area

3) Expected Potential Impact

During construction time, operation of construction equipment and vehicles will use local roads in and around KSBISRSP. Number of construction vehicles will increase than normal times, the increase would be effected local social infrastructure and services.

4) Related Regulation

- None

5) Conclusion of Examination

Most of the construction works are small scale, therefore construction periods are limited. The impact by the construction works will not be significant if proper management and mitigation measures are carried out.

(d) Socially Vulnerable Groups such as the Poor, Indigenous and Ethnic People (Planning/Design Phase, Operation Phase)

1) Activity

- Design of main/secondary canals, drainages and other water resource facilities
- Rehabilitation works of canals/drainages and other related facilities

2) Affected Area

- Area along MD-1 canal (Bati area)

3) Expected Potential Impact

There are no indigenous and ethnic people in KSBISRSP Area. As the result of interview survey, monthly incomes of affected families rank from US\$ 30(min) to US\$100(max) per year. However, their incomes are relative instability because their main livelihood is construction works depend on circumstances. In fact, two household heads out of them as construction workers is losing their job at the moment.

And also, one old woman living alone is handicapped person and no income, she have been relied on living alone to supports of neighbors (include her son's family). They made agreement to their resettlement because they have been become aware of their illegal occupancy. However, it is difficult for them to resettle another place without official support.



Interview to Affected households

- 4) Related Regulation
 - Sub-decree on Social Land Concession (2003)

- 5) Conclusion of Examination

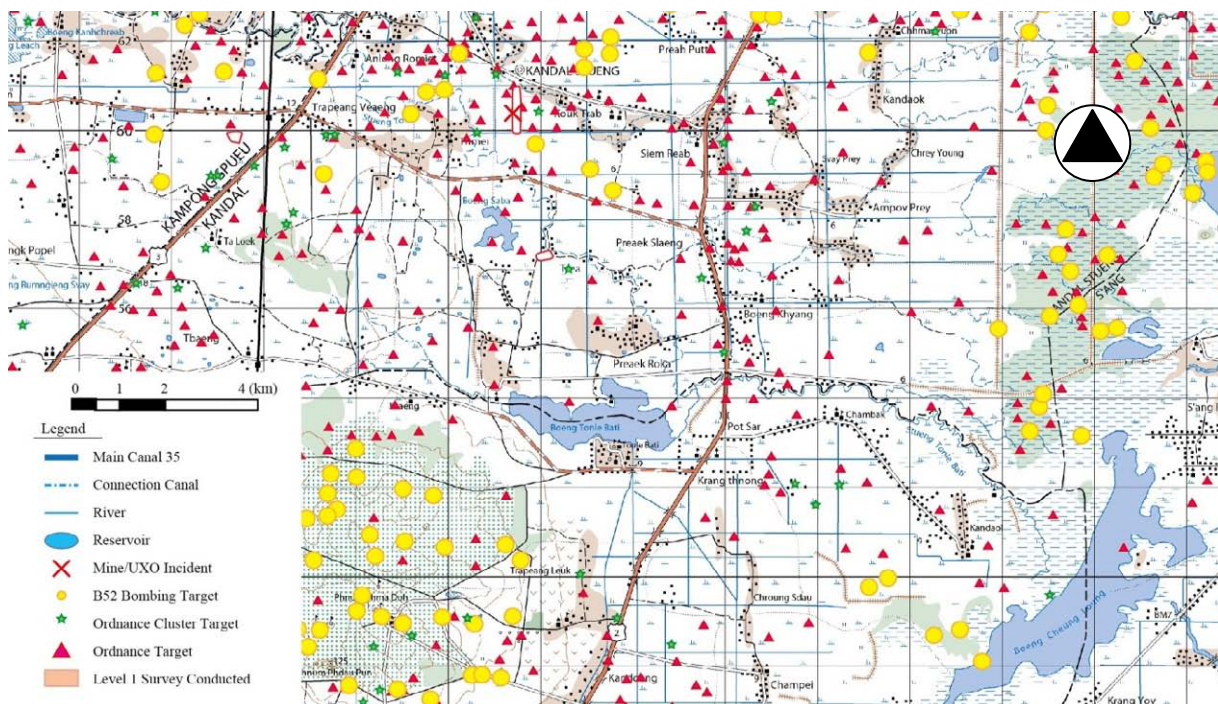
They agree to their resettlement if they can receive adequate official support to their resettlement. MOWRAM would prepare abbreviation RAP included special care for these vulnerable groups.

(e) Sanitation/Hazardous (risk) infectious diseases such as HIV/AIDS/Accident (Construction phase)

- 1) Activity
 - Operation of construction equipment and vehicles
 - Rehabilitation works of canals/drainages and other related facilities
- 2) Affected Area
 - In and around the KSBISRSP Area
- 3) Expected Potential Impact

Due to inflow of construction workers from outside of the community during construction phase, the anticipated impacts are (i) deterioration of sanitation condition, (ii) deterioration of public security, (iii) increase of risk of diseases including AIDS/HIV, (iv) accident, (v) local conflict among people and workers. Although construction scale is not large and duration is at most 36 months, these issues need to be taken into consideration.

In addition, it is required scrupulous attention to landfill works since there is a possibility that land mines and duds of Khmer Rouge Regime have been buried in the earth. MINE/UXO Contamination Map of KSBISRSP Area is shown below.



Source: Cambodian Mine Action Center

Figure AH-2.3.4.1 MINE/UXO Contamination Map in KSBISRSP Area

- 4) Related Regulation

- Labor Law (1997)

5) Conclusion of Examination

A great attention should be paid to management of construction workers and construction sites. However, taking into consideration work scale, the number of construction workers will not be large and is only temporary. Therefore, serious negative impacts by construction work are not envisaged if proper mitigation measures.

And also, KSBISRSP Area where has possibility of land mines and duds should be conducted removal work of these dangerous material in KSBISRSP Area as necessary before construction phase

AH-2.3.5 Mitigation Measures

In accordance with the above examination, the mitigation measures against negative impacts anticipated are proposed as follows:

(1) Pollution Control

(a) Air pollution and Noise and Vibration (Construction Phase)

- To educate construction workers on minimizing idling of construction machinery
- To restricted construction time. e.g. during daytime only
- To hold stakeholder meetings to build consensus about the construction time
- To stipulate environmental consideration measures in the technical specification of the construction works

(b) Water Pollution by Construction Works (Construction Phase)

- To dilute or neutralize alkalified water from concrete mixer trucks by pooling in regulating pond before discharging
- To pool discharging water from the concrete plant for dilution or neutralization
- To install adequate treatment system for muddy and alkalified water in construction site such as installation of water tank to collect water from concrete works for neutralization
- To stipulate environmental consideration measures in the technical specification of the construction works

(c) Waste Management by Construction Works (Construction Phase)

- To comply with relevant laws pertaining to the management and disposal of solid waste, hazardous waste and re-waste.
- To arrange suitable sites for disposal of solid waste prior to the construction works,
- To avoid dumping in the area of private property without written consent of the owner
- To carry out recycle use of disposed soil as much as possible

(d) Water Pollution (Operation Phase)

- To conduct support programs regarding appropriate agricultural management
- To control the amount of fertilizer and pesticide through the training farmers
- To introduce check system among the FWUC members regarding agricultural management
- To monitor water quality and agricultural activities regularly

(2) Natural Environment

(a) Soil Erosion (Operation Phase, Operation Phase)

- To implement maintenance of canals by adequate methods and appropriate timing
- To design main canal and related structures to consider alleviation of soil erosion
- To adopt concrete lining to main canals

(b) Flora, Fauna and Biodiversity (Operation Phase)

- To make choice environmentally friendly design for main canals
- To consider aquatic ecosystem by maintenance and operation measures

(3) Social Environment

(a) Involuntary Resettlement (Planning/Design Phase)

- To conduct a detailed socio-economic survey of the affected families/people before the D/D Stage;
- To conduct a series of meetings with the affected families/people and village chiefs to build consensus on: (i) project purpose, (ii) compensation measures, (iii) support programs among them;
- To prepare the abbreviated RAP based on the results of the survey and meetings described above;
- To compensate for all the losses at an adequate rate;
- To prepare realistic schedule of land acquisition and inform the affected families/people of the schedule well in advance; and
- To monitor the process of recovery of living/livelihood conditions of the affected families/people.

(b) Land Use and Utilization of Local Resources (Construction Phase)

- To design canals/drainage by minimizing land acquisition as much as possible during D/D
- To conduct detailed socio-economic survey for affected persons to identify all losses from land acquisition before D/D Phase
- To fairly compensate to all affected persons, including those without title to land, for all their losses at replacement rates, if any
- To establish joint committee as decision making body to implement land acquisition process, members of which consist of (i) executing agencies (MOWRAM, MAFF, PDOWRAM and PDA), (ii) related agencies (Provincial Department of Land Management, Urban Planning and Construction PDLMUPC etc.) and (iii) local authorities (commune council, village chief, etc.)
- To conduct stakeholder meetings with affected people on: (i) project purpose, (ii) compensation measures, (iii) support programs to build consensus among the people especially the affected people through involvement of village chief
- To prepare adequate and realistic schedule of land acquisition through joint committee and inform affected people early
- To prepare Abbreviation RAP based on above surveys and meeting results.
- To monitor recovery condition of the affected people and the community
- To properly restore the affected area after construction works

- (c) Existing Social Infrastructures and Services (Construction Phase)
 - To hold a series of public consultation meetings for surrounding people in order to explain, discuss and find the way of passage restriction
 - To educate construction workers for adequate traffic rule of construction vehicles
 - To post a bill to inform impassable duration to commune council, village chief by means of, such like, social facilities including schools, pagodas and hospitals, after the work schedule is fixed with people's consensus
- (d) Socially Vulnerable Groups such as the Poor, Indigenous and Ethnic People (Planning /Design Phase)
 - To fairly compensate to all affected persons, including those without title to land, for all their losses at replacement rates, if any
 - To conduct stakeholder meetings with affected people to hear their opinion
 - To prepare adequate and realistic schedule of land acquisition through joint committee and inform affected people
 - To monitor recovery life condition of the affected people and the community
 - To pay special attention to vulnerable groups by operation phase
- (e) Sanitation/ Hazardous (risk) Infectious Diseases such as HIV/AIDS /Accident (Construction Phase)
 - To improve sanitary condition of workers by proper arrangement of accommodation, installation of toilets and proper water supply
 - To implement education programs for workers about sanitation, security and rules/discipline of daily activities
 - To implement safety education and training for construction workers
 - To implement periodical patrol of workers in order to avoid both occurrence of local conflict and epidemics of diseases
 - To hold a series of stakeholder meetings for surrounding people in order to explain construction works and its schedule.
 - To stipulate environmental consideration measures in the technical specifications of the construction works
 - To conduct detailed field survey of land mines and duds
 - To conduct elimination of landmines and duds before construction work

AH-2.3.6 Conclusion and Recommendation

It is expect that environmental negative impact by KSBISRSP is small and limited because all construction scale is not large and only rehabilitation work. And also, it is not necessary to prepare EIA report under Cambodian laws by project scale. However, small scale resettlement and land acquisition may be occur, these impact will be require adequate mitigations. Firstly, MOWRAM must prepare abbreviation RAP or land acquisition policy. Next, MOWRAM must carry on resettlement and land acquisition process by proper methods before D/D Phase. Especially, resettlement must be considered to avoid large impact even if all affected households made agreement to their relocation. Therefore, MOWRAM must implement detailed socio-economic and inventory surveys, and hold public stakeholder meetings before D/D Phase.

Resettlement and land acquisition should be conducted under responsibility of Cambodian government. If the process wouldn't conduct at an appropriate time, the issue will become obstructive factor for KSBISRSP implementation smoothly.

AH-2.4 Main Canal 35 Rehabilitation Sub-project

AH-2.4.1 Description of Sub-project

(1) Principal Features

Main Canal 35 irrigation system, consisting of three reservoirs and main and secondary canals, was originally constructed during Pol Pot regime (1975-1977) targeting to irrigate more than 3,000 ha of the existing paddy field.

This irrigation system is facing to insufficient irrigation water supply since long time due to damage of the reservoir dike by flood and deterioration of irrigation facilities. The latest rehabilitation works were implemented by MOWRAM in 2008, which however only covered the dikes of two upstream reservoirs and new construction of spillways and intakes, while the other facilities such as main and secondary canals remained as it was, therefore rehabilitation of canals has been proposed by the local authority in order to maximum utilize the water source impounded in the rehabilitated reservoirs.

Principal features of MC35RSP are tabulated as follows:

Table AH-2.4.1.1 Rehabilitation Works Proposed by Examined in this Survey

Description	Examination in this Survey
1) Target irrigation area	- 850 ha in rainy season - 130 ha in early rainy season (with 1 reservoir)
2) Reservoir - Dike - Spillway - Intake	Do. As left
3) Main Canal 35 - Related structures(new)	Length: 14,000m out of 25,299 m - Related structures Check structure: 9 nos. Turnout: 16 nos. Culvert: 8 nos. Drain inlet: 10 nos. Drop: 5 nos. Cross Drain: 1 no. Road Bridge: 1 no. Footpath Bridge: 9 nos.
4) Secondary canals - Canal earthworks - Related structures	Length: 11,600 m in total (6 nos.) (Rehabilitation: 9,200 m, New Construction: 2,400 m) - Check structure: 20 nos. - Turnout: 35 nos. - Culvert: 26 nos. - Cross Drain: 1 no. - Drop: 1 no.
5) Drain and tertiary canals	Do. As left

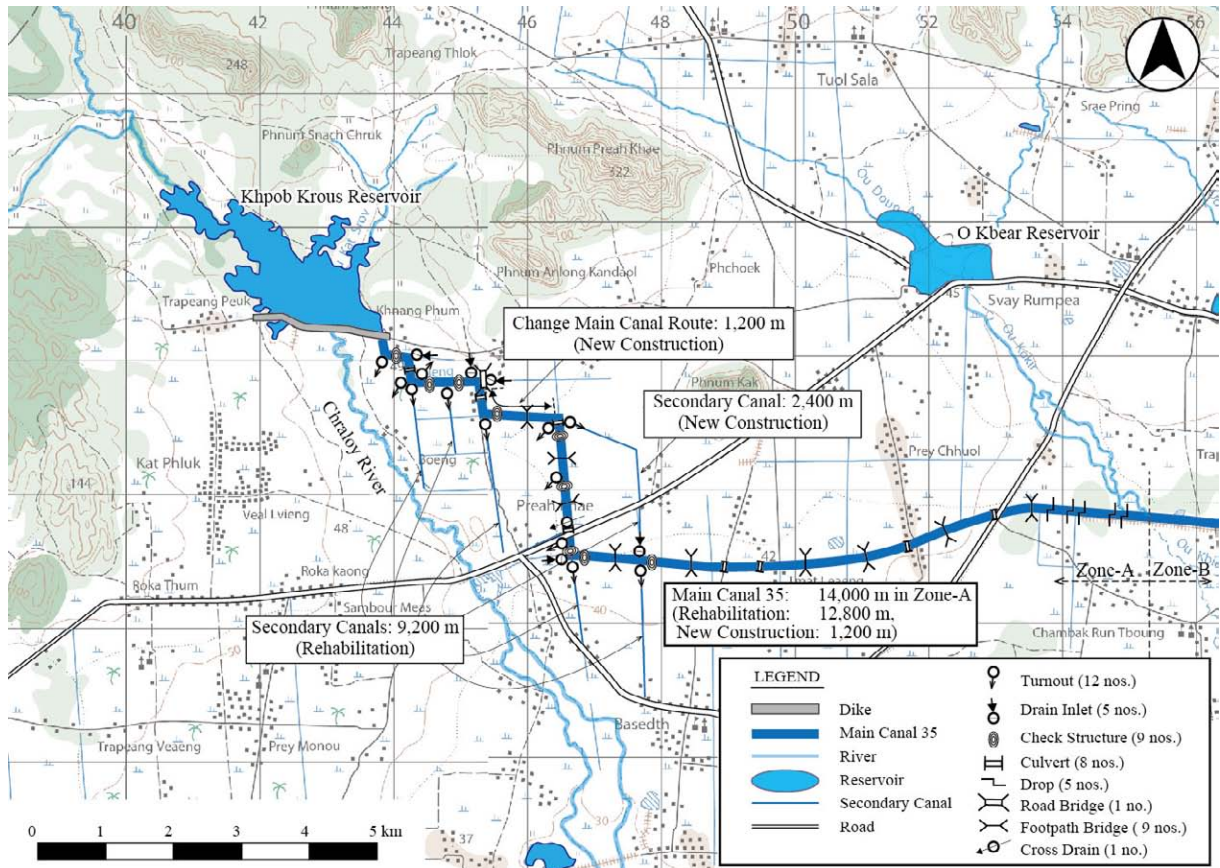
Source ¹: Main Canal 35 Rehabilitation Project in Basedth District, Kampong Speu Province, Project Proposal Document To Small Scale Infrastructure Project (2009)

²: JICA Survey Team

(2) Location

The system is located in the upstream of the Stung Slakou River basin, and situated in the plateau and mountainous region, west of Phnom Penh. The irrigation command area lies in the left bank of the Chraloy River along the provincial road, having long and narrow shape extending from west to east with gentle slope as shown in the location map in Figure AH-2.4.1.1

The area is administratively situated mainly in Basedth District, Kampong Speu Province bordering to the national road No.4, and partly extending in the western part of Takeo Province.



Source: JICA Survey Team

Figure AH-2.4.1.1 Location Map of MC35RSP

(3) Time Schedule

Implementation time schedule of MC35RSP are shown as follows:

Work Item	Year										
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	
1. Loan Agreement (L/A)											
2. Procurement of Consultant											
3. Clearance of Mines and UXOs											
4. Land Acquisition											
5. Consulting Services											
5-1 Detailed design for water resources facilities and canal system											
5-2 Assistance for procurement of ICB Contractor											
5-3 Construction supervision											
6. Rehabilitation Work											
6-1 Preparatory works											
6-2 Rehabilitation construction works											
(1) Partial rehabilitation of Khpob Krous Reservoir and intake structure											
(2) Partial rehabilitation of main canal system (14.0 km)											
(3) Partial rehabilitation and new construction of secondary canal system (14.5 km)											
(4) New construction of tertiary canal system (850 ha)											
(5) New construction of Sub-project office											

Source: JICA Survey Team

Figure AH-2.4.1.2 Implementation time schedule for Main Canal System of MC35RSP

(4) Examination of Alternatives

MC35RSP is the rehabilitation works of existing canals and water resource facilities were constructed during Khmer Rouge's reign area. Therefore, alternatives are very limited. Main and secondary canal alignments were selected by relocated residential area as much as possible.

AH-2.4.2 Description of Environment

AH-2.4.2.1 Physical Resources

Basedth District is in the south of Kampong Speu Province, in southern Cambodia. The district capital is Basedth town located some 50 kilometers south of the provincial capital of Kampong Speu by road. The district shares a border with Kampot and Takeo provinces to the south. National Highway 3 forms the eastern district boundary. The district is made up of flat farmland and supports extensive agriculture and a large population. Basedth District is subdivided into 15 communes and 218 villages. 6 out of 9 villages are to be affected by MC35RSP in Preah Khae Commune. The six villages are Khnang Phum, Thnal Dach, Khlouk, Trapeang Veang, Thnal and Boeng.

(1) Climate

Climate of RGC is dominated by the tropical rainy season and dry season. The southwest monsoon brings the rainy season from mid-May to mid-September or early October, while the northeast monsoon's flow of drier and cooler air lasts from early November to March. Temperatures are fairly uniform at around 27 degrees Celsius. Average annual rainfall is between 1,300 and 1,900 millimeters, with the heaviest amount in the southeast.

(2) Topography and Soil

Basedth district is located in an upper plateau of rolling terrain on old alluvium. It suffers from drought once in five years on average.

The soil of Cambodia have developed under a humid to sub-humid tropical climate with alternate wet-dry conditions, from the decomposition of acid or basic rocks, colluvial outwash from either or both of these rocks, recent or old alluvial materials and from coastal accretion (Crocker, 1962). The three types of soil; (i) Latosols, (ii) Red Yellow Podsoils, (iii) Planosols are distributed on Kampong Speu Province.

Table AH-2.4.2.1.1 General Soil Clarification of Kampong Speu Province

No.	Type of Soil	Agricultural Potential Remarks
1	Latosols	Generally good: Soil need protection from erosion and fire. Composition phosphate and organic fertilizers (Rock phosphate)
2	Red Yellow Podsoils	Poor Soil: Structure easily destroyed. Soil rapidly leached, lacking fertilizes elements.
3	Planosols	Good Soil: Enough for rice when prepared and irrigated.

Source: Sustainable Land Management 2006

(3) Surface Water

Khprob Krous Reservoir is the major surface water source in Basedth district, connected to Khnang Phum village in Preah Khae commune. Kampong Speu Province posses some other surface waters such as Prek Thnot River which is big and long water body attached to Mekong mainstream. Other water sources of Basedthe district are O Kbear Reservoir, Ka Ek Tom Reservoir, Stueng Tras, etc.



Khoov Krous Reservoir

(4) Groundwater

Groundwater has been used different forms of wells, drilled, ring, dug and mixed in the district. The total of wells in the whole district was about 2,600 in 2008. In 2011, the district was installed with 71 hand pumping wells from the government project carried out by the Ministry of Rural Development. No data availability exactly reported the groundwater quality even in the district or provincial level recently.

AH-2.4.2.2 Pollution Control

(1) Air Quality

Sub-decree on Air Pollution and Noise Disturbance Control came into effect in 2000, has clearly set the ambient air quality standard for 6 common air pollutants, CO, NO₂, SO₂, O₃, Pb, and TSP by Cambodia Ministry of Environment. Neither data of air quality measurement was found in MC35RSP Area and the district caused by possible human and business activities. Commonly the sampling or analysis of the quality is taken and conducted within the country's capital city, Phnom Penh where business establishment are gathering herein.

(2) Noise and Vibration

As the study project site is located in remote area where even access roads are in poor condition thus assumingly that there would not be any noise and vibration disturbance and pollution occurs. Moreover, none of secondary data of noise and vibration are available even from the commune or district level.

(3) Water Quality

According to village and commune chiefs, local farmers are using small amount of chemical fertilizer and pesticide for their paddy fields. However, the command area has never been reported of any health incidence occurrence resulted by water consumption. Only in 2005 there was information found of water quality degradation of Stung Kampong Speu was recorded while caused by solid and liquid waste discharge.

(4) Soil Erosion

Out of some provinces of Cambodia, Siem Reap, Kampong Thom, Battambang and Kratie as examples, Kampong Speu Province also encountered with soil erosion due to the reduction of ecological services from diminishing forest cover as an evident in agricultural landscapes. KSBISRSP site where existing canal need to be rehabilitated in regard of widening and deepening in this sense due to it became shallow filled with alluvial soil. This can be implied that not only it caused by locals' activities, covering and encroaching state land for illegal ownership but also by nature of soil erosion as the poor soil texture and structure content itself as well in the area especially in rainy season.

AH-2.4.2.3 Natural Resources

(1) Flora, Fauna and Biodiversity

The MC35RSP Area has been development as paddy fields and other agricultural lands.

The area can be commonly seen everywhere of the province with tree species known for sugar palm production, palm tree. Other local trees also found in the area. As the area mainly surrounded with residential areas and paddy fields, thus wildlife is hardly to see around the location. But some may appear in upper part of the commune where small hill with dwarf and scattered trees exist. Some freshwater fish species and fresh water shells are caught by local people especially during wet season.



Natural environment of MC35RSP

(2) Protected Area

Kirirom National Park is in Kampong Speu province. However, the MC35RSP Area does not encompass any protected area.

(3) Land Use

Land use and natural resources of Basedth district, variety of land use can be described following as; urban settlement, village residence, wet season rice, village with paddy field, moist evergreen broad leafed forest, deciduous forest, dry deciduous forest, riparian forest, secondary forest, grassland, abandoned field covered with grass, shrubland, abandoned field covered with shrub, lake and reservoir.

Table AH-2.4.2.3.1 Land Use of Basedth District

District	Total Land Area (ha)	Forest Land Area (ha)		Cultivation Land Area (ha)	Construction Land Area (ha)	Other Land Area (ha)
		Total	Flooded			
Basedth	28,371	5,320	0	18,665	4,386	0

Source: Basedth District Data Books 2009

AH-2.4.2.4 Social Resources

(1) Population

Number of communes within the affected district totally is 15, however only Preah Khae commune considered to be encountered to project area. The commune administrative consisted of nine villages. Basedth population was 119,531 in 2008 while Preah Khae commune was 5,541. The average male-to female ratio was 94.72 in 2008.

Table AH-2.4.2.4.1 Existing Social Status of MC35RSP affected District

No.	Commune	Population	Male-to-Female ratio
Basedth District			
1	Basedth	10,737	94.1
2	Kat Phluk	7,647	99.7
3	Nitean	7,070	91.4
4	Pheakdei	6,057	97.0
5	Pheari Mean Chey	7,639	96.0
6	Phong	7,684	98.1
7	Pou Angkrang	14,747	96.1
8	Pou Chamraeun	6,684	93.3
9	Pou Mreal	9,203	97.0
10	Svay Chacheb	7,705	93.1
11	Tuol Ampil	9,464	93.3
12	Tuol Sala	6,376	91.8
13	Kak	5,173	93.8
14	Svay Rumppear	7,804	92.4
15	Preah Khae	5,541	91.4
Total		119,531	94.72

Source: 2008 Kampong Speu Population census

(2) Economic Status

Key Kampong Speu Provincial Industries are agriculture (rice, fruit trees, palm trees, cassava, water melon, etc.), industry (cassava, cashew and eucalyptus enterprises, garments and footwear, wood products, cement factory, quarries handicrafts and other small business enterprises), tourism (Kirirom National Park, waterfall, former capital of the Kingdom, Udong, and so on). The major economic activities of Basedth district involve such as rice and crop production like corn, soya bean, mung bean, peanut, cassava, sweet potatoes, sesame, sugar palm and livestock production. Due to topographical location of the area the affected villagers can practice their farming only during wet season.

(3) Heritage and Religion Site

Kampong Speu is popular with some heritage and religious sites. Udong the Kingdom historical city, Chetareus Pagoda where Buddha's bone is kept, Ampe Phnom Mountain, Kirirom the home of pine tree and also known as a National Park to various biodiversity etc., are located in this province, but outside MC35RSP Area.

(4) Water Supply and Sewage System

Sources of drinking water in MC35RSP Area mainly are pumping or mixed wells, while some can access to pond water. However percentage of families using unsafe of source water was a bit high about 47% in 2008. Commonly sewage pipe system in the province and in whole country is practiced in the urban area only, while in Preah Khae commune has not been seen.

Table AH-2.1.2.4. 2 Water and Sanitation, by Commune in the Affected District

Commune Name	Ratio of People to wells (%)		Ratio of People to wells (%)						Families using safe and unsafe water sources in dry season (%)		Families filtering or regularly boiling water (%)	
	Total wells	Year round wells	Pipe water	Pump or mixed wells	Ring wells	Pond water	Rain water	River, lake, stream water	Clean/safe sources	Unsafe sources	Water filter	Regularly boiled water
Basedth	38.0	63.0	0.0	46.2	31.2	22.3	0.3	0.0	43.6	56.4	14.6	37.0
Kat Phluk	136.0	192.0	0.0	40.9	21.1	38.9	0.0	0.0	32.2	67.8	1.2	17.2
Nitean	68.0	107.0	0.0	29.8	25.8	27.9	4.1	12.4	43.9	56.1	1.7	42.5
Pheakdei	71.0	103.0	0.0	71.1	17.9	11.0	0.0	0.0	80.0	20.0	8.7	14.6
Pheari Mean Chey	54.0	92.0	0.0	50.9	15.2	33.3	0.6	0.0	55.0	45.0	7.1	30.0
Phong	53.0	69.0	0.0	58.1	19.5	20.1	1.8	0.5	55.5	44.5	6.5	25.3
Pou Angkrang	41.0	78.0	2.5	29.0	36.4	23.4	2.9	5.8	38.2	61.8	5.9	43.0
Pou Chamraeun	47.0	74.0	0.0	40.9	29.5	22.7	0.1	6.9	78.6	21.4	1.3	20.4
Pou Mreal	39.0	61.0	0.0	44.3	28.2	21.2	0.0	6.3	64.6	35.4	2.2	26.1
Svay Chacheb	46.0	63.0	0.0	46.5	58.0	0.4	0.1	0.0	77.1	22.9	8.3	27.3
Tuol Ampil	48.0	74.0	2.5	41.6	24.6	30.8	0.2	0.3	59.1	40.9	14.2	22.5
Tuol Sala	33.0	59.0	0.0	47.7	34.4	12.0	4.2	1.7	72.7	27.3	1.1	39.7
Kak	72.0	112.0	0.0	48.5	12.7	36.9	1.5	0.5	51.9	48.1	27.8	31.8
Svay Rumpear	69.0	123.0	5.5	39.1	31.9	20.6	2.3	0.6	51.9	48.1	7.6	22.7
Preah Khae	95.0	117.0	0.0	55.4	18.0	26.6	0.0	0.0	52.4	47.6	21.8	21.6

Source: Basedth District Data Books 2009

AH-2.4.3 Result of Scoping

AH-2.4.3.1 Environmental Scoping for MC35RSP

Environmental scoping for MC35RSP, which clarifies conceivable environmental and social impacts due to proposed projects activities, was conducted. The major environment and social impact assessment studies are presented in the following scoping matrix and checklist. It is noted that the evaluation in the matrix is made by considering a degree of conceivable impacts in the case any adequate mitigation measure is not conducted and also common to MC35RSP. The evaluation will be utilized for preparation of specifications of detailed study in the next chapter.

Table AH-2.4.3.1.1 Result of Environmental Scoping for MC35RSP

No.	Likely Impact	Project-related Activities				
		Overall Rating	Planning / Design Phase	Construction Phase	Operation Phase	
Pollution Control	1	Air pollution	B-	-	B-	-
	2	Water pollution	B-	-	B-	B-
	3	Soil contamination	-	-	-	-
	4	Waste	B-	-	B-	-
	5	Noise and vibration	B-	-	B-	-
	6	Ground subsidence	-	-	-	-
	7	Offensive odor	-	-	-	-
	8	Bottom sediment	-	-	-	-
	9	Disaster	-	-	-	-

No.	Likely Impact	Project-related Activities			
		Overall Rating	Planning / Design Phase	Construction Phase	Operation Phase
Natural Environment	10	Topography and geographical features	-	-	-
	11	Soil erosion	B-	-	B-
	12	Groundwater	-	-	-
	13	Hydrological situation	C-	-	C-
	14	Coastal zone	-	-	-
	15	Flora, fauna and biodiversity	-	-	-
	16	Meteorology	-	-	-
	17	Landscape	-	-	-
	18	Global warming	-	-	-
Social Environment	19	Involuntary resettlement	-	-	-
	20	Local economy such as employment and livelihood, etc.	A+	-	B+
	21	(Surrounding) Land use and utilization of local resources	B-/A+	B-	B-
	22	Social institutions (including regional severance)	-	-	-
	23	Existing social infrastructures and services	B-	-	B-
	24	Socially vulnerable groups such as the poor, indigenous and ethnic people (including gender matter)	B+	-	-
	25	Misdistribution of benefit and damage	-	-	-
	26	Historical and cultural heritage (including religious matters)	-	-	-
	27	Water usage or water rights and rights of common	A+	-	-
	28	Local conflict of interests	-	-	-
	29	Sanitation	B-	-	B-
	30	Hazardous (risk) infectious diseases such as HIV/AIDS	B-	-	B-
	31	Accident	B-	-	B-

Source: JICA Survey Team

<Rating>

A-: Serious impact is expected, if any measure is not implemented to the impact.

B-: Some impact is expected, if any measure is not implemented to the impact.

C-: Extent of impact is unknown (Examination is needed. Impact may become clear as study progresses.)

-: No impact is expected.

A+: Remarkable effect is expected due to the project implementation itself and environmental improvement caused by KSBISRSP.

B+: Some effect is expected due to the project implementation itself and environmental improvement caused by KSBISRSP.

Overall rating: Highest rate will be the overall rating among the rating of relevant project-related activities for negative and positive ratings, respectively. (e.g. Even only one "A-" is included in an environmental item, overall rating of the environmental item becomes "A-".)

AH-2.4.3.2 Checklist of Environmental Scoping

Checklist of environmental scoping for MC35RSP is prepared as described in Table AH-2.4.3.2.1.

Table AH-2.4.3.2.1 Checklist of Environmental Scoping for MC35RSP

No	Likely Impacts	Rating Over all	Explanation on Potential Impacts (Project-related activity is shown in the parenthesis"< >".)
Pollution			
1	Air pollution	B-	<Operation of construction equipment and vehicles> <Rehabilitation of existing main/secondary canals and other facilities> <New construction of main/secondary canals and other facilities> Emission of exhaust gas from construction equipment and vehicles and dust pollution due to operation of the construction equipment and vehicles would cause air pollution in and around the construction sites during the construction. However, the impact is limited and temporary.
2	Water pollution	B-	<Operation of construction equipment and vehicles> <Rehabilitation of existing main/secondary canals and other facilities> Muddy water from construction site and oil spill from construction equipment and vehicles would cause water pollution in the existing canals in and around the construction site. <Utilization of irrigation water > Increased irrigation water might encourage farmers to use more agro-chemicals and fertilizers to carry out intensive farming.
3	Soil contamination	-	MC35RSP does not have any factor which may cause the soil contamination in terms of project location and construction method.

No	Likely Impacts	Rating Over all	Explanation on Potential Impacts (Project-related activity is shown in the parenthesis“<>”.)
4	Waste	B-	<Operation of construction equipment and vehicles> <Rehabilitation of existing main/secondary canals and other facilities> <New construction of main/secondary canals and other facilities> Construction waste including residue soil and concrete waste would be produce by construction work.
5	Noise and vibration	B-	<Operation of construction equipment and vehicles> <Rehabilitation of existing main/secondary canals and other facilities> <New construction of main/secondary canals and other facilities> - Vibration caused by such construction works would cause damage to residential people, existing houses and other kinds of building structures.
6	Ground subsidence	-	MC35RSP does not have any factor which may cause the ground subsidence in terms of project location and construction method.
7	Offensive odor	-	MC35RSP does not have any factor which may cause the offensive odor in terms of project location and construction method.
8	Bottom sediment	-	MC35RSP does not have any factor which may cause the bottom sediment in terms of project location and construction method.
9	Disaster	-	MC35RSP does not have any factor which may cause the disaster in terms of project location and construction method.
10	Topography and geographical features	-	MC35RSP does not have any factor which may cause the disaster in terms of project location and construction method because project site is already developed as .
11	Soil erosion	B-	<Control of maintenance of canals and drainage> <New construction of main/secondary canals and other facilities> New and rehabilitated canals/drainage would cause soil erosion in some sections.
12	Groundwater	-	MC35RSP does not have any factor which may cause the groundwater in terms of project location and construction method because MC35RSP does not utilize groundwater.
13	Hydrological situation	C-	<Rehabilitation of existing main/secondary canals and other facilities> <New construction of main/secondary canals and other facilities> Rehabilitation work canals/drainage in some sections would affect hydrological situation in project area without adequate control of maintenance of those structure. Detailed hydrological analysis undertook in this study.
14	Coastal zone	-	MC35RSP does not have any factor which may cause the c in terms of project location.
15	Flora, fauna and biodiversity	-	MC35RSP does not have any factor which may affect and/or be related to flora and fauna since command area of MC35RSP are already development area as agricultural lands.
16	Meteorology	-	MC35RSP does not have any factor which may affect and/or be related to the meteorology.
17	Landscape	-	MC35RSP does not have any factor which may cause the groundwater in terms of project location and construction method.
18	Global warming	-	MC35RSP does not have any factor which may cause the groundwater in terms of project location and construction method because MC35RSP is only rehabilitation and improvement project and not including new development.
19	Involuntary Resettlement	-	<Design of main/secondary canals and other facilities > It is expected no involuntary resettlement will be caused by MC35RSP since main works of MC35RSP are rehabilitation works for existing water supply system.
20	Local economy such as employment and livelihood, etc.	A+	<Rehabilitation of existing main/secondary canals and other facilities> <New construction of main/secondary canals and other facilities> - Overall, the construction of MC35RSP will make more employment and business opportunities for local residents during construction. <Utilization of irrigation water > - After operation of MC35RSP, regional farmers would have positive impact due to improvement irrigation water availability.
21	Land use and utilization of local resources	B-/B+	<Design of main/secondary canals and other facilities > <Rehabilitation of existing main/secondary canals and other facilities> <New construction of main/secondary canals and other facilities> Construction work will cause loss of some structures (Garden, fence and other facilities) and paddy field along existing canals. <Utilization of irrigation water > After operation of the KSBISRSP, regional formers around the MC35RSP would have positive impact due to improved irrigation water availability
22	Social institutions	-	MC35RSP does not have any factor which may cause social institution in terms of project location and construction methods.
23	Existing social infrastructures and services	B-	<Operation of construction equipment and vehicles> <Rehabilitation of existing main/secondary canals and other facilities> Construction work and traffic restriction would disturb access to the existing social infrastructures and services.
24	Socially vulnerable groups such as the poor, indigenous and ethnic people	-	MC35RSP does not have any factor which may cause social vulnerable groups. According to village leaders, local people of MC35RSP area al

No	Likely Impacts	Rating Over all	Explanation on Potential Impacts (Project-related activity is shown in the parenthesis“< >”.)
25	Misdistribution of benefit and damage	-	MC35RSP does not have any factor which may cause misdistribution since MC35 RSP will bring in large benefit to whole of in and around the commune area.
26	Historical and cultural heritage (including religious matters)	-	MC35RSP does not have any factor which may cause historical and cultural heritage in terms of project location and construction methods.
27	Water usage or water rights and rights of common	A+	<Utilization of irrigation water > After operation of the MC35RSP new regulator and canals/drainage will provide a substantial improvement in irrigation water provision without adequate water resource management.
28	Local conflict of interests	-	MC35RSP does not have any factor which may cause local conflict of interests since MC35 RSP will conduct large benefits to whole of in and around the commune area.
29	Sanitation	B-	<Operation of construction equipment and vehicles> <Rehabilitation of existing main/secondary canals and other facilities> <New construction of main/secondary canals and other facilities> Sanitary issues would occur in labor camp and neighboring area in the case sanitary facility is not adequately installed such as toilet and septic tank.
30	Hazardous (risk) infectious diseases such as HIV/AIDS	B-	<Operation of construction equipment and vehicles> <Rehabilitation of existing main/secondary canals and other facilities > <New construction of main/secondary canals and other facilities> Risk of infectious diseases by labors would be expected during construction due to the inflow of the construction workers from outside.
31	Accident	B-	<Operation of construction equipment and vehicles> <Rehabilitation of existing main/secondary canals and other facilities> <New construction of main/secondary canals and other facilities> Some accidents are inevitable during construction.

Source: JICA Survey Team

Note: * Regarding the impacts on “Gender” and “Children’s Right”, might be related to all criteria of Social Environment.

<Rating>

A-: Serious impact is expected, if any measure is not implemented to the impact.

B-: Some impact is expected, if any measure is not implemented to the impact.

C-: Extent of impact is unknown (Examination is needed. Impact may become clear as study progresses.)

-: No impact is expected. Therefore, EIA is not required.

A+: Remarkable effect is expected due to MC35RSP implementation itself and environmental improvement caused by MC35RSP.

B+: Some effect is expected due to MC35RSP implementation itself and environmental improvement caused by MC35RSP.

Overall rating: Highest rate will be the overall rating among the rating of relevant project-related activities for negative and positive ratings, respectively. (e.g. Even only one “A-” is included in an environmental item, overall rating of the environmental item becomes “A-”.)

AH-2.4.4 Anticipated Negative Impact of Environment

(1) Pollution Control

(a) Air pollution, Noise and Vibration (Construction Phase)

1) Activity

- Operation of construction equipment and vehicles
- Rehabilitation of existing main/secondary canals and other facilities
- New construction of main/secondary canals and other related facilities

2) Affected Area

- In and around construction area

3) Expected Potential Impact

During the construction phase, transportation of heavy equipment would cause air pollution, noise and vibration. Transportation of construction vehicles and transportation/operation of heavy equipment, such as dump truck, excavator, bulldozer, roller compactor and watering lorry, would exhaust emission gasses including NO₂ and SPM. And also, such heavy equipment would cause noise and vibration.

4) Related Regulation

- Sub-decree on Air and Noise Pollution Control

5) Conclusion of Examination

Most of the construction works of MC35RSP are small scale, numbers of heavy equipment and construction vehicles for the works will be limited. Therefore, the impact to air quality, noise and vibration by construction works will be insignificant if proper mitigation measures are carried out.

(b) Water Pollution by Construction Works (Construction Phase)

1) Activity

- Operation of construction equipment and vehicles
- Rehabilitation of existing main/secondary canals and other facilities
- New construction of main/secondary canals and other related facilities

2) Affected Area

- Downstream of construction area

3) Expected Potential Impact

Muddy water from construction site and soil spilt from construction machinery would cause water pollution of existing canals. In addition, alkalified water caused by the concrete works will be another concern during construction phase.

4) Related Regulation

- Sub-decree on Water Pollution Control

5) Conclusion of Examination

Large scale construction including earthwork will not implement during the rainy season to avoid water pollution of existing canal water and water use. In addition, since the amount of concrete to be used is not large, alkalified water from the concrete works in the canals might be diluted by canal water. However, it is necessary to establish adequate treatment system if large quantity of alkalified water is observed during construction time.

(c) Waste Management by Construction Works (Construction Phase)

1) Activity

- Operation of construction equipment and vehicles
- Rehabilitation of existing main/secondary canals and other facilities
- New construction of main/secondary canals and other related facilities

2) Affected Area

- In and around construction area

3) Expected Potential Impact

Concrete and other construction waste would be produced by the construction works. In addition, rehabilitation works of canal/drainage will create soil disposal.

4) Related Regulation

- Sub-decree on Solid Waste Management (1999)

5) Conclusion of Examination

As most of the construction works are small scale and therefore construction waste is very limited. The impact of waste by construction works will not be serious if appropriate management and mitigation measures are provided.

(d) Water Pollution (Operation Phase)

1) Activity

- Utilization of irrigation water

2) Affected Area

- Downstream of MC35RSP command area

3) Expected Potential Impact

The command area of MC35RSP Area has been already developed with farming. As the result of interview survey to village leaders, usages of agro-chemicals and fertilizer would be limited in command areas since these prices are too high for local farmers. They usually compost manure, rice straw and other natural resources. However, nutrient load or chemical contamination might increase affecting downstream areas after rehabilitated and operated canals since increase of agro-chemicals and fertilizer usage by MC35RSP rehabilitation.

4) Related Regulation

- Sub-decree on Water Pollution Control (April 6, 1999)

5) Conclusion of Examination

Increased irrigation water might encourage farmers to use more agro-chemicals and fertilizers to carry out intensive farming after the MC35RSP.

(2) Natural Environment

(a) Soil Erosion (Construction Phase, Operation Phase)

1) Activity

- Operation and maintenance of main/secondary canals

2) Affected Area

- Main canals, secondary canals and other facilities

3) Expected Potential Impact

Soil erosion was found in some sections of existing canals/drainages at present. After the rehabilitation, soil erosion will occur if adequate maintenance works are provided.

4) Related Regulation

- None

5) Conclusion of Examination

In planning phase, high potential site of soil erosion was not selected as rehabilitation targets. Soil erosion is not only man-cause but also natural-cause. Although it is difficult to completely prevent canals from erosion, adequate design and maintenance of canals would alleviate soil erosion to some degree.

(b) Hydrological Situation (Operation Phase)

1) Activity

- Operation and maintenance of main/secondary canals

2) Affected Area

- Area of the KSBISRSP

3) Expected Potential Impact

Hydrological situation of the command area will be affected MC35RSP

4) Related Regulation

- None

5) Conclusion of Examination

After the rehabilitation work, hydrological situation will change MC35RSP Area. However, MC35RSP is rehabilitation work, and hydrological situation will return previous status when past irrigation system functioned. Therefore, the impact is very limited if proper mitigation measures are carried out. Detailed water balance analysis of MC35RSP shown Main report Chapter II-2.5.3.2.

(3) Social Environment

(a) Land Use and Utilization of Local Resources (Planning/Design Phase, Construction Phase)

1) Activity

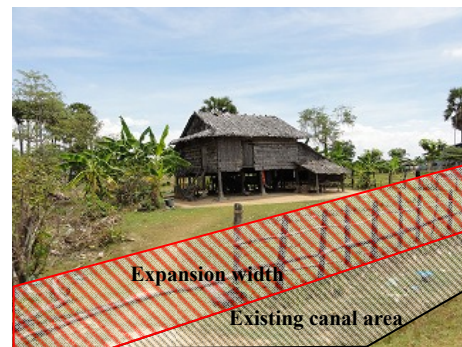
- Rehabilitation of existing canals/drainages and other facilities

2) Affected Area

- Area along canals / drainages

3) Expected Potential Impact

Lands along the existing canal as well as the proposed alignment should be acquired prior to the implementation of the Sub-Project. Most of the lands to be acquired are currently used as paddy or other agricultural fields. Some parts of the proposed alignment will run through the residential area; therefore, some backyard gardens or fences would also be affected by MC35RSP, although no involuntary resettlement would be required. In addition, temporary land acquisition might be required in and around the construction site during the construction stage. Village leaders of the related communes shows their willingness to cooperate with the Sub-Project for smooth land acquisition since the stable supply of t irrigation water by MC35RSP is crucial to their livelihoods.



Affected house along existing main canal

4) Related Regulation

- Constitution (1993)
- Land Law (2001)
- Expropriation Law (2010)
- Sub-decree on Social Land Concession (2003)

5) Conclusion of Examination

Due consideration should be given to the process of land acquisition from the design phase. Even though the total area of land acquisition might be small, the potential impact on the respective affected families/people must not be negligible. It is, therefore, crucially important for MOWRAM in coordination with village leaders to explain the possible benefit from MC35RSP and its potential negative impact on affected families/people, especially those living along the existing canal, in the

planning/design stage, to build consensus on the Sub-project design and the proposed compensation measures for affected families/people to avoid a potential social problem in the future.

(c) Existing Social Infrastructures and Services (Construction Phase)

- 1) Activity
 - Operation of construction equipment and vehicles
- 2) Affected Area
 - Local roads in and around MC35RSP Area
- 3) Expected Potential Impact

During construction time, operation of construction equipment and vehicles will move local roads in and around construction site of MC35RSP. Number of construction vehicles will increase than normal times, the situation would be effected local social infrastructure and services.

- 4) Related Regulation
 - None
- 5) Conclusion of Examination

Most of the construction works are small scale, therefore construction periods are limited. The impact by the construction works will not be significant if proper management and mitigation measures are carried out.

(d) Sanitation/Hazardous (risk) infectious diseases such as HIV/AIDS /Accident (Construction Phase)

- 1) Activity
 - Operation of construction equipment and vehicles
 - Rehabilitation of existing main/secondary canals and other facilities
- 2) Affected Area
 - In and around the MC35RSP Area
- 3) Expected Potential Impact

Due to inflow of construction workers from outside of the community during construction phase, the anticipated impacts are (i) deterioration of sanitation condition, (ii) deterioration of public security, (iii) increase of risk of diseases including AIDS/HIV, (iv) accident, (v) local conflict among people and workers. Although construction scale is not large and duration is at most 36 months, these issues need to be taken into consideration.

- 4) Related regulation
 - Labor Law (1997)
- 5) Conclusion of examination

Since the people in and around the MC35RSP Area is not familiar to the construction workers, a great attention should be paid to management of construction workers and construction sites. However, taking into consideration work scale, the number of construction workers will not be large. Therefore, serious negative impacts are not envisaged if proper mitigation measures are provided.

AH-2.4.5 Mitigation Measures

In accordance with the above examination, the mitigation measures against negative impacts anticipated are proposed as follows:

- (1) Pollution Control
 - (a) Air pollution and Noise and vibration (Construction phase)
 - To educate construction workers on minimizing idling of construction machinery
 - To restricted construction time. e.g. during daytime only
 - To hold stakeholder meetings to build consensus about the construction time
 - To stipulate environmental consideration measures in the technical specification of the construction works
 - (b) Water Pollution by Construction Works (Construction Phase)
 - To dilute or neutralize alkalified water from concrete mixer trucks by pooling in regulating pond before discharging
 - To pool discharging water from the concrete plant for dilution or neutralization
 - To install adequate treatment system for muddy and alkalified water in construction site such as installation of water tank to collect water from concrete works for neutralization
 - To avoid implementation of earthwork during rainy season
 - To stipulate environmental consideration measures in the technical specification of the construction works
 - (c) Waste Management by Construction Works (Construction Phase)
 - To comply with relevant laws pertaining to the management and disposal of solid waste, hazardous waste and re-waste.
 - To arrange suitable sites for disposal of solid waste prior to the construction works,
 - To avoid dumping in the area of private property without written consent of the owner
 - To carry out recycle use of disposed soil as much as possible
 - (d) Water Pollution (Operation Phase)
 - To conduct support programs regarding appropriate agricultural management
 - To control the amount of fertilizer and pesticide through the training farmers
 - To introduce check system among the FWUC members regarding agricultural management
 - To monitor water quality and agricultural activities regularly
- (2) Natural Environment
 - (a) Soil Erosion (Construction Phase / Operation Phase)
 - To implement maintenance of canals by adequate methods and appropriate timing
 - To design main canal and related structures to consider alleviation of soil erosion
- (3) Social Environment
 - (a) Land Use and utilization of Local Resources (Planning/Design Phase)
 - To design the canals/drainages to minimize the possible adverse effects by land acquisition in the D/D Phase;
 - To conduct a detailed socio-economic survey of affected families/persons to identify all the losses from land acquisition before the D/D Phase;
 - To fairly compensate all affected families/persons, including those without a legal title to land, for all their losses at reasonable rates or replacement rates, if any;
 - To establish a IRC as a decision making body to carry out the land acquisition process;

- To hold stakeholder meetings with affected families/ people;
 - To prepare a realistic schedule of land acquisition and inform affected families/ of the schedule well in advance; and
 - To properly restore the affected area after the construction works
- (b) Existing Social Infrastructures and Services (Construction Phase)
- To hold a series of public consultation meetings for surrounding people in order to explain, discuss and find the way of passage restriction
 - To educate construction workers for adequate traffic rule of construction vehicles
 - To post a bill to inform impassable duration to commune council, village chief by means of, such like, social facilities including schools, pagodas and hospitals, after the work schedule is fixed with people's consensus
- (c) Sanitation/ Hazardous (risk) Infectious Diseases such as HIV/AIDS /Accident (Construction Phase)
- To improve sanitary condition of workers by proper arrangement of accommodation, installation of toilets and proper water supply
 - To implement education programs for workers about sanitation, security and rules/discipline of daily activities
 - To implement safety education and training for construction workers
 - To implement periodical patrol of workers in order to avoid both occurrence of local conflict and epidemics of diseases
 - To hold a series of stakeholder meetings for surrounding people in order to explain construction works and its schedule.
 - To stipulate environmental consideration measures in the technical specifications of the construction works

AH-2.4.6 Conclusion and Recommendation

It is expected that no large impact such as involuntary resettlement might be cause by MC35RSP. However, preparation of abbreviation RAP framework include land acquisition policy before D/D Phase and implementation of mitigation measures during construction phase must be conducted under responsibility of MOWRAM. Especially, formulation of land acquisition policy have commitment in project progress, MOWRAM must finalize the policy before D/D Phase.

AH-2.5 Srrass Prambai Water Recession Rehabilitation Sub-project

AH-2.5.1 Description of Sub-project

(1) Principal Features

Srrass Prambai Irrigation System, consisting of the Srrass Prambai Reservoir and main and secondary canals was originally constructed during Pol Pot regime targeting to irrigate the flood recession cultivation area in the flood plain between the Tonle Basac and the Mekong Rivers. The system was sufficiently operated till 2000, however the reservoir dike was damaged in 2000 by flood. The recession cultivation lands have been facing the shortage of irrigation water since then, and the lowland paddy areas were abandoned. Therefore, the farmers and the local authority requested to MOWRAM for urgent rehabilitation. Previously, rehabilitation works of the reservoir dike with about

7 km were executed by the local religious party under the assistance of PDOWRAM, while the rest of the dike remains untreated. The proposed works include the rehabilitation of the reservoir dike and related intake facilities. The principal features of the rehabilitation works under SPWRRSP are summarized in Table AH-2.5.1.1 below.

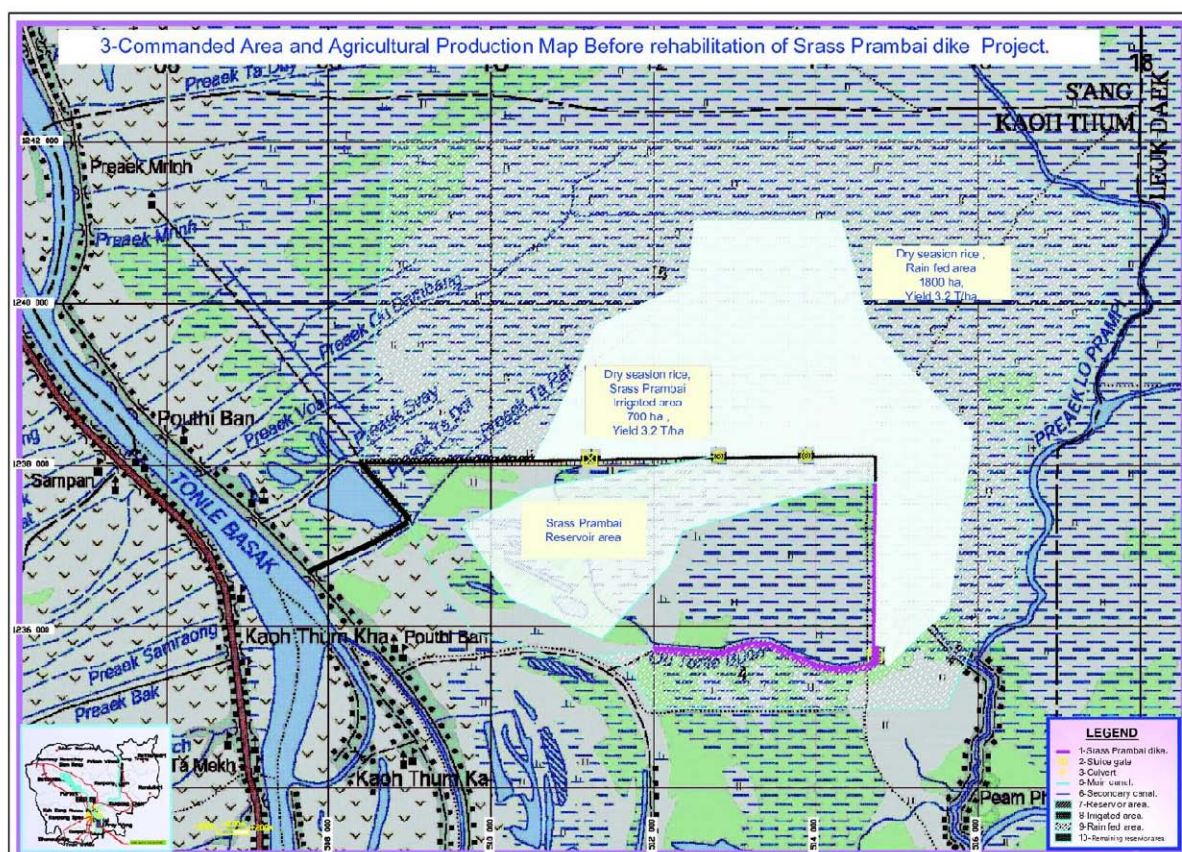
Table AH-2.5.1.1 Principal features of SPWRRSP

Description	Quantities
(a) Irrigation Development Area	(a) Irrigation Development Area
	- 1,200 ha
(b) Hardware Components	(c) Hardware Component
- Rehabilitation of reservoirs dike	- Rehabilitation of the existing dike (9.1 km)
- Replacement of intake culverts on reservoir dike	- Replacement of 7 intake culvert with provision of new slide gates
- Construction of project office	(a) Office building (300 m ²) (b) Parking shed, gate and fencing (c) Well drilling and electric works, etc.

Source: JICA Survey Team

(2) Location

The Sub-project area lies at the left side of the Basac River in its lower reach, about 20 km from the national border with Vietnam, as shown in the location map in Figure AH-2.5.1.1. The area is administratively situated in Po Ti Ban Commune, Kaoh Thum District, Kandal Province.



Source: JICA Survey Team

Figure AH-2.5.1.1 Location Map of SPWRRSP

(3) Time Schedule

Implementation time schedule of SPWRRSP are shown as follows:

Work Item	Year									
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
1. Loan Agreement (L/A)										
2. Procurement of Consultant										
3. Clearance of Mines and UXOs										
4. Land Acquisition										
5. Consulting Services										
5-1 Detailed design for water resources facilities and canal system										
5-2 Assistance for procurement of ICB Contractor										
5-3 Construction supervision										
6. Rehabilitation Work										
6-1 Preparatory works										
6-2 Rehabilitation and construction works										
(1) Partial rehabilitation of Sras Prambai Reservoir										
(2) New construction of intake structures (7 nos.)										
(3) New construction of Sub-project office										

Source: JICA Survey Team

Figure AH-2.5.1.2 Implementation Time Schedule for Main System of SPWRRSP

(4) Examination of Alternatives

SPWRRSP is just rehabilitation work of broken dikes and related water supply facilities. There are no other alternative expect zero option. If SPWRRSP would not implement, the parts of facilities have been deteriorated, and if left as they are, it is sure that the water supply to the command area would be difficult in the near future.

AH-2.5.2 Description of Environment

AH-2.5.2.1 Physical Resources

Sras Prambai is located in Pothi Ban Commune, Koh Thom District, Kandal Province to the southeastern part of Phnom Penh. Pothi Ban is one of 11 communes in the district, and consists of 9 villages, Preaek Mrenh, Preaek Hang, Kbal Chrouy, Preaek Thmei, Preaek Ta In, Kampong Kor, Preaek Ta Dos, Preaek Ta Rat, and Pouthi Ban. Kandal province has 140,797 hectares devoted to agricultural production. Around 101,500 hectares of this is rice production, with yields the national average. The main other crops are maize, sugarcane, soybean, and many varieties of vegetables and fruits. Kandal supplies fish, meat, and vegetables to Phnom Penh and to export markets.

(1) Climate

Climate of RGC is dominated by the tropical rainy season and dry season. The southwest monsoon brings the rainy season from mid-May to mid-September or early October, while the northeast monsoon's flow of drier and cooler air lasts from early November to March. Temperatures are fairly uniform at around 27 degrees Celsius. Average annual rainfall is between 1,300 and 1,900 millimeters, with the heaviest amount in the southeast.

(2) Topography and Soil

The average altitude of the province is supposedly not more than 10m above sea level. The province also features two of the biggest rivers of the country, the Tonle Bassac and the mighty Mekong. Soil type of Kandal Province is mostly Alluvial Lithosols. Closer to the banks of the Mekong and Tonle Sap rivers, soils are Brown Alluvials. In the north-west of the province, Red-yellow podzols are common.

Table AH-2.5.2.1.1 General Soil Clarification of Kampong Speu Province

Classification	Type of Soil	Agricultural Potential Remarks
1st	LATOSOLS	Generally Good: Soil needs protection from erosion and fire. Composition phosphate and organic fertilizers (Rock phosphate)
1st	ALLUVIALS	Good Soil: Potential Acidity: Recommend colmatage canals. Cultivation concordance with the water regime. Green manure, phosphate, and potash (avoid the use of sulphate fertilizers).
1st	BROWN ALLUVIALS	Rich Soil: Need phosphate and potash. Flood protection

Classification	Type of Soil	Agricultural Potential Remarks
3rd	RED YELLOW PODSOLS	Poor: Structure easily destroyed. Soil rapidly leached, lacking fertilizes elements.

Source: <http://www.elc.maff.gov.kh/en/laws/19-soil-group.html>

(3) Surface water

Kandal Province is rich with water bodies, Tonle Sap and Bassac, Steung Prek Thnaot, etc. The commune where SPWRRSP Area located in is also much of surface water such as Preaek Mrenh, Preaek Hang, Preaek Thmei, Preaek Ta In, Preaek Ta Dos, Preaek Ta Rat, Prek O Dambang, Prek Voal, and some others. However, most of them are dry up during dry season.

(4) Groundwater

With the district level, groundwater has been consumed more while at the commune level locals use less as they mainly rely on mainstream known as Bassac River where their villages situated along it. But some communes are relied on the groundwater, mixed wells, ponds and other sources where their dwells are away from the mainstream. Only one village people along Swass Prembay dike use the water from canal.

AH-2.5.2.2 Pollution Control

(1) Air Quality

SPWRRSP Area is in a rural area with less development even road condition still in poor especially during wet season. No industry activities or establishment are set up within SPWRRSP commune. Traffic movement on the dike or at SPWRRSP Area is rarely seen. In this sense, none of measure of air quality at the site has been done yet or taken into consideration.

(2) Noise and Vibration

Neither air pollution nor vibration caused by economic and business activities and other roots so far has been seriously reported at all in SPWRRSP commune or site.

(3) Water Quality

Water quality within Kandal province has been recorded with some problem in several years ago. General safety of groundwater and the aesthetic quality of the water is poor, according to the results of total 17 parameters measured on-site and written by Environment International Volume 35, Issue 3, April 2009, Pages 455-460. Arsenic and other trace elements contamination in groundwater were analyzed. It's unclear whether the sample points were selected and taken from SPWRRSP area or commune.

(4) Soil Erosion

Erosion occurs not only in the upland areas but also in the lowland's. In practice, water run-off occurs on all land, and the top soil is lost when no protective and conservation measures are in place. Even that, neither degree of soil erosion data/information in SPWRRSP area nor commune or district or province is available until now. Most think erosion is a serious problem and occurs in the upland region only.

AH-2.5.2.3 Natural Resources

(1) Flora, Fauna and Biodiversity

The SPWRRSP Area has been development as paddy fields and other agricultural lands. There are flooded forests and grass, small scattered trees, shrubs and dwarf trees are growing in the proposed

reservoir area. Acacia planting have been along the dike. According to local fishermans, some fish species such as Striped snakehead, Lesser bighead carp, Ompok eugeneiatus, Moonlight gourami, Striped catfish, Dusky face carp, Giant snakehead, Climbing perch, Walking catfish, were caught in SPWRRSP Area.



Natural environment in SPWRRSP

(2) Protected Area

The SPWRRSP Area does not encompass any Protected Area.

(3) Land Use

Land use in Kaoh Thum district area is variety, village settlement, village with paddy field, irrigated cropland, secondary forest land, flooded forest, abandoned field covered by grass, flooded grass, shrub land, abandoned field covered by shrub, lake, river etc. Almost land use in SPWRRSP Site, Srass Prambai dominated with paddy field, shrub land and grassland during dry season while in rainy season it filled up with full of flood and very popular for fishing activities.



Houses along the existing dike

Majority of SPWRRSP Area has no tenure as locals come to clear land for agriculture cultivation. Three villages of Pouthi Ban commune dominate most part of the area while two other more villages of Kampong Kong involves with small plots of the area.

The information of land use in Kandal district is shown in the following table.

Table AH-2.5.2.3.1 Land Use of Kaoh Thum district

District	Total Land Area (Ha)	Forest Land Area (Ha)		Cultivation Land Area (Ha)	Construction Land Area (Ha)	Other Land Area (Ha)
		Total	Flooded			
Basedth	48,800	14,552	13,041	17,479	5,980	10,789

Source: Kaoh Thum District Data Books 2009

AH-2.5.2.4 Social Resources

(1) Population

There are 2 communes, Pouthi Ban and Kampong Kong, of 11 communes in Kaoh Thum district mainly affected by SPWRRSP. Actually only 5 villages of both commune are engaging within the area. The population of both communes is about 11,125 from Pouthi Ban and 11,450 from Kampong Kong (Kaoh Thum District Population Census, 2008).

Data of male-to female ratio in Pouthi Ban commune was 99.9 and in Kampong Kong was 92.6 in 2008. There have no indigenous people living in this district. In 2008 number of minority of Khmer Islamic was 4,214 and Vietnamese was 12,573 while Laos was 0 at that time.

Table AH-2.5.2.4.1 Existing Social Status of Kaoh Thum District Affected Commune by SPWRRSP

No.	Commune	Population	Male-to-Female Ratio
1	Chheu Khmau	10,976	94.9
2	Chrouy Ta Kaev	9,154	93.3
3	Kampong Kong	11,450	92.6

No.	Commune	Population	Male-to-Female Ratio
4	Kaoh Thum Ka	5,424	87.9
5	Kaoh Thum Kha	6,784	106.7
6	Leuk Daek	13,176	96.8
7	Pouthi Ban	11,125	99.9
8	Preaek chrey	13,065	103.7
9	Preaek Sdei	20,346	97.2
10	Preaek Thmei	18,972	97.0
11	Sampov Pun	20,994	98.5
Total		141,470	97.4

Source: Kaoh Thum District Population Census, 2008

(2) Economic status

Major economic activities of Kaoh Thum district area are dominated with agriculture sector, rice, fruit trees and some other crops. Also services such as agricultural machinery, vehicle and electronic tools and equipment repair outlets as well as food shop businesses, rice mills, small and large scale markets, hotels etc., are the area's economic supporting agent. Somehow this status of the commune where SPWRRSP Area is located in thus it mainly depends upon agriculture activities, fruit trees, mung bean, soy bean, peanut, corn, sweet potato and fisheries.

According to local village chiefs, about 80 families are living on the SPWRRSP Dike, while only 20 families of them are permanently doing fishing for whole year round. Among them some fishing for commercial purpose and some are for family's consumption.

(3) Heritage and religion site

There are several religious sites in Kaoh Thum district, Tuol Preah Raja pagoda, where a huge Buddhist statue was built and popular visited; Preah Ta Duoung pagoda, however for SPWRRSP Area neither heritage nor religious site is located.

(4) Water supply and sewage system

Sources of drinking water within the commune are pipe water, pumping water, well water, rainwater and natural water surface in particular from Bassac mainstream. Sewage pipe system mainly are installed and used in the provincial city or district town, whereas in rural commune is hardly to see the existing one.

Table AH-2.5.2.4.2 Existing social status of Kaoh Thum District affected commune by SPWRRSP

Commune Name	Ratio of People to wells (%)		Ratio of People to wells (%)						Families using safe and unsafe water sources in dry season (%)		Families filtering or regularly boiling water (%)	
	Population -total wells	Population - year round wells	Pipe water	Pump or mixed wells	Ring wells	Pond water	Rain water	River, lake, stream water	Clean/safe sources	Unsafe sources	Water filter	Regularly boiled water
Chheu Khmau	40.0	40.0	0.0	15.2	0.0	0.0	3.2	81.6	15.2	84.8	4.8	55.5
Chrouy Ta Kaev	50.0	81.0	3.4	4.1	0.0	0.0	6.1	86.4	7.5	92.5	5.9	43.6
Kampong Kong	17.0	17.0	8.9	47.1	3.3	1.5	0.7	38.5	27.8	72.2	14.6	36.6
Kaoh Thum Ka	42.0	42.0	0.0	36.9	0.0	0.0	0.3	62.8	36.9	63.1	0.6	49.1
Kaoh Thum Kha	35.0	35.0	41.6	8.4	0.0	0.0	0.0	50.0	50.0	50.0	3.9	57.0
Leuk Daek	194.0	199.0	0.0	1.2	0.0	1.6	0.8	96.4	1.2	98.8	1.2	80.9
Pouthi Ban	59.0	80.0	3.6	8.9	0.0	0.1	2.0	85.3	10.0	90.0	43.8	29.8
Preaek chrey	94.0	128.0	0.0	6.0	0.7	0.9	0.0	92.5	6.6	93.4	5.1	84.6
Preaek Sdei	77.0	78.0	39.8	4.5	0.0	0.1	0.7	54.9	44.7	55.3	4.1	49.6
Preaek Thmei	30.0	31.0	22.5	18.8	0.0	0.1	1.1	57.5	39.8	60.2	2.3	69.4
Sampov Pun	36.0	36.0	42.0	10.8	0.0	1.0	1.0	45.0	49.0	51.0	9.4	81.0

Source: Kaoh Thum District Data Books 2009

AH-2.5.3 Result of Scoping

AH-2.5.3.1 Environmental Scoping for SPWRRSP

Environmental scoping for SPWRRSP, which clarifies conceivable environmental and social impacts due to proposed projects activities, was conducted. The major environment and social impact assessment studies are presented in the following scoping matrix and checklist. It is noted that the evaluation in the matrix is made by considering a degree of conceivable impacts in the case any adequate mitigation measure is not conducted and also common to SPWRRSP. The evaluation was utilized for preparation of specifications of detailed study in the next chapter.

Table AH-2.5.3.1.1 Result of Environmental Scoping for SPWRRSP

No.	Likely Impact	Project-related Activities				
		Overall Rating	Planning / Design Phase	Construction Phase	Operation Phase	
Pollution Control	1	Air pollution	B-	-	B-	-
	2	Water pollution	B-	-	B-	-
	3	Soil contamination	-	-	-	-
	4	Waste	B-	-	B-	-
	5	Noise and vibration	B-	-	B-	-
	6	Ground subsidence	-	-	-	-
	7	Offensive odor	-	-	-	-
	8	Bottom sediment	-	-	-	-
	9	Disaster	-	-	-	-
Natural Environment	10	Topography and geographical features	-	-	-	-
	11	Soil erosion	-	-	-	-
	12	Groundwater	-	-	-	-
	13	Hydrological situation	C-	-	-	C-
	14	Coastal zone	-	-	-	-
	15	Flora, fauna and biodiversity	B-	-	B-	B-
	16	Meteorology	-	-	-	-
	17	Landscape	-	-	-	-
	18	Global warming	-	-	-	-
Social Environment	19	Involuntary resettlement	-	-	-	-
	20	Local economy such as employment and livelihood, etc.	A-/A+	A-	B+	A-/A+
	21	(Surrounding) Land use and utilization of local resources	A-/A+	A-	-	A-/A+
	22	Social institutions (including regional severance)	-	-	-	-
	23	Existing social infrastructures and services	B-/A+	-	B-	A+
	24	Socially vulnerable groups such as the poor, indigenous and ethnic people (including gender matter)	C-/B+	C-	-	C-/B+
	25	Misdistribution of benefit and damage	B-	-	-	B-
	26	Historical and cultural heritage (including religious matters)	-	-	-	-
	27	Water usage or water rights and rights of common	A+	-	-	A+
	28	Local conflict of interests	B-	B-	-	B-
	29	Sanitation	B-	-	B-	-
	30	Hazardous (risk) infectious diseases such as HIV/AIDS	B-	-	B-	-
	31	Accident	B-	-	B-	-

<Rating>

A-: Serious impact is expected, if any measure is not implemented to the impact.

B-: Some impact is expected, if any measure is not implemented to the impact.

C-: Extent of impact is unknown (Examination is needed. Impact may become clear as study progresses.)

-: No impact is expected.

A+: Remarkable effect is expected due to the project implementation itself and environmental improvement caused by SPWRRSP.

B+: Some effect is expected due to the project implementation itself and environmental improvement caused by SPWRRSP.

Overall rating: Highest rate will be the overall rating among the rating of relevant project-related activities for negative and positive ratings, respectively. (e.g. Even only one "A-" is included in an environmental item, overall rating of the environmental item becomes "A-".)

Source: JICA Survey Team

AH-2.5.3.2 Checklist of Environmental Scoping

Checklist of environmental scoping for SPWRRSP is prepared as described in Table AH-2.5.3.2.1.

Table AH-2.5.3.2.1 Checklist of Environmental Scoping for SPWRRSP

No	Likely Impacts	Rating Over all	Explanation on Potential Impacts (Project-related activity is shown in the parenthesis"<>".)
Pollution Control			
1	Air pollution	B-	<Operation of construction equipment and vehicles> <Rehabilitation of reservoir> Emission of exhaust gas from construction equipment and vehicles and dust pollution due to operation of the construction equipment and vehicles would cause air pollution in and around the construction sites during the construction. However, the impact is limited and temporality.
2	Water pollution	B-	<Operation of construction equipment and vehicles> <Rehabilitation of reservoir> Muddy water from construction site and soil spill from construction equipment and vehicles would cause water pollution in Tonle Bassac River/existing canals in and around the construction site. Water quality of reconstructed Srrass Prambai reservoirs threaten to worse by inflow of irrigation water and human sewage.
3	Soil contamination	-	SPWRRSP does not have any factor which may cause the soil contamination in terms of project location and construction method.
4	Waste	B-	<Operation of construction equipment and vehicles> <Rehabilitation of reservoir> Construction waste including residue soil and concrete waste would be produce by construction work.
5	Noise and vibration	B-	<Operation of construction equipment and vehicles> <Rehabilitation of reservoir> - Vibration caused by such construction works would cause damage to residential people, the existing house and other kinds of building structures.
6	Ground subsidence		SPWRRSP does not have any factor which may cause the ground subsidence in terms of project location and construction methods.
7	Offensive odor		SPWRRSP does not have any factor which may cause the offensive odor in terms of project location and construction method.
8	Bottom sediment		SPWRRSP does not have any factor which may cause the bottom sediment in terms of project location and construction method.
9	Disaster		SPWRRSP does not have any factor which may cause the disaster in terms of project location and construction method.
Natural Environment			
10	Topography and geographical features	-	SPWRRSP does not have any factor which may cause Topography and geographical features.
11	Soil erosion	-	SPWRRSP does not have any factor which may cause soil erosion.
12	Groundwater	-	SPWRRSP does not have any factor which may cause the groundwater in terms of project location and construction methods because SPWRRSP does not utilize groundwater.
13	Hydrological situation	C-	<Rehabilitation of reservoir> SPWRRSP would affect hydrological situation in project area, detailed hydrological analysis of the command area undertook in this study.
14	Coastal zone	-	SPWRRSP does not have any factor which may cause the c in terms of project location.
15	Flora, fauna and biodiversity	B-	<Rehabilitation of reservoir> Proposed reservoir area has been unique environment as floodplain area. The area would return to reservoir by rehabilitation work of SPWRRSP
16	Meteorology	-	SPWRRSP does not have any factor which may affect and/or be related to the meteorology.
17	Landscape	-	SPWRRSP does not have any factor which may cause the groundwater in terms of project location and construction method.
18	Global warming	-	SPWRRSP does not have any factor which may cause the global in terms of project location and construction method because SPWRRSP is only rehabilitation and improvement project and not including new development.
Social Environment			
19	Involuntary Resettlement	-	It is expected that no involuntary resettlement will be caused by SPWRRSP.
20	Local economy such as employment and livelihood, etc.	A-/A+	<Rehabilitation of reservoir> Proposed reservoir area is official land, however many local people have been use the area for a number of things such as paddy fields and agricultural lands during dry season, fisheries during wet season. After SPWRRSP, these usages would be considerably restricted in comparison with before.
			<Rehabilitation of reservoir> During construction phase, SPWRRSP will make more employment and business opportunities for local residents. <Utilization of irrigation water from reservoir> After operation of the SPWRRSP, regional farmers around the SPWRRSP would have positive impact due to improved irrigation water provision during dry season.

No	Likely Impacts	Rating Over all	Explanation on Potential Impacts (Project-related activity is shown in the parenthesis "<>".)
21	Land use and utilization of local resources	A-/A+	<Reconstruction of reservoir> Temporary and permanent land acquisition will be requested by SPWRRSP for diversion channels and new drainages. <Utilization of irrigation water from reservoir> After operation of the SPWRRSP, regional farmers around the SPWRRSP would have positive impact due to improvement of irrigation water availability.
22	Social institutions	-	SPWRRSP does not have any factor which may cause social institution in terms of project location and construction method.
23	Existing social infrastructures and services	B-/A+	<Operation of construction equipment and vehicles> Construction work and traffic restriction would disturb access to the existing social infrastructures and services around the SPWRRSP Areas. < Rehabilitation of reservoir > After SPWRRSP, local people can use whole of the roads of the rehabilitation dike area.
24	Socially vulnerable groups such as the poor, indigenous and ethnic people	C-/B+	<Rehabilitation of reservoir> After SPWRRSP, usages of reservoir area would be considerably restricted in comparison with before. If there are any socially vulnerable groups such as poor and ethnic minority has no other paddy fields, they would be effected significant impact by SPWRRSP. <Rehabilitation of reservoir> <Utilization of irrigation water from reservoir> After operation of the SPWRRSP, local people including vulnerable groups around SPWRRSP would have positive impact due to improved irrigation water provision during dry season.
25	Misdistribution of benefit and damage	B-	SPWRRSP will supply benefit to local farmers who have paddy fields surrounding proposed reservoir. In the other hand, people who have been cultivated in reservoir area would be affected negative impact since they lose their land even illegal occupancy.
26	Historical and cultural heritage (including religious matters)	-	SPWRRSP does not have any factor which may affect and/or be related to the meteorology.
27	Water usage or water rights and rights of common	A+	<Utilization of irrigation water from reservoir> After operation of the SPWRRSP, regional farmers around the SPWRRSP would have positive impact due to improved irrigation water provision during dry season.
28	Local conflict of interests	B-	SPWRRSP will supply benefit to local farmers who have paddy fields surrounding proposed reservoir. In the other hand, people who have been cultivated in reservoir area would be affected negative impact since they lose their land even illegal occupancy.
29	Sanitation	B-	<Operation of construction equipment and vehicles> <Rehabilitation of reservoir> Sanitary issues would occur in labor camp and neighboring area in the case sanitary facility is not adequately installed such as toilet and septic tank.
30	Hazardous (risk) infectious diseases such as HIV/AIDS	B-	<Operation of construction equipment and vehicles> <Rehabilitation of reservoir> Risk of infectious diseases by labors would be expected during construction due to the inflow of the construction workers from outside.
31	Accident	B-	<Operation of construction equipment and vehicles> <Rehabilitation of reservoir> Some accidents are inevitable during construction.

Note: * Regarding the impacts on "Gender" and "Children's Right", might be related to all criteria of Social Environment.
<Rating>

A-: Serious impact is expected, if any measure is not implemented to the impact.

B-: Some impact is expected, if any measure is not implemented to the impact.

C-: Extent of impact is unknown (Examination is needed. Impact may become clear as study progresses.)

-: No impact is expected. Therefore, EIA is not required.

A+: Remarkable effect is expected due to the project implementation itself and environmental improvement caused by SPWRRSP.

B+: Some effect is expected due to the project implementation itself and environmental improvement caused by SPWRRSP

Overall rating: Highest rate will be the overall rating among the rating of relevant project-related activities for negative and positive ratings, respectively. (e.g. Even only one "A-" is included in an environmental item, overall rating of the environmental item becomes "A-".)

Source: JICA Survey Team

AH-2.5.4 Anticipated Negative Impact of Environment

(1) Pollution Control

(a) Air pollution, Noise and Vibration (Construction Phase)

1) Activity

- Operation of construction equipment and vehicles
- Rehabilitation of reservoir

2) Affected Area

- In and around construction area

3) Expected Potential Impact

During the construction phase, transportation of heavy equipment would cause air pollution, noise and vibration. Transportation of construction vehicles and transportation/operation of heavy equipment, such as dump truck, excavator, bulldozer, roller compactor and watering lorry, would exhaust emission gasses including NO₂ and SPM. And also, such heavy equipment would cause noise and vibration.

4) Related Regulation

- Sub-decree on Air and Noise Pollution Control

5) Conclusion of Examination

Most of the construction works of MC35RSP are small scale, numbers of heavy equipment and construction vehicles for the works will be limited. Therefore, the impact to air quality, noise and vibration by construction works will be insignificant if proper mitigation measures are carried out.

(b) Water Pollution by Construction Works (Construction Phase)

1) Activity

- Operation of construction equipment and vehicles
- Rehabilitation of reservoir

2) Affected Area

- Downstream of construction area

3) Expected Potential Impact

Muddy water from construction site and soil spilt from construction machinery would cause water pollution of existing water resources. In addition, alkalified water caused by the concrete works will be another concern during construction phase.

4) Related Regulation

- Sub-decree on Water Pollution Control

5) Conclusion of Examination

Large scale construction including earthwork will not implement during the rainy season to avoid water pollution. In addition, since the amount of concrete to be used is not large, alkalified water from the concrete works in the canals might be diluted by water resources. However, it is necessary to establish adequate treatment system if large quantity of alkalified water is observed during construction time.

(c) Waste Management by Construction Works (Construction Phase)

1) Activity

- Rehabilitation of reservoir

2) Affected Area

- In and around construction area

3) Expected Potential Impact

Concrete and other construction waste would be produced by the construction works. In addition, rehabilitation works of canal/drainage will create soil disposal.

4) Related Regulation

- Sub-decree on Solid Waste Management (1999)

5) Conclusion of Examination

As most of the construction works are small scale and therefore construction waste is very limited. The impact of waste by construction works will not be serious if appropriate management and mitigation measures are provided.

(d) Water Pollution (Operation Phase)

1) Activity

- Rehabilitation of reservoir

2) Affected Area

- Reconstructed Sras Prambai Reservoir area

3) Expected Potential Impact

After SPWRRSP, flood irrigation water of Sras Prambai reservoir would be maintained during the dry season longer than existing status. Over 100 households live along the dike in now, they dump their waste to the reservoir area and their sewage water directly inflow to the reservoir. In addition, agricultural chemicals usage might increase after SPWRRSP.

4) Related Regulation

- Sub-decree on Water Pollution Control

5) Conclusion of examination

The reservoir will be filled with flood water from Tonle Basac River longer than before, and water quality of the reservoir threatens to worse by various causes. The reservoir would become eutrophicate and declining water quality without proper water management.

(2) Natural Environment

(a) Hydrological Situation (Operation phase)

1) Activity

- Rehabilitation of reservoir

2) Affected area

- Area of the SPWRRSP

3) Expected Potential Impact

Hydrological situation of the command area will be affected SPWRRSP

4) Related regulation

- None

5) Conclusion of examination

After the rehabilitation work, hydrological situation will change SPWRRSP Area. However, SPWRRSP is rehabilitation work, and hydrological situation just return previous status which past irrigation system functioned. And also, their function as flood prone would have been maintained. Therefore, the impact is limited if proper mitigation measures are carried out. Detailed hydrological analysis of SPWRRSP shown Main report Chapter II-2.7.3

(b) Flora, Fauna and Biodiversity (Construction Phase, Operation Phase)

1) Activity

- Rehabilitation of reservoir

2) Affected Area

- Area in the Sras Prambai Reservoir

3) Expected Potential Impact

Proposed reservoir area has been unique environment as floodplain area of Tonle Bassac River. There are no secondary data of biodiversity, but many species might inhabit the area depend on the unique environment. According to fisherman, many types of fresh water fish are caught in the area both of seasons. The area will be submerged until the end of dry season after SPWRRSP. Submerged period will be longer than before, flora and fauna and biodiversity of proposed reservoir area might be affected by SPWRRSP.



Floodplain area inside proposed reservoir

4) Related Regulation

- None

5) Conclusion of Examination

Surrounding area of the proposed reservoir area is similar natural environment as floodplain area, the reservoir area form only a small part of the floodplain area due to Bassac River. The wildlife habitats and existing ecosystem would be effected no large impact by SPWRRSP.

(3) Social Environment

(a) Local Economy such as Employment and Livelihood, etc. (Planning/Design phase, Operation phase)

1) Activity

- Rehabilitation of reservoir

2) Affected Area

- Area in the Sras Prambai Reservoir

3) Expected Potential Impact

Local people living in and around the proposed reservoir area have relied on the area for their livelihoods in both dry and wet seasons. They have used the area for producing rice and other agricultural crops in the dry season, while it has been used for fishing throughout a year. SPWRSP which aims to restore the functions of the reservoir by rehabilitation will make it impossible for them to use the area for farming during the dry season. It is therefore expected that the implementation of SPWRSP would change the land use and affect the income/livelihood of local people in and around the reservoir.

4) Related regulation

- Constitution (1993)
- Land law (2001)

- Expropriation Law (2010)
- Sub-decree on Social Land Concession (2003)

5) Conclusion of examination

Many local people have been using the area in the reservoir for producing paddy and other agricultural crops during the dry season, although the area is the government land.. It will be difficult for them to use the area when SPWRRSP rehabilitates the reservoir. It is however expected that the impact might be less significant as they could expand the fishing activities in the dry season and the expected income from fishing would be larger than that from paddy production. Furthermore, most of them have another land to cultivate outside the reservoir area according to village chiefs.



Fisheries in SPWRRSP

MOWRAM should conduct a detailed socio-economic survey of local people who have used/are using the reservoir area for farming and prepare a compensation policy to reconstruct their livelihoods and avoid any social problems in the future. In the other hand, fisherman might remain nearly unaffected by SPWRRSP because they become available to use the reservoir throughout the year after SPWRRSP.

- (b) Land Use and Utilization of Local Resources / Socially Vulnerable Groups such as the Poor, Indigenous and Ethnic People (including Gender matter) / Local Conflict of interests (Planning/Design Phase, Operation phase)

1) Activity

- Rehabilitation of reservoir

2) Affected Area

- Area in the Srass Prambai Reservoir

3) Expected Potential Impact

According to villagers, there are some Vietnamese who have lived along the dike since they migrated there few years ago and used the reservoir area for farming. They seem not to have any other lands to cultivate outside the reservoir, although they have also engaged in fishing mainly during the wet season. It's highly likely that their livelihoods would be significantly affected by the Sub-project. There is a need to conduct a detailed socio economic survey as the existing socio-economic status of SPWRRSP Area does not clearly describe their socio economic status.



Paddy field inside proposed reservoir area

4) Related Regulation

- Constitution (1993)
- Land law (2001)

- Expropriation Law (2010)
- Sub-decree on Social Land Concession (2003)

5) Conclusion of Examination

MOWRAM should conduct a socio-economic survey and inventory survey to grasp status of the vulnerable group, such as the number of families, their income level, major livelihoods, and other important matters. MOWRAM should prepare a compensation policy based on the results of the said survey and also comments/suggestions given in the public consultation meetings with local people.

(c) Existing Social Infrastructures and Services (Construction phase)

1) Activity

- Operation of construction equipment and vehicles

2) Affected Area

- Local road on the dike

3) Expected Potential Impact

During construction time, contractor will be controlling entry to construction area of the dike on a temporary basis. The situation would be effected local social infrastructure and services.

4) Related Regulation

- None

5) Conclusion of Examination

Most of the construction works are small scale, therefore construction periods are limited and temporarily. The impact by the construction works will not be significant if proper management and mitigation measures are carried out.

(d) Misdistribution of Benefit and Damage/ Local Conflict of Interests (Operation phase)

1) Activity

- Rehabilitation of reservoir

2) Affected Area

- Proposed Sgrass Prambai Reservoir area

3) Expected Potential Impact

SRWRRSP will supply benefit to local farmers who have paddy fields surrounding proposed reservoir. In the other hand, people who have been cultivated in reservoir area would lose their existing paddy land even illegal occupancy.

4) Related Regulation

- None

5) Conclusion of Examination

MOWRAM should hold stakeholder meeting to affected people to achieve their understanding of SRWRRSP benefits of commune level. And also, adequate compensation policy should be prepared to reduce their disbenefits at the earliest possible time during project process.

(e) Sanitation/Hazardous (risk) Infectious Diseases such as HIV/AIDS /Accident (Construction phase)

- 1) Activity
 - Operation of construction equipment and vehicles
 - Rehabilitation of reservoir

- 2) Affected Area
 - Proposed Sras Prambai Reservoir area

- 3) Expected Potential Impact

Due to inflow of construction workers from outside of the community during construction phase, the anticipated impacts are (i) deterioration of sanitation condition, (ii) deterioration of public security, (iii) increase of risk of diseases including AIDS/HIV, (iv) accident, (v) local conflict among people and workers. Although construction scale is not large and duration is at most 36 months, these issues need to be taken into consideration.

- 4) Related Regulation
 - Labor Law (1997)

- 5) Conclusion of Examination

Since the people in and around the SPWRRSP Area is not familiar to the construction workers, a great attention should be paid to management of construction workers and construction sites. However, taking into consideration work scale, the number of construction workers will not be large. Therefore, serious negative impacts are not envisaged if proper mitigation measures are provided.

AH-2.5.5 Mitigation Measures

In accordance with the above examination, the mitigation measures against negative impacts anticipated are proposed as follows:

- (1) Pollution Control
 - (a) Air pollution and Noise and Vibration (Construction Phase)
 - To educate construction workers on minimizing idling of construction machinery
 - To restricted construction time. e.g. during daytime only
 - To hold stakeholder meetings to build consensus about the construction time
 - To stipulate environmental consideration measures in the technical specification of the construction works
 - (b) Water Pollution by Construction Works (Construction Phase)
 - To dilute or neutralize alkalified water from concrete mixer trucks by pooling in regulating pond before discharging
 - To pool discharging water from the concrete plant for dilution or neutralization
 - To install adequate treatment system for muddy and alkalified water in construction site such as installation of water tank to collect water from concrete works for neutralization
 - To stipulate environmental consideration measures in the technical specification of the construction works
 - (c) Waste Management by Construction Works (Construction Phase)
 - To comply with relevant laws pertaining to the management and disposal of solid waste, hazardous waste and re-waste

- To arrange suitable sites for disposal of solid waste prior to the construction works
 - To avoid dumping in the area of private property without written consent of the owner
 - To carry out recycle use of disposed soil as much as possible
- (d) Water Pollution (Operation Phase)
- To conduct support programs regarding appropriate agricultural management
 - To introduce composting activity to the farmers
 - To control the amount of fertilizer and pesticide through the training farmers
 - To introduce check system among the FWUC members regarding agricultural management
 - To monitor water quality and agricultural activities regularly
 - To control the amount of fertilizer and pesticide through the training farmers
 - To conduct environmental education about waste management program to local people
- (2) Natural Environment
- (a) Soil Erosion
- To implement maintenance of canals by adequate methods and appropriate timing
 - To design main canal and related structures to consider alleviation of soil erosion
- (3) Social Environment
- (a) Local Economy Such as Employment and Livelihood, etc. (Planning/ Design Phase, Operation phase)
- To conduct a detailed socio-economic survey of affected families/people in the beginning of the Sub-project preparatory stage to estimate the extent of the impact on their household economy;.
 - To conduct stakeholder meetings with affected families/people and village chiefs to explain and discuss: (i) project purpose, (ii) compensation measures, and (iii) support programs, so as to build consensus on the Sub-Project and compensation for their losses; and
 - To fairly compensate all affected families / people including those without a legal title to land.
- (b) Land Use and Utilization of Local Resources / Socially Vulnerable Groups such as the Poor, Indigenous and Ethnic People (including Gender matter) , Local Conflict of Interests (Planning/Design Phase, Operation Phase)
- To conduct a detailed socio-economic survey of affected families/persons to clarify their socio-economic conditions and estimate the potential impact before the D/D Phase;
 - To fairly compensate all affected families/persons, including those without a title to land, for all their losses at replacement rates, if any;
 - To establish a joint committee as a decision making body to carry out the land acquisition process
 - To hold stakeholder meetings with affected families/people
 - To prepare a realistic schedule of land acquisition and inform affected families/people of the schedule well in advance; and
 - To monitor the living conditions of the affected families/people during the Sub-project as well as in the post-project period.
 - To properly restore the affected area after construction works

(c) Existing Social Infrastructures and Services

- To hold a series of public consultation meetings for surrounding people in order to explain, discuss and find the way of passage restriction
- To educate construction workers for adequate traffic rule of construction vehicles
- To post a bill to inform impassable duration to commune council, village chief by means of, such like, social facilities including schools, pagodas and hospitals, after the work schedule is fixed with people's consensus

(d) Misdistribution of Benefit and Damage (Operation Phase)

- To conduct detailed socio-economic survey of affected people during early stage of project preparation to identify all losses from land acquisition
- To conduct stakeholder meetings with local people including affected people on project contents
- To compensate affected persons, including those without title to land.

(e) Sanitation/ Hazardous (risk) Infectious Diseases such as HIV/AIDS /Accident (Construction Phase)

- To improve sanitary condition of workers by proper arrangement of accommodation, installation of toilets and proper water supply
- To implement education programs for workers about sanitation, security and rules/discipline of daily activities
- To implement safety education and training for construction workers
- To implement periodical patrol of workers in order to avoid both occurrence of local conflict and epidemics of diseases
- To hold a series of stakeholder meetings for surrounding people in order to explain construction works and its schedule.
- To stipulate environmental consideration measures in the technical specifications of the construction works

AH-2.5.6 Conclusion and Recommendation

In this Sub-Project, significant environmental issue is impact to land use by re-construction of Sras Prambai Reservoir. Existing status of reservoir area has been used as paddy field by local people in illegally. Official land acquisition process is no necessary to SPWRRSP since whole of the reservoir area belong to government. However, land acquisition is very sensitive issue to the SPWRRSP Progress. MOWRAM should conduct detailed socio-economic survey for local people who do farming inside the reservoir and prepare compensation policy to avoid having critical impact to local farmers, especially voluntary groups.

AH-2.6 Daun Pue Irrigation System Rehabilitation Sub-project

AH-2.6.1 Description of Sub-project

(1) Principal Features

Daun Pue Irrigation System was constructed in Pol Pot regime (1975-1977) targeting water supply from the Chieb Stream to its command area of about 1,400 ha. The system consists of temporary headworks constructed manually with wooden material and sand bags, and main and secondary canals. The irrigation system has been seriously deteriorated, and only some upstream parts of the area is

currently irrigated supplementary in the rainy season. The local authority requested to MOWRAM for urgent rehabilitation, and Kampong Chhnang PDOWRAM has given a highest priority to this area. Objective of DPISRSP is to ensure water supply for the command area in main cropping season (rainy season) by rehabilitation of irrigation system including new construction of headworks. The principal features of the rehabilitation works under DPISRSP are summarized in Table AH-2.6.1.1 below.

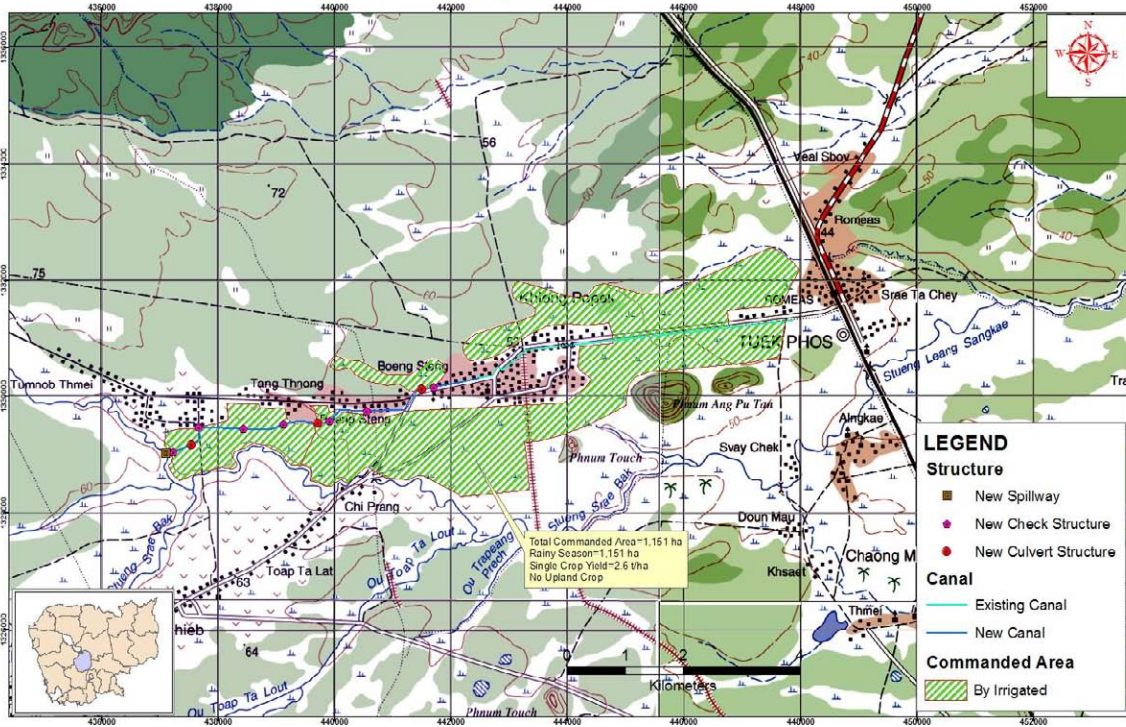
Table AH-2.6.1.1 Principal Features of DPISRSP

Descriptions	Quantities
(a) Project Area	(a) Sub-project Area 1,150 ha
(b) Hardware Components	
- Construction of headworks	(a) River training of up and down stream of proposed headworks (b) Construction of headworks with provision of flood gates (2 m x 10 m x 4 sets) (c) Construction of intake structure
- Rehabilitation of Daun Pue Main Canal	(a) Improvement of canal (6.2 km from BP to P6+200, raising of embankment and/or enlargement of canal section), (c) Changing route of main canal (4.9 km from P6+200 to EP, Upgrading of secondary to main canal) (d) Construction of canal inspection road (e) Replacement or new construction of canal related structures; - Check structure 14 nos. - Turnout 34 nos. - Culverts 13 nos.
- Rehabilitation of secondary canals	(a) Improvement of canal (3.4 km in total) (b) Construction of new secondary canal from main canal to existing secondary canal (1.2 km) (c) Construction of canal inspection road (d) Replacement or new construction of canal related structures; - Check structure 9 nos. - Turnout 15 nos. - Culverts 8 nos.
- Rehabilitation of drains	(a) Improvement and reshaping of drains
- Construction of project office	(a) Office building (300 m ²) (b) Parking shed, gate and fencing (c) Well drilling and electric works, etc.
- Development of tertiary system	(a) Rehabilitation and improvement tertiary irrigation canals, and drains

Source: JICA Survey Team

(2) Location

The Sub-project Area is located in the upstream of the Chieb River basin, about 40 km upstream from its confluence with the Tonle Sap River. The irrigation command area lies in the left bank of the Chieb River and along the provincial road, having long and narrow shape extending from west to east with gentle slope as shown in the location map in Figure AH-2.6.1.1. Administratively, the area lies in Chieb, Khlong Porporok and Aphivath Communes in Teuk Phos District.



Source: JICA Survey Team

Figure AH-2.6.1.1 Location Map of DPISRSP

(3) Time Schedule

Implementation time schedule of DPISRSP are shown as follows:

Work Item	Year									
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
1. Loan Agreement (L/A)										
2. Procurement of Consultant										
3. Clearance of Mines and UXOs										
4. Land Acquisition										
5. Consulting Services										
5-1 Detailed design for water resources facilities and canal system										
5-2 Assistance for procurement of ICB Contractor										
5-3 Construction supervision										
6. Rehabilitation Work										
6-1 Preparatory works										
6-2 Temporary works										
6-3 Rehabilitation and new construction works										
(1) Daun Pue Headworks Construction Works										
(a) Design, approval, fabrication and transportation of gates										
(b) New construction of hydro-mechanical works and intake structure										
(2) Partial rehabilitation of main canal system (11.7 km)										
(3) Partial rehabilitation and construction of secondary canal system (5.2 km)										
(4) New construction of tertiary canal system (1,150 ha)										
(5) New construction of Sub-project office										

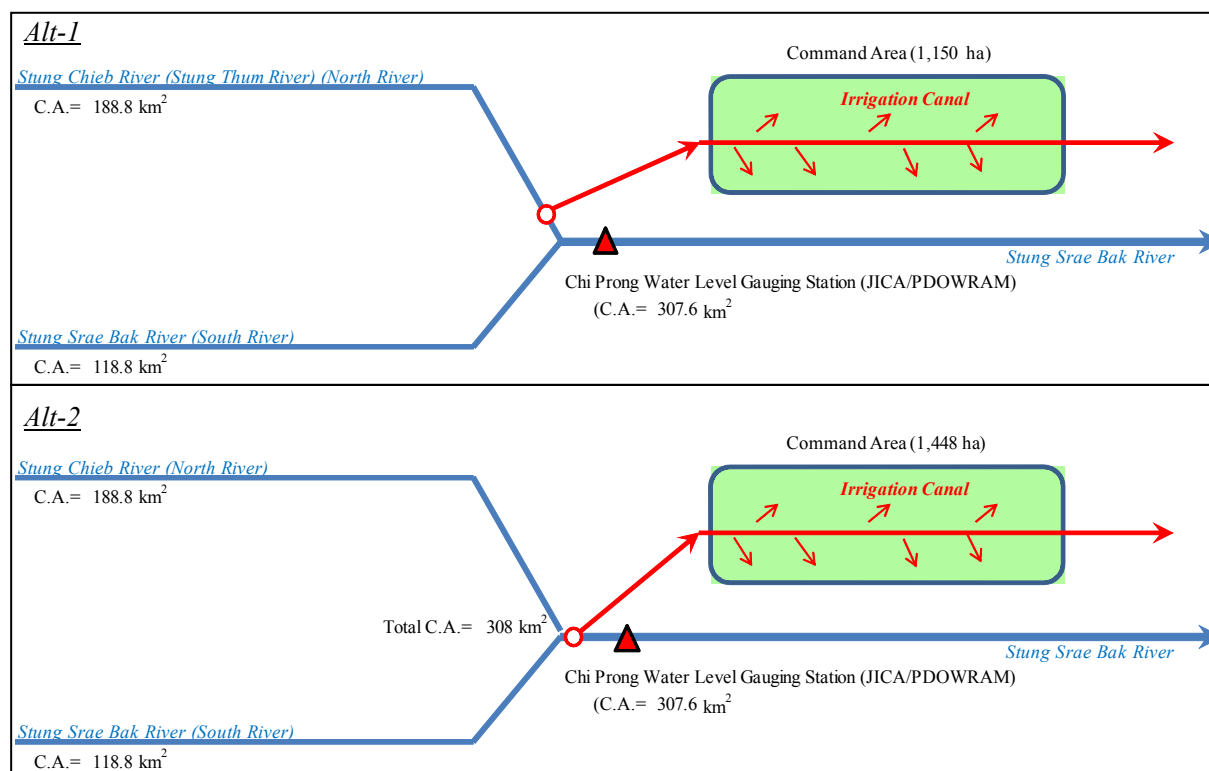
Source: JICA Survey Team

Figure AH-2.6.1.2 Implementation Time Schedule for Main System of DPISRSP

(4) Examination of Alternatives

In view of water balance study, two alternatives of intake site were analyzed. Two case of intake sites, which are (Alt-1) only the Stung Chieb River before confluence and (Alt-2) the Stung Chieb River + the Stung Srea Bak River after confluence (Figure AH-2.6.1.3), were simulated for water balance study for DPISRSP Area. Results of water balance simulations of DPISRSP are shown in Figure AB-2.6.2.5.2 and Figure AB-2.6.2.5.2 in ANNEX B

DPISRSP selected Alt-1 by various reasons such as environmental consideration of downstream area, construction cost, benefits, and other reasons.



Source: JICA Survey Team

Figure AH-2.6.1.3 Implementation Time Schedule for Main System of DPISIRSP

Table AH-2.6.1.1 Results of Water Balance Study of DPISIRSP (80% Dependability)

Study Case	Total Area	Early Rice (Early Rainy)	Mid Rice	Crop Intensity	Dependability	Deficit Year (times/20years)
Alt-1: Only Stung Chieb River	1,200 ha	0 ha	1,180 ha	100%	80%	4
Alt-2: Stung Chieb River + Stung Srae Bak River	1,448 ha	174 ha	1,448 ha	112%	80%	4

Source: JICA Survey Team

AH-2.6.2 Description of Environment

AH-2.6.2.1 Physical Resources

Kampong Chhnang Province borders Kampong Thom and the Tonle Sap to the North, Kampong Cham and Kandal to the East, Kampong Speu to the South and Pursat to the West. The area of the province is 5,521 square kilometers. There are 8 districts, 1 town, 65 communes and 4 Sangkat in the province.

There are no more forests remaining except in the Southwest of the country where the biggest coherent forest area of Southeast Asia begins, the massive and unexplored Cardamom Mountains. The provincial borderline in the Southwest resides on the hillside of the highest Mountain of Cambodia its name is Phnom Aoral with an altitude of 1,813 m.

DPISIRSP site is located in Teuk Phos district. Affected commune by DPISIRSP is Khlong Popok, besides another one namely Akphivadh, in which consisted of seven villages. Five villages among them are located in DPISIRSP command area, known as Boeng Steng, Kraoy Wat, Khlong Popok, Trapaeng Srae and Trapaeng Krabao (2 villages are outside the Sub-project Area).

(1) Climate

Climate of RGC is dominated by the tropical rainy season and dry season. The southwest monsoon brings the rainy season from mid-May to mid-September or early October, while the northeast monsoon's flow of drier and cooler air lasts from early November to March. Temperatures are fairly

uniform at around 27 degrees Celsius. Average annual rainfall is between 1,300 and 1,900 millimeters, with the heaviest amount in the southeast.

(2) Topography and Soil

The topography of Kampong Chunang is variable from east to west, from the Tonle Sap floodplains through lowland paddy fields to lowland/ upland mosaic and upland forested areas in the west. Most parts of this province are fertile alluvial soil reservoirs with plenty of fishes and endless rice plantations.

(3) Surface Water

There are many surface water sources within Kampong Chhnang Province. Tonle Sap lake is the major reservoir source which is mainly for provinces surrounded it, Rolous Reservoir, Steung Baribo, Steung Srae Bak, Steung Leang Sangkae, O Veng Stream, O Trapeang Prech, O Toap Ta Lout, etc. while Steung Daun Peu is the indispensable source for the Sub-project rehabilitation and improvement in the area.

(4) Groundwater

According to Kampong Chhnang Provincial Data Book 2009, the total number of pumped or mixed wells for the whole province was amount for 19,019 in 2008. Percentage of families using pumped or mixed wells in the Sub-project district, Teuk Phos was 79.3% while 17.5% used ring wells in 2008.

AH-2.6.2.2 Pollution Control

(1) Air Quality

The project area as it's located in rural, about 30 km away from Teuk Phos central district of Kampong Chhnang and absolutely less developed while seen only the rural road were changed, thus air quality that's mainly measured for some factors like SO_x, NO_x, CO, Leads, TSP and other substances has never been reported neither by government responsible department nor NGOs and other involved agencies.



Paddy field in DPISRSP command area

(2) Noise and Vibration

Neither secondary data nor information related to noise and vibration is available in the Sub-project Area and even at the provincial level.

(3) Water Quality

Water quality report at the Sub-project Site has not been found from the desk search while it's available at the provincial level particularly within the Lake Tonle Sap where hundreds of floating villages set up on there. Solid and liquid wastes were discharged from houses into the water without treatment and proper management.

(4) Soil Erosion

Soil erosion within the commune project area was reported none while question was enquired to the commune chief. Also, there has not been recorded any erosion neither happening nor found at all from the secondary data search.

AH-2.6.2.3 Natural Resources

(1) Flora, Fauna and Biodiversity

The district and communes which located in and around the Sub-project Area mainly covers with paddy fields and palm trees as well as some other domestic fruit trees plantation in family scale

growing purposes like cassava, mango, and banana trees. Some typical trees with local names are also found in this location. The majority of villagers involve in rice farming and climbing the trees for juice, fruit and leaves during dry season period for construction, therefore wildlife within the area is hardly to be seen.

(2) Protected Area

The DPISRSP Area does not encompass any protected area.

(3) Land Use

Data and information of land use in the district affected project is shown in the following table. With more detailed of scale at commune level where mainly falls within five villages of Khlong Popok commune and a small portion of Akphivoadth commune cannot be found from any literature review.

Table AH-2.6.2.3.1 Land Use of District affected DPISRSP

District	Total Land Area (Ha)	Forest Land Area (Ha)		Cultivation Land Area (Ha)	Construction Land Area (Ha)	Other Land Area (Ha)
		Total	Flooded			
Teuk Phos	176,386	127,560	0	40,070	3,311	5,445

Source: Teuk Phos District Data Book 2009

AH-2.6.2.4 Social Resources

(1) Population

Amongst eight communes of Teuk Phos district, only five villages of Khlong Popok commune and a small part from Akphivoadth commune are going to be impacted by the Sub-project Study. The Khlong Popok commune consists of seven villages namely Beung Steng, Kraoy Wat, Khlong Popok, Trapaeng Srae, Trapaeng Krabao, Takab and Youk. The last two villages, Takab and Youk are situated out of the Sub-project Area.

Table AH-2.6.2.4.1 Existing Social Status of affected District by DPISRSP

No.	Commune	Population	0-5 Years	Age 6-17	Age 18-60	Age 61+
Teuk phos District		Male	3,969	8,852	13,522	1,696
		Female	4,022	9,229	15,135	2,106
By Age Male-to-Female Ratio			98.86	95.91	89.34	80.53
District Male-to-Female ratio			91.95			
1	Aphivadth	9,212	n/a	n/a	n/a	n/a
2	Chieb	6,676	n/a	n/a	n/a	n/a
3	Chaong Maong	6,283	n/a	n/a	n/a	n/a
4	Kbal Tuek	4,843	n/a	n/a	n/a	n/a
5	Khlong Popok	5,616	n/a	n/a	n/a	n/a
6	Krang Skear	12,542	n/a	n/a	n/a	n/a
7	Tang Krasang	9,149	n/a	n/a	n/a	n/a
8	Tuol Khpos	4,210	n/a	n/a	n/a	n/a
TOTAL		58,531				

Source: Teuk Phos District Data Book 2009

(2) Economic Status

The rural households in the Sub-project Area relied mainly on agriculture, rice cultivation and its related sub-sectors such as palm sugar production, fruit trees, mango, banana, cassava, water melon etc, but for family growing scale only.

(3) Heritage and Religion Site

Only one religious site, Khlong Popok Pagoda where local people generally gathering in while national ceremony or feast celebration is met, was told by the commune chief that is located along Chiproang bituminous road in the area. There's no heritage site within the commune.

(4) Water Supply and Sewage System

Sources of drinking water are primarily rainwater and natural water surface consumption during the wet season, while hand pumping water from drilled wells and ring wells use in dry season, in the affected commune.

Table AH-2.6.2.4.2 Existing Water Supply Status of affected District

Commune Name	Ratio of People to wells (%)		Ratio of People to wells (%)						Families using safe and unsafe water sources in dry season (%)		Families filtering or regularly boiling water (%)	
	Total wells	Year round wells	Pipe water	Pump or mixed wells	Ring wells	Pond water	Rain water	River, lake, stream water	Clean/safe sources	Unsafe sources	Water filter	Regularly boiled water
Akphivoadth	8.0	9.0	0.0	87.7	12.3	0.0	0.0	0.0	94.7	5.3	14.6	48.1
Chieb	14.0	15.0	0.0	73.0	27.0	0.0	0.0	0.0	84.7	15.3	16.1	52.4
Chaong Maong	10.0	13.0	1.7	70.1	22.5	0.0	0.0	5.6	100.0	0.0	8.4	28.1
Kbal Tuek	27.0	34.0	0.0	93.4	6.6	0.0	0.0	0.0	91.1	8.9	10.2	24.2
Khlong Popok	16.0	17.0	0.0	86.6	8.7	0.4	0.0	4.3	87.0	13.0	6.4	17.8
Krang Skear	6.0	13.0	0.5	59.7	34.4	0.2	0.0	5.2	49.0	51.0	9.3	54.2
Tang Krasang	13.0	16.0	0.0	92.4	6.3	0.0	0.0	1.3	89.0	11.0	5.4	71.6
Tuol Khpos	20.0	31.0	7.4	88.6	3.9	0.0	0.0	0.0	98.1	1.9	4.6	41.0

Source: Kaoh Thum District Data Books 2009

AH-2.6.3 Result of Scoping

AH-2.6.3.1 Environmental Scoping for DPISRSP

Environmental scoping for DPISRSP, which clarifies conceivable environmental and social impacts due to proposed projects activities, was conducted. The major environment and social impact assessment studies are presented in the following scoping matrix and checklist. It is noted that the evaluation in the matrix is made by considering a degree of conceivable impacts in the case any adequate mitigation measure is not conducted and also common to DPISRSP. The evaluation was utilized for preparation of specifications of detailed study in the next chapter.

Table AH-2.6.3.1.1 Result of Environmental Scoping for DPISRSP

No.	Likely Impact	Project-related Activities			
		Overall Rating	Planning / Design Phase	Construction Phase	Operation Phase
Pollution Control	1 Air pollution	B-	-	B-	-
	2 Water pollution	B-	-	B-	-
	3 Soil contamination	-	-	-	-
	4 Waste	B-	-	B-	-
	5 Noise and vibration	B-	-	B-	-
	6 Ground subsidence	-	-	-	-
	7 Offensive odor	-	-	-	-
	8 Bottom sediment	-	-	-	-
	9 Disaster	-	-	-	-
Natural Environment	10 Topography and geographical features	-	-	-	-
	11 Soil erosion	B-	-	B-	B-
	12 Groundwater	-	-	-	-
	13 Hydrological situation	B-	-	-	B-
	14 Coastal zone	-	-	-	-
	15 Flora, fauna and biodiversity	B-	-	B-	B-
	16 Meteorology	-	-	-	-
	17 Landscape	-	-	-	-
	18 Global warming	-	-	-	-
Social Environment	19 Involuntary resettlement	-	-	-	-
	20 Local economy such as employment and livelihood, etc.	A+	-	B+	A+
	21 (Surrounding) Land use and utilization of local resources	B-/A+	B-	-	B-/A+
	22 Social institutions (including regional severance)	-	-	-	-
	23 Existing social infrastructures and services	B-	-	B-	-
	24 Socially vulnerable groups such as the poor, indigenous and ethnic people (including gender matter)	-	-	-	-
	25 Misdistribution of benefit and damage	-	-	-	-
	26 Historical and cultural heritage (including religious matters)	-	-	-	-
	27 Water usage or water rights and rights of common	A+	-	-	A+
	28 Local conflict of interests	B-	B-	-	B-

No.	Likely Impact	Project-related Activities			
		Overall Rating	Planning / Design Phase	Construction Phase	Operation Phase
29	Sanitation	B-	-	B-	-
30	Hazardous (risk) infectious diseases such as HIV/AIDS	B-	-	B-	-
31	Accident	B-	-	B-	-

Source: JICA Survey Team

<Rating>

A-: Serious impact is expected, if any measure is not implemented to the impact.

B-: Some impact is expected, if any measure is not implemented to the impact.

C-: Extent of impact is unknown (Examination is needed. Impact may become clear as study progresses.)

-: No impact is expected.

A+: Remarkable effect is expected due to the project implementation itself and environmental improvement caused by DPISRSP.

B+: Some effect is expected due to the project implementation itself and environmental improvement caused by DPISRSP.

Overall rating: Highest rate will be the overall rating among the rating of relevant project-related activities for negative and positive ratings, respectively. (e.g. Even only one "A-" is included in an environmental item, overall rating of the environmental item becomes "A-".)

AH-2.6.3.2 Checklist of Environmental Scoping

Checklist of environmental scoping for DPISRSP is prepared as described in Table AH-2.6.3.2.1.

Table AH-2.6.3.2.1 Checklist of Environmental Scoping for DPISRSP

No	Likely Impacts	Rating Over all	Explanation on Potential Impacts (Project-related activity is shown in the parenthesis "<>".)
Pollution Control			
1	Air pollution	B-	<Operation of construction equipment and vehicles> <Rehabilitation of existing main/secondary canals and other facilities> <Construction of new headworks and its related facilities> Emission of exhaust gas from construction equipment and vehicles and dust pollution due to operation of the construction equipment and vehicles would cause air pollution in and around the construction sites during the construction. However, the impact is limited and temporary.
2	Water pollution	B-	<Rehabilitation of existing main/secondary canals and other facilities> <Construction of new headworks and its related facilities> Muddy water from construction site and oil spill from construction equipment and vehicles would cause water pollution in the existing canals in and around the construction site. <Utilization of irrigation water > Increased irrigation water might encourage farmers to use more agro-chemicals and fertilizers to carry out intensive farming.
3	Soil contamination	-	DPISRSP does not have any factor which may cause the soil contamination in terms of project location and construction method.
4	Waste	B-	<Operation of construction equipment and vehicles> <Rehabilitation of existing main/secondary canals and other facilities> <Construction of new headworks and its related facilities> Construction waste including residue soil and concrete waste would be produce by construction work.
5	Noise and vibration	B-	<Operation of construction equipment and vehicles> <Rehabilitation of existing main/secondary canals and other facilities> <Construction of new headworks and its related facilities> Vibration caused by such construction works would cause damage to residential people, existing houses and other kinds of building structures.
6	Ground subsidence	-	DPISRSP does not have any factor which may cause the ground subsidence in terms of project location and construction method.
7	Offensive odor	-	DPISRSP does not have any factor which may cause the offensive odor in terms of project location and construction method.
8	Bottom sediment	-	DPISRSP does not have any factor which may cause the bottom sediment in terms of project location and construction method.
9	Disaster	-	DPISRSP does not have any factor which may cause the disaster in terms of project location and construction method.
Natural Environment			
10	Topography and geographical features	-	DPISRSP does not have any factor which may cause the disaster in terms of project location and construction method because project site is already developed area .
11	Soil erosion	B-	<Control of maintenance of canal/drainage> New and rehabilitated canals would cause soil erosion in some sections.
12	Groundwater	-	DPISRSP does not have any factor which may cause the groundwater in terms of project location and construction method because DPISRSP does not utilize groundwater.
13	Hydrological situation	B-	<Rehabilitation of existing main/secondary canal and other facilities> <Construction of new headworks and its related facilities> New headworks would affect hydrological situation of DPISRSP area Detailed hydrological analysis undertook in this study.
14	Coastal zone	-	DPISRSP does not have any factor which may cause the c in terms of project location.
15	Flora, fauna and biodiversity	-	<New construction of headworks, canal and other facilities > New headworks will dam up Strung Chieb River during some priod. Downstream area of Chieb River would be decrease the river water.
16	Meteorology	-	DPISRSP does not have any factor which may affect and/or be related to the meteorology.

No	Likely Impacts	Rating Over all	Explanation on Potential Impacts (Project-related activity is shown in the parenthesis"<>".)
17	Landscape	-	DPIRSRP does not have any factor which may cause the groundwater in terms of project location and construction method.
18	Global warming	-	DPIRSRP does not have any factor which may cause the groundwater in terms of project location and construction method because DPIRSRP is only rehabilitation and improvement project and not including new development.
Social Environment			
19	Involuntary Resettlement	-	<Design of main/secondary canal and other facilities > It is expected no large involuntary resettlement will be caused by DPIRSRP
20	Local economy such as employment and livelihood, etc.	A+	<Design of main/secondary canals and other facilities > <Rehabilitation of existing main/secondary canals and other facilities> <Construction of new headworks and its related facilities> - Overall, the construction of DPIRSRP will make more employment and business opportunities for local residents during construction. - After operation of DPIRSRP, regional farmers would have positive impact due to improvement irrigation water availability.
21	Land use and utilization of local resources	B-/B+	<Design of main/secondary canals and other facilities > <Rehabilitation of existing main/secondary canals and other facilities> <Construction of new headworks and its related facilities> Construction work will cause loss of some structures (Garden, fence and other facilities) and paddy field along existing canals. And also, some part of main canal will construct existing secondary canal alignment, the route need land acquisition. <Operation of main/secondary canals and other facilities > After operation of the DPIRSRP, regional farmers around the DPIRSRP would have positive impact due to improved irrigation water availability
22	Social institutions	-	DPIRSRP does not have any factor which may cause social institution in terms of project location and construction methods.
23	Existing social infrastructures and services	B-	<Operation of construction equipment and vehicles> <Rehabilitation of existing main/secondary canals and other facilities> <Construction of new headworks and its related facilities> Construction work and traffic restriction would disturb access to the existing social infrastructures and services.
24	Socially vulnerable groups such as the poor, indigenous and ethnic people	-	DPIRSRP does not have any factor which may cause social vulnerable groups. According to village leaders, local people of DPIRSRP Area.
25	Misdistribution of benefit and damage	-	DPIRSRP does not have any factor which may cause misdistribution since DPIRSRP will bring in large benefit to whole of in and around the commune area.
26	Historical and cultural heritage (including religious matters)	-	DPIRSRP does not have any factor which may cause historical and cultural heritage in terms of project location and construction methods.
27	Water usage or water rights and rights of common	A+	<Utilization of irrigation water > After operation of the DPIRSRP, new headworks and canals/drainage will provide a substantial improvement in irrigation water provision without adequate water resource management.
28	Local conflict of interests	B-	<Rehabilitation of existing main/secondary canals and other facilities> Almost local people welcome DPIRSRP because DPIRSRP will conduct large benefits to whole of in and around the commune area. However, some people living along the canal might have grievance against existing government land title.
29	Sanitation	B-	<Operation of construction equipment and vehicles> <Rehabilitation of existing main/secondary canals and other facilities> <Construction of new headworks and its related facilities> Sanitary issues would occur in labor camp and neighboring area in the case sanitary facility is not adequately installed such as toilet and septic tank.
30	Hazardous (risk) infectious diseases such as HIV/AIDS	B-	<Operation of construction equipment and vehicles> <Rehabilitation of existing main/secondary canals and other facilities > <Construction of new headworks and its related facilities> -Risk of infectious diseases by labors would be expected during construction due to the inflow of the construction workers from outside.
31	Accident	B-	<Operation of construction equipment and vehicles> Some accidents might be inevitable during construction phase. <Construction of new headworks and its related facilities> The command area is required removal of land mines and duds of Khmer Rouge Regime before construction phase.

Note: * Regarding the impacts on "Gender" and "Children's Right", might be related to all criteria of Social Environment.

<Rating>

A-: Serious impact is expected, if any measure is not implemented to the impact.

B-: Some impact is expected, if any measure is not implemented to the impact.

C-: Extent of impact is unknown (Examination is needed. Impact may become clear as study progresses.)

-: No impact is expected. Therefore, EIA is not required.

A+: Remarkable effect is expected due to DPIRSRP implementation itself and environmental improvement caused by DPIRSRP.

B+: Some effect is expected due to DPIRSRP implementation itself and environmental improvement caused by DPIRSRP.

Overall rating: Highest rate will be the overall rating among the rating of relevant project-related activities for negative and positive ratings, respectively. (e.g. Even only one "A-" is included in an environmental item, overall rating of the environmental item becomes "A-".)

Source: JICA Survey Team

AH-2.6.4 Anticipated Negative Impact of Environment

(1) Pollution Control

(a) Air pollution, Noise and Vibration (Construction phase)

1) Activity

- Operation of construction equipment and vehicles
- Rehabilitation of existing main/secondary canals and other facilities
- Construction of new headworks and its related facilities

2) Affected Area

- In and around construction area

3) Expected Potential Impact

During the construction phase, transportation of heavy equipment would cause air pollution, noise and vibration. Transportation of construction vehicles and transportation/operation of heavy equipment, such as dump truck, excavator, bulldozer, roller compactor and watering lorry, would exhaust emission gasses including NO₂ and SPM. And also, such heavy equipment would cause noise and vibration.

4) Related Regulation

- Sub-decree on Air and Noise Pollution Control

5) Conclusion of Examination

Most of the construction works of DPISRSP are small scale, numbers of heavy equipment and construction vehicles for the works will be limited. Therefore, the impact to air quality, noise and vibration by construction works will be insignificant if proper mitigation measures are carried out.

(b) Water Pollution by Construction Works (Construction Phase)

1) Activity

- Operation of construction equipment and vehicles
- Rehabilitation of existing main/secondary canals and other facilities
- Construction of new headworks and its related facilities

2) Affected Area

- Downstream of construction area

3) Expected Potential Impact

Muddy water from construction site and soil spilt from construction machinery would cause water pollution of existing canals. In addition, alkalified water caused by the concrete works will be another concern during construction phase.

4) Related Regulation

- Sub-decree on Water Pollution Control

5) Conclusion of Examination

Large scale construction including earthwork will not implement during the rainy season to avoid water pollution of existing canal water and water use. In addition, since the amount of concrete to be used is not large, alkalified water from the concrete works in the canals might be diluted by canal water. However, it is necessary to establish adequate treatment system if large quantity of alkalified water is observed during construction time.

(c) Waste Management by Construction Works (Construction phase)

1) Activity

- Operation of construction equipment and vehicles
- Rehabilitation of existing main/secondary canals and other facilities
- Construction of new headworks and its related facilities

2) Affected Area

- In and around construction area

3) Expected Potential Impact

Concrete and other construction waste would be produced by the construction works. In addition, rehabilitation works of canal/drainage will create soil disposal.

4) Related Regulation

- Sub-decree on Solid Waste Management (1999)

5) Conclusion of Examination

As most of the construction works are small scale and therefore construction waste is very limited. The impact of waste by construction works will not be serious if appropriate management and mitigation measures are provided.

(d) Water Pollution (Operation phase)

1) Activity

- Utilization of irrigation water

2) Affected Area

- Downstream of DPISRSP command area

3) Expected Potential Impact

Increased irrigation water might encourage farmers to use more agro-chemicals and fertilizers to carry out intensive farming.

4) Related Regulation

- Sub-decree on Water Pollution Control (April 6, 1999)

5) Conclusion of Examination

The command area of DPISRSP Area has been already developed with farming. According to local farmers, usage of agro-chemicals and fertilizer would be limited in command areas since these chemical. They usually compost manure, rice straw and other natural resources. However, after regulators is rehabilitated and operated, nutrient load or chemical contamination may increase affecting downstream areas because of increase of agro-chemicals and fertilizer usage.

(2) Natural Environment

(a) Soil Erosion (Construction Phase, Operation Phase)

1) Activity

- Operation and maintenance of main/secondary canals

2) Affected Area

- Main canals, secondary canals and other facilities

3) Expected Potential Impact

Soil erosion was found in some sections of existing canals/drainages at present. After the rehabilitation, soil erosion will occur if adequate maintenance works are provided.

4) Related Regulation

- None

5) Conclusion of Examination

In planning phase, high potential site of soil erosion was not selected as rehabilitation targets. Soil erosion is not only man-cause but also natural-cause. Although it is difficult to completely prevent canals from erosion, adequate design and maintenance of canals would alleviate soil erosion to some degree.

(b) Hydrological Situation (Operation Phase)

1) Activity

- Rehabilitation of existing main/secondary canals and other facilities
- Construction of new headworks and its related facilities

2) Affected Area

- Area of DPISRSP

3) Expected Potential Impact

Hydrological situation of the command area and downstream of the Stung Chieb River will be affected DPISRSP.

4) Related Regulation

- None

5) Conclusion of Examination

Hydrological situation will change DPISRSP Area because new headworks which connect Stung Chieb River to main canal will be constructed. The headworks design and scale was considered to water balance of Chieb River basin include downstream area. Detailed water balance analysis of DPISRSP shown Main report Clause II-2.8.3.

(c) Flora, Fauna and Biodiversity (Construction Phase, Operation Phase)

1) Activity

- Construction of new headworks and its related facilities

2) Affected Area

- Downstream ecosystem on the Stung Chieb River

3) Expected Potential Impact

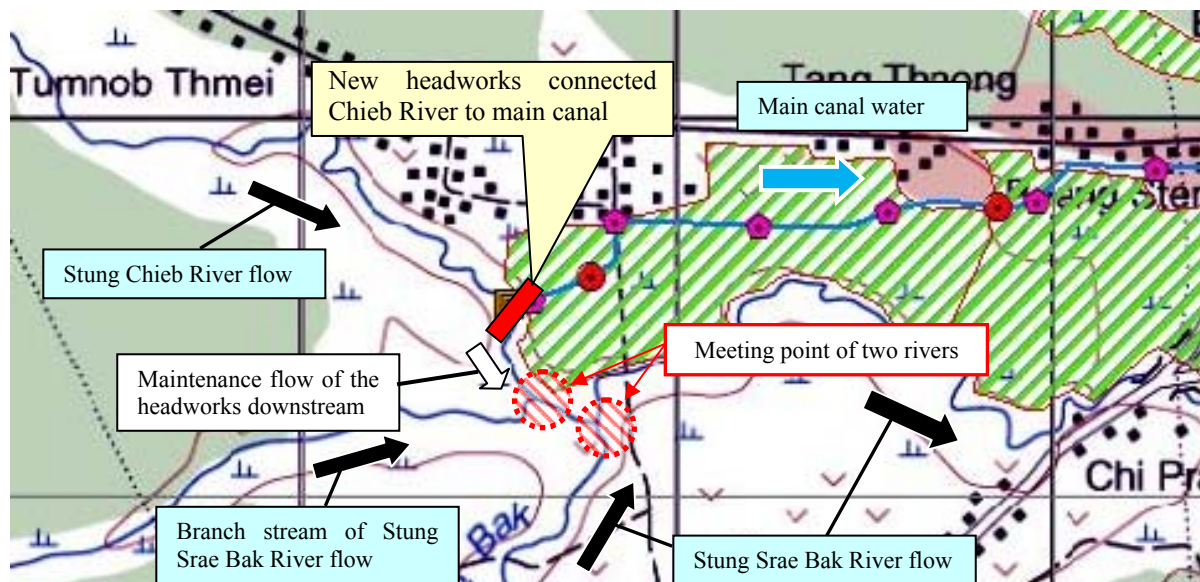
Damming up the river or water intake is done only during the wet season to support the paddy production in the downstream area; therefore, the river flow in the dry season will be maintained as it



New headworks location site

is. Even during the wet season, the river maintenance flow will be kept to maintain the functions of the river. Furthermore, the flow of the Stung Srae Bak River, which meets the Stung Chieb River at 200 m below the head works, will supplement the flow volume of the Stung Chieb River.

As long as the operations of the head works will be done properly in both seasons, the expected impact on the downstream ecosystem would be minimal.



Source: JICA Survey Team

Figure AH-2.6.4.1 New Headworks Location of DPISRSP

4) Related Regulation

- None

5) Conclusion of Examination

The construction of new head works would change the downstream flow of the river and might affect the downstream ecosystem. However, the impact is expected to be limited as long as the aforementioned mitigation measures are properly taken.

(3) Social Environment

(a) Land use and Utilization of Local Resources / Local Conflict of Interests (Planning/Design phase, Operation Phase)

1) Activity

- Rehabilitation of existing main/secondary canals and other facilities
- Construction of new headworks and its related facilities

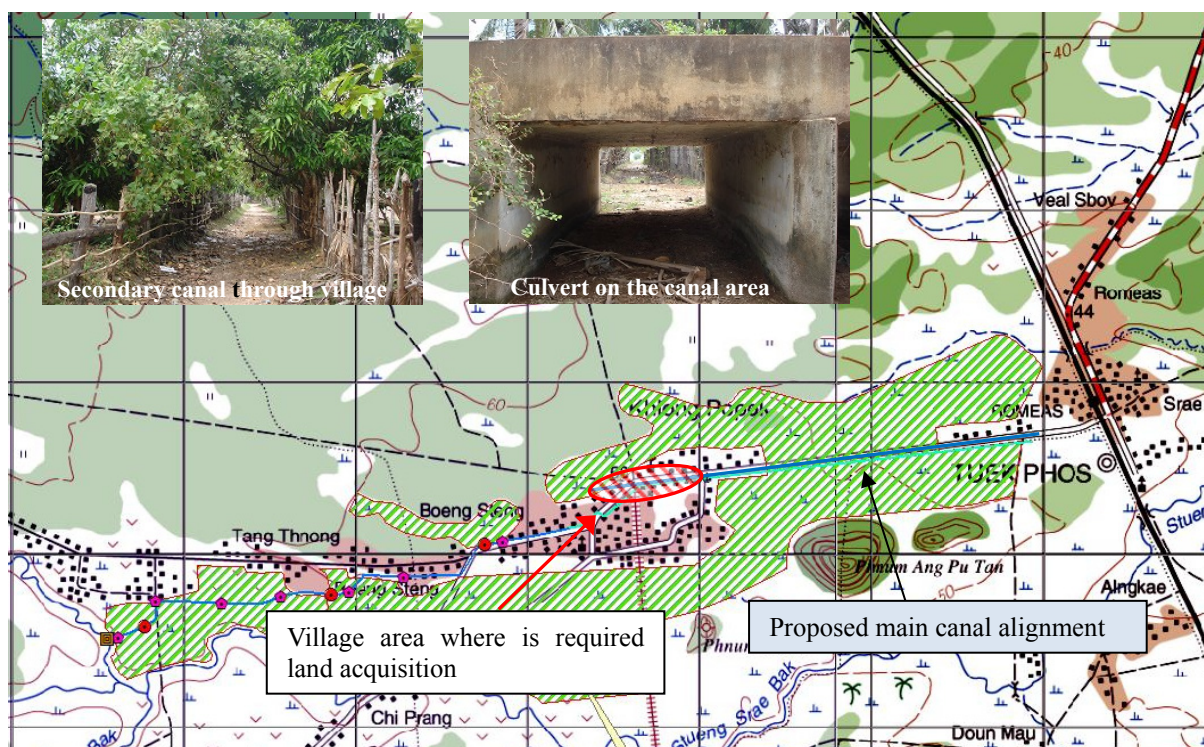
2) Affected area

- Areas along the main canals/secondary canals and around the proposed site for the new head works

3) Expected Potential Impact

The rehabilitation of the existing canals, which include the widening of canals, will need to acquire lands and existing immovable assets along the canals. Almost all the canals are located in paddy fields, but about 1km of the secondary canal passes through four villages: Trapaeng Chhrey; Khlong Popok;

Takab; and Trapaeng Krabao. It is therefore necessary to acquire existing structures and property, such as private fences, culverts and trees planted by local people along the canal, which belong to about 40 households in the villages according to village leaders. The areas to be acquired are categorized as the state land and those living in the areas are regarded as illegal occupants under the current government system. However, local people in the villages claimed that they had lived in the areas before the construction of the canal in Khmer Rouge Regime.



Source: JICA Survey Team

Figure AH-2.6.4.2 Land Acquisition Area in Village Area of DPISRSP

Table AH-2.6.4.1 Summary of Interview Survey Result for Affected Village Leaders

Affected Villages			
Trapaeng Chhrey	Khlong Popok	Takab	Trapaeng Krabao
Question1: Do you have any opinion to DPISRSP?			
Three villages during July to September go to Daun Peu river with some sand bags in order to barrage and make water diverse to our paddy fields. We really need water.	It's good as you know we don't have water for our paddy crop even some times in wet season. We sometimes have conflict between villagers for water into our paddy fields.	If the Sub-project approved for this canal, I think it's good we have water for our fields. But some people may have not satisfied with losing their property since their previous ownership before Khmer Rouge.	Water supply is good for the village but it depends on how depth it will be if it's not deep then it's ok.
Question2: If any house and other facilities on the canal area, could these be removed?			
There are 11 families within the canal area, if 10 m width and of course the Sub-project will cause some destruction to their property more seriously than other villages. If it affected only to some part for instant over the plantation I think this can be accepted by them.	The facilities of those affected villagers can be removed from the canal area.	Many times I got complain from my villagers, you know that the plot where people living on today is belong to them for long it's not the property the government contributes to them. Thus I think it's not easy to remove some things on their land.	Yes, if there if a small part from their front house. As I mentioned earlier they can share some benefit for village here. As you know the number of families will be affected in this village even much but I think only one house located at the end of this village will be severely impacted.
Number of affected households/population within the whole village and the canal area?			
Village population: 193 families (861 persons) Affected families: 11 (45 person)	Village population: 179 families (738 persons) Affected families: 4 (9person)	Village population: 128 families (552 persons) Affected families: 7 (39person)	Village population: 308 families (1,369 persons) Affected families: 18 (72person)

Source: JICA Survey Team

4) Related Regulation

- Constitution (1993)
- Land law (2001)
- Expropriation Law (2010)
- Sub-decree on Social Land Concession (2003)

5) Conclusion of Examination

Land acquisition should be conducted carefully from the design phase. In particular, due consideration should be given to consultations with local people in the affected villages, as some families/ people have already doubted if the Sub-project would treat their losses properly based on their past experiences. Hence, MOWRAM must conduct a detailed socio-economic survey to estimate all losses from land acquisition and hold a series of public consultation meetings with them at the earliest stage. Furthermore, the part of canal alignment should be re-considered/re-examined based on the results of public consultation meetings with affected families/ people to minimize the possible effect in the D/D Phase.

(b) Existing Social Infrastructures and Services (Construction Phase)

1) Activity

- Operation of construction equipment and vehicles
- Rehabilitation of existing main/secondary canals and other facilities

2) Affected Area

- Local roads in and around DPISRSP Area

3) Expected Potential Impact

During construction time, operation of construction equipment and vehicles will move local roads in and around construction site of DPISRSP. Number of construction vehicles will increase than normal times, the situation would be effected local social infrastructure and services. And also, some part of proposed main canal area is using as local walking pass by local people, however, during construction phase, the road usage will be limited by construction work until the work finish.



Local walking path on canal area

4) Related Regulation

- None

5) Conclusion of Examination

Most of the construction works are small scale and construction periods is short term. Existing walking pass will be removed, but new walking pass along main canal will construct to manage the canal. The impact by the construction works will not be significant if proper management and mitigation measures are carried out.

(c) Sanitation/Hazardous (risk) Infectious Diseases such as HIV/AIDS/Accident (Construction Phase)

1) Activity

- Operation of construction equipment and vehicles
- Rehabilitation of existing main/secondary canals and other facilities
- Construction of new headworks and its related facilities

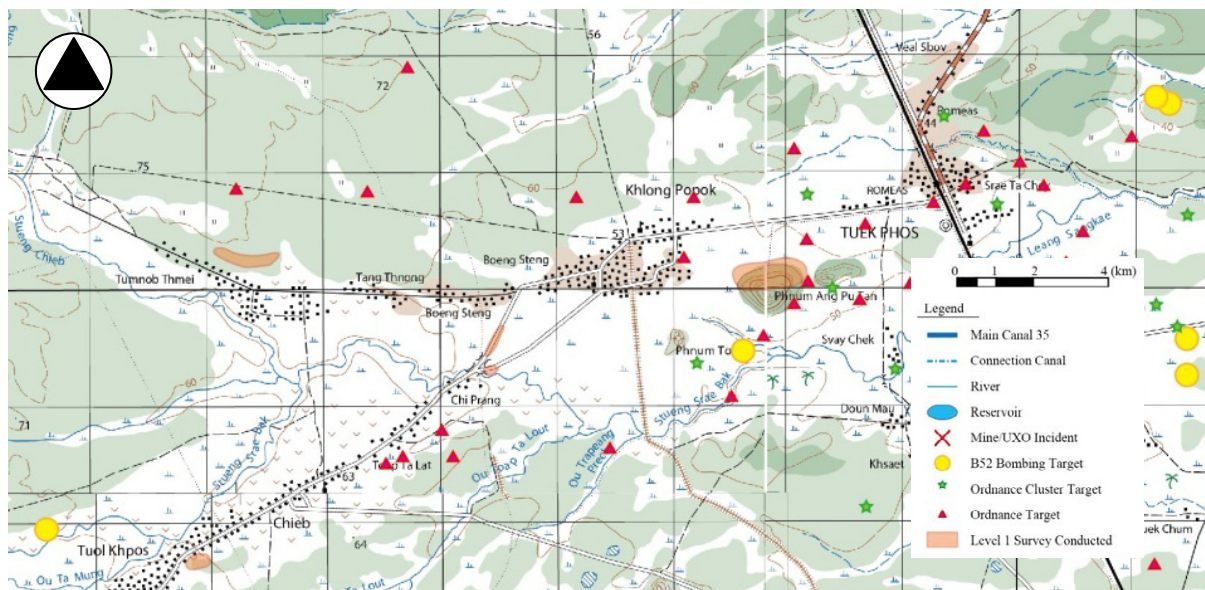
2) Affected Area

- In and around DPISRSP Area

3) Expected Potential Impact

Due to inflow of construction workers from outside of the community during construction phase, the anticipated impacts are (i) deterioration of sanitation condition, (ii) deterioration of public security, (iii) increase of risk of diseases including AIDS/HIV, (iv) accident, (v) local conflict among people and workers. Although construction scale is not large and duration is at most 36 months, these issues need to be taken into consideration.

In addition, it is required scrupulous attention to land fill works since there is a possibility that land mines and duds of Khmer rouge regime have been buried in the earth. MINE/UXO Contamination Map of DPISRSP Area is shown below.



Source: Cambodian Mine Action Center

Figure AH-2.6.4.1 MINE/UXO Contamination Map in DPISRSP Area

4) Related Regulation

- Labor Law (1997)

5) Conclusion of Examination

Since the people in and around DPISRSP Area is not familiar to the construction workers, a great attention should be paid to management of construction workers and construction sites. However, taking into consideration work scale, the number of construction workers will not be large. Therefore, serious negative impacts are not envisaged if proper mitigation measures are provided.

And also, DPISRSP Area where has possibility of land mines and duds should be conducted removal work of these dangerous material in DPISRSP Area as necessary before construction phase

AH-2.6.5 Mitigation Measures

In accordance with the above examination, the mitigation measures against negative impacts anticipated are proposed as follows:

- (1) Pollution Control
 - (a) Air pollution and Noise and vibration (Construction Phase)
 - To educate construction workers on minimizing idling of construction machinery;
 - To restricted construction time. e.g. during daytime only;
 - To hold stakeholder meetings to build consensus about the construction time; and
 - To stipulate environmental consideration measures in the technical specification of the construction works.
 - (b) Water Pollution by Construction Works (Construction Phase)
 - To dilute or neutralize alkalified water from concrete mixer trucks by pooling in regulating pond before discharging;
 - To pool discharging water from the concrete plant for dilution or neutralization;
 - To install adequate treatment system for muddy and alkalified water in construction site such as installation of water tank to collect water from concrete works for neutralization; and
 - To stipulate environmental consideration measures in the technical specification of the construction works.
 - (c) Waste Management by Construction Works (Construction Phase)
 - To comply with relevant laws pertaining to the management and disposal of solid waste, hazardous waste and re-waste;
 - To arrange suitable sites for disposal of solid waste prior to the construction works;
 - To avoid dumping in the area of private property without written consent of the owner; and
 - To carry out recycle use of disposed soil as much as possible.
 - (d) Water Pollution (Operation Phase)
 - To conduct support programs regarding appropriate agricultural management;
 - To introduce check system among the FWUC members regarding agricultural management;
 - To control the amount of fertilizer and pesticide through the training farmers; and
 - To monitor water quality and agricultural activities regularly.
- (2) Natural Environment
 - (a) Soil Erosion (Construction Phase, Operation Phase)
 - To implement maintenance of canals by adequate methods and appropriate timing; and
 - To design main canal and related structures to consider alleviation of soil erosion.
 - (b) Flora, Fauna and Biodiversity (Operation Phase)
 - To ensure the river maintenance flow to keep a certain level of water in the wet season;
 - To restrict water intake from the river during the dry season; and
 - To ensure adequate and proper operation and maintenance of the new head works by FWUC.
- (3) Social Environment
 - (a) Land Use and Utilization of Local Resources (Planning/Design Phase, Operation Phase)
 - To realign and design the irrigation and drainage canals to minimize the scale of land acquisition caused by the Sub-Project during the D/D Phase;
 - To conduct a detailed socio-economic survey of affected families/people to identify/estimate all the potential losses from land acquisition before the D/D Phase;

- To fairly compensate all affected families/persons, including those without a title to land, for all their losses at replacement rates, if any;
 - To establish a joint committee as a decision making body to carry out the land acquisition process;
 - To conduct stakeholder meetings with affected families/people;
 - To prepare a realistic schedule of land acquisition and inform affected families/people of the schedule well in advance; and
 - To properly restore the affected area after the construction works.
- (b) Existing Social Infrastructures and Services (Construction Phase)
- To hold a series of public consultation meetings for surrounding people in order to explain, discuss and find the way of passage restriction;
 - To educate construction workers for adequate traffic rule of construction vehicles; and
 - To post a bill to inform impassable duration to commune council, village chief by means of, such like, social facilities including schools, pagodas and hospitals, after the work schedule is fixed with people's consensus
- (c) Sanitation/ Hazardous (risk) Infectious Diseases such as HIV/AIDS /Accident (Construction Phase)
- To improve sanitary condition of workers by proper arrangement of accommodation, installation of toilets and proper water supply;
 - To implement education programs for workers about sanitation, security and rules/discipline of daily activities;
 - To implement safety education and training for construction workers;
 - To implement periodical patrol of workers in order to avoid both occurrence of local conflict and epidemics of diseases;
 - To hold a series of stakeholder meetings for surrounding people in order to explain construction works and its schedule;
 - To stipulate environmental consideration measures in the technical specifications of the construction works;
 - To implement detailed field survey of land mines and duds; and
 - To remove land mines and duds before construction work.

AH-2.6.6 Conclusion and Recommendation

In this Sub-project, significant environmental issues are; (i) Impact to downstream area of new headworks in Stung Chiev River, and (ii) Land acquisition of some part of main canals.

It is expected that construction of new headworks would affect no significant impact to downstream of Stung Chiev River since another river and stream link up about 200m of downstream. In addition, intake volume of new headworks was designed with environmentally-friendly consideration. MOWRAM should pay attention to the operation of headworks via FWUC to ensure maintenance flow and to prohibit water intake during the dry season.

Land acquisition for some part of existing secondary canal through village area might be difficult because some affected households already have been developed a feeling of distrust to official land acquisition process. If available, the part of canal alignment of the area should be re-considered through public consultation meeting with affected peoples during D/D Phase.

CHAPTER AH-3 ENVIRONMENTAL MANAGEMENT AND MONITORING PLANS

AH-3.1 Establishment of Environmental Management Unit in MOWRAM

MOWRAM is responsible section to provide systematic and continuous support committed to the implementation Environmental Management and Monitoring Plan for SPPIDRIP. In existing status, there are Resettlement Units in MOWRAM and four our permanent members belong to the units to manage resettlement and land acquisition of MOWRAM projects. The Unit should manage to mitigation/management measures of social environment related to resettlement and land acquisition. However, there is no unit for natural environmental management section in MOWRAM. Therefore, MOWRAM should establish Environmental Management Unit for natural environment and Pollution. Role of the Unit should include the following:

- Environmental Management;
- Environmental Monitoring;
- Regular Environmental Audits & Corrective Action; and
- Documentation of the standardized operation procedures, Environmental Management and Monitoring Plan & Other relevant records.

AH-3.2 Environmental Management Plan

AH-3.2.1 Basic Approach Environmental Management Plan

EMP is designed based on the impact assessment which covers all aspects of the natural and social environment so that adverse impacts, if any, are taken care of and SPPIDRIP does not create any hazard or affect the quality of life for present and future generations. EMP should always have a long term perspective and make futuristic predictions considering the developmental activities likely to take place.

EMP provides guidance and stipulations on how project activities are to be controlled, implemented and monitored in order to minimize environmental impact. Tables AH-3.2.1.1-3.2.1.6 summarize the main mitigation and management measures for significant impacts in planning/design, construction and operation phases, respectively.

Table AH-3 2.1.1 Environmental Management and Responsibilities for RCHRSP

Impact	Activity	Mitigation/Management Measures	Planning and Implementation		
			Planning and Implementation	Supervision and Responsible	
Pollution Control					
1	Air pollution and Noise and Vibration	<ul style="list-style-type: none"> - Operation of construction equipment and vehicles - Rehabilitation works of regulator, canals/drainages and other related facilities 	<ul style="list-style-type: none"> - To educate construction workers for minimizing idling of construction machinery - To limit construction time. e.g. during daytime only - To hold stakeholder meetings to build consensus about the construction time - To stipulate environmental consideration measures in the technical specification of the construction works 	Design consultant and Contractor	MOWRAM and Contractor
2	Water Pollution by Construction Works	<ul style="list-style-type: none"> - Operation of construction equipment and vehicles - Rehabilitation works of regulator, canals/drainages and other related facilities 	<ul style="list-style-type: none"> - To dilute or neutralize alkalified water from concrete mixer trucks by pooling in regulating pond before discharging - To pool discharging water from the concrete plant for dilution or neutralization - To install adequate treatment system for muddy and alkalified water in construction site such as installation of water tank to collect water from concrete works for neutralization - To stipulate environmental consideration measures in the technical specification of the construction works 	Design consultant and Contractor	MOWRAM and Contractor

Impact	Activity	Mitigation/Management Measures	Planning and Implementation		
			Planning and Implementation	Supervision and Responsible	
3	Waste Management by Construction Works	<ul style="list-style-type: none"> - Operation of construction equipment and vehicles - Rehabilitation works of regulator, canals/drainages and other related facilities 	<ul style="list-style-type: none"> - To comply with relevant laws pertaining to the management and disposal of solid waste, hazardous waste and re-waste. - To arrange suitable sites for disposal of solid waste prior to the construction works, - To avoid dumping in the area of private property without written consent of the owner - To carry out recycle use of disposed soil as much as possible - To stipulate environmental consideration measures in the technical specification of the construction works 	Design consultant and Contractor	MOWRAM and Contractor
4	Water Pollution (Operation Phase)	<ul style="list-style-type: none"> - Utilization of irrigation water 	<ul style="list-style-type: none"> - To conduct support programs regarding appropriate agricultural management - To introduce composting activity to the farmers - To introduce check system among the FWUC members regarding agricultural management - To monitor water quality and agricultural activities regularly - To stipulate environmental consideration measures in the technical specification of the construction works 	MOWRAM, and FWUC	MOWRAM, and FWUC
Natural Environment					
5	Soil Erosion	<ul style="list-style-type: none"> - Operation and maintenance of regulator and canals/drainage 	<ul style="list-style-type: none"> - To implement maintenance of canals by adequate methods and appropriate timing - To design main canal and its structures to consider alleviation of soil erosion 	MOWRAM, PDOWRAM and FWUC	MOWRAM and FWUC
Social Environment					
6	Land use and utilization of local resources	<ul style="list-style-type: none"> - Rehabilitation works of regulator, canals/drainages and other related facilities 	<ul style="list-style-type: none"> - To design temporary diversion channels, other temporary related facilities and drainage canals by minimizing land acquisition as much as possible during D/D - To establish joint committee as IRC to implement land adjustment process, members of which consist of: (i) executing agencies (MOWRAM, PDOWRAM, PDA), (ii) related agencies (PDLMUPC etc.) and (iii) local authorities (commune council, village chief, etc) - To conduct detailed socio-economic survey for affected persons during preparatory stage of RCHRSP to identify all losses from land acquisition - To fairly compensate to all affected persons, including those without title to land, for all their losses at replacement rates, if any. - To properly restore the affected area after construction works 	Design consultant, MOWRAM, PDOWRAM, Local authorities, and IRC	MOWRAM, MEF, RD and IRC
7	Existing social infrastructures and services	<ul style="list-style-type: none"> - Operation of construction equipment and vehicles - Rehabilitation works of regulator, canals/drainages and other related facilities 	<ul style="list-style-type: none"> - To establish a temporary bridge during rehabilitation work - To hold a series of public consultation meetings for surrounding people in order to explain, discuss and find the way of passage restriction - To educate construction workers for adequate traffic rule of construction vehicles - To post a bill to inform impassable duration to commune council, village chief by means of, such like, social facilities including schools, pagodas and hospitals, after the work schedule is fixed with people's consensus. 	Contractor	MOWRAM
8	Water usage or water rights and rights of common	<ul style="list-style-type: none"> - Rehabilitation works of regulator, canals/drainages and other related facilities 	<ul style="list-style-type: none"> - To conduct construction works in fallow period intensively as much as possible - To hold a series of stakeholder meetings when detailed construction works schedule is prepared in order to build consensus among stakeholders including affected people. - To consider alternative water source like pump well for drinking and domestic use for those who have to visit far away for collecting water to avoid increase of women's burden, - To train stakeholders in order to share the work among men and women for water collection - To distribute water for drinking and domestic use by water tanker for the affected people during construction phase 	Contractor, FWUC and PDOWRAM	MOWRAM and FWUC
9	Sanitation	<ul style="list-style-type: none"> - Operation of construction equipment and vehicles 	<ul style="list-style-type: none"> - To improve sanitary condition of workers by proper arrangement of accommodation, installation of toilets and proper water supply 	Contractor	MOWRAM
10	Hazardous (risk) infectious diseases such as HIV/AIDS	<ul style="list-style-type: none"> - Rehabilitation 	<ul style="list-style-type: none"> - To implement education programs for workers about sanitation, security and rules/discipline 		

Impact	Activity	Mitigation/Management Measures	Planning and Implementation		
			Planning and Implementation	Supervision and Responsible	
11	Accident	works of regulator, canals/drainages and other related facilities	<ul style="list-style-type: none"> of daily activities - To implement safety education and training for construction works - To implement periodical patrol of workers in order to avoid both occurrence of local conflict and epidemics of diseases - To hold a series of stakeholder meetings for surrounding people in order to explain construction works and its schedule. - To stipulate environmental consideration measures in the technical specification of the construction works 		

Source: JICA Survey Team

Table AH-3 2.2.2 Environmental Management and Responsibilities for USISRSP

Impact	Activity	Mitigation/Management Measures	Planning and Implementation		
			Planning and Implementation	Supervision and Responsible	
Pollution Control					
1	Air pollution and Noise and Vibration	<ul style="list-style-type: none"> - Operation of construction equipment and vehicles - Rehabilitation of Main and Secondary canals/drainages and other related facilities - Rehabilitation of the existing dike and construction of the reservoir (Tumnup Lok Reservoir) 	<ul style="list-style-type: none"> - To educate construction workers for minimizing idling of construction machinery - To limit construction time. e.g. during daytime only - To hold stakeholder meetings to build consensus about the construction time - To stipulate environmental consideration measures in the technical specification of the construction works 	Design consultant and Contractor	MOWRAM and Contractor
2	Water Pollution by Construction Works (Construction Phase)	<ul style="list-style-type: none"> - Operation of construction equipment and vehicles - Rehabilitation of Main and Secondary canals/drainages and other related facilities - Rehabilitation of the existing dike and construction of the reservoir (Tumnup Lok Reservoir) 	<ul style="list-style-type: none"> - To dilute or neutralize alkalified water from concrete mixer trucks by pooling in regulating pond before discharging - To pool discharging water from the concrete plant for dilution or neutralization - To install adequate treatment system for muddy and alkalified water in construction site such as installation of water tank to collect water from concrete works for neutralization - To stipulate environmental consideration measures in the technical specification of the construction works 	Design consultant and Contractor	MOWRAM and Contractor
3	Waste Management by Construction Works	<ul style="list-style-type: none"> - Operation of construction equipment and vehicles - Rehabilitation of Main and Secondary canals/drainages and other related facilities - Rehabilitation of the existing dike and construction of the reservoir (Tumnup Lok Reservoir) 	<ul style="list-style-type: none"> - To comply with relevant laws pertaining to the management and disposal of solid waste, hazardous waste and re-waste. - To arrange suitable sites for disposal of solid waste prior to the construction works, - To avoid dumping in the area of private property without written consent of the owner - To carry out recycle use of disposed soil as much as possible - To stipulate environmental consideration measures in the technical specification of the construction works 	Design consultant and Contractor	MOWRAM and Contractor
4	Water Pollution (Operation Phase)	<ul style="list-style-type: none"> - Utilization of irrigation water 	<ul style="list-style-type: none"> - To conduct support programs regarding appropriate agricultural management - To introduce composting activity to the farmers - To introduce check system among the FWUC members regarding agricultural management - To monitor water quality and agricultural activities regularly - To stipulate environmental consideration measures in the technical specification of the construction works 	MOWRAM, and FWUC	MOWRAM, and FWUC
Natural Environment					
5	Soil Erosion	<ul style="list-style-type: none"> - Control of Maintenance Canals/Drainages 	<ul style="list-style-type: none"> - To implement maintenance of canals by adequate methods and appropriate timing - To design main canal and its structures to consider alleviation of soil erosion 	MOWRAM, PDOWRAM and FWUC	MOWRAM and FWUC

Impact	Activity	Mitigation/Management Measures	Planning and Implementation		
			Planning and Implementation	Supervision and Responsible	
6	Flora, fauna and biodiversity	- Rehabilitation of the existing dike and construction of the reservoir (Tumnup Lok Reservoir)	- To ensure the amount of river maintenance water particularly in the dry season	MOWRAM, PDOWRAM and FWUC	MOWRAM and FWUC
Social Environment					
7	Local economy such as employment and livelihood, etc.	- Rehabilitation of Main and Secondary canals/drainages and other related facilities - Rehabilitation of the existing dike and construction of the reservoir (Tumnup Lok Reservoir)	- To design canals to minimize negative impact as much as possible in D/D - To conduct detailed socio-economic survey of affected people during early stage of project preparation to identify all losses from land adjustment. - To establish joint committee as IRC to implement land adjustment process, members of which consist of: (i) executing agencies (MOWRAM, PDOWRAM, PDA), (ii) related agencies (PDLMUPC etc.) and (iii) local authorities (commune council, village chief, etc) - To conduct stakeholder meetings with farmers including affected people on: (i) project purpose, (ii) compensation measures, (iii) support programs to build consensus among the people especially the affected people through involvement of village chief - To compensate affected persons, including those without title to land. - To prepare adequate and realistic schedule of land adjustment through joint committee and inform affected people early - To monitor the life condition of the affected people and the community	Design consultant, MOWRAM, PDOWRAM, Local authorities, and IRC	MOWRAM, MEF, RD and IRC
8	Land use and utilization of local resources	- Rehabilitation of Main and Secondary canals/drainages and other related facilities - Rehabilitation of the existing dike and construction of the reservoir (Tumnup Lok Reservoir)	- To conduct detailed socio-economic survey of affected people during early stage of project preparation to identify all losses from land adjustment - To establish joint committee as decision making body to implement land adjustment process, consisting of executing agencies, related agencies and local authorities. - To conduct stakeholder meetings with local people including affected people by USISRSP - To decide compensation policy among joint committee and affected people - To prepare adequate and realistic schedule of land adjustment through joint committee and inform affected people early	Design consultant, MOWRAM, PDOWRAM, Local authorities, and IRC	MOWRAM, MEF, RD and IRC
9	Existing social infrastructures and services	- Operation of construction equipment and vehicles - Rehabilitation of Main and Secondary canals/drainages and other related facilities - Rehabilitation of the existing dike and construction of the reservoir (Tumnup Lok Reservoir)	- To educate construction workers for adequate traffic rules of construction vehicles - To limit construction time. e.g. at daytime only - To conduct stakeholder meetings to obtain consensus about the construction time with surrounding people. - To design and re-construct canal crossing to minimize negative impact as much as possible - To enact the local rules to construct new canal crossings by themselves	Contractor	MOWRAM
10	Misdistribution of benefit and damage	- Rehabilitation of Main and Secondary canals/drainages and other related facilities	- To conduct detailed socio-economic survey of affected people during early stage of project preparation to identify all losses from land adjustment	MOWRAM, PDOWRAM, Local authorities, and IRC	MOWRAM, MEF, RD and IRC
11	Local conflict of interests	- Rehabilitation of the existing dike and construction of the reservoir (Tumnup Lok Reservoir)	- To conduct stakeholder meetings with local people including affected people on project contents - To decide compensation policy among joint committee and affected people - To prepare adequate and realistic schedule of land adjustment through joint committee and inform affected people early		
12	Sanitation	- Operation of construction equipment and vehicles	- To improve sanitary condition of workers by proper arrangement of accommodation, installation of toilets and proper water supply	Contractor	MOWRAM
13	Hazardous (risk) infectious diseases such as HIV/AIDS	- Rehabilitation of Main and Secondary canals/drainages and other related	- To implement education programs for workers about sanitation, security and rules/discipline of daily activities		
14	Accident		- To implement safety education and training for construction works - To implement periodical patrol of workers in		

Impact	Activity	Mitigation/Management Measures	Planning and Implementation	
			Planning and Implementation	Supervision and Responsible
	<ul style="list-style-type: none"> facilities Rehabilitation of the existing dike and construction of the reservoir (Tumnap Lok Reservoir) 	<ul style="list-style-type: none"> order to avoid both occurrence of local conflict and epidemics of diseases To hold a series of stakeholder meetings for surrounding people in order to explain construction works and its schedule. To stipulate environmental consideration measures in the technical specification of the construction works 		

Source : JICA Survey Team

Table AH-3 2.2.3 Environmental Management and Responsibilities for KSIBISRSP

Impact	Activity	Mitigation/Management Measures	Organization		
			Planning and Implementation	Supervision and Responsible	
Pollution Control					
1	Air pollution and Noise and Vibration	<ul style="list-style-type: none"> Operation of construction equipment and vehicles Rehabilitation works of canals/drainages and other related facilities 	<ul style="list-style-type: none"> To educate construction workers for minimizing idling of construction machinery To limit construction time. e.g. during daytime only To hold stakeholder meetings to build consensus about the construction time To stipulate environmental consideration measures in the technical specification of the construction works 	Design consultant and Contractor	MOWRAM and Contractor
2	Water Pollution by Construction Works (Construction Phase)	<ul style="list-style-type: none"> Operation of construction equipment and vehicles Rehabilitation works of canals/drainages and other related facilities 	<ul style="list-style-type: none"> To dilute or neutralize alkalified water from concrete mixer trucks by pooling in regulating pond before discharging To pool discharging water from the concrete plant for dilution or neutralization To install adequate treatment system for muddy and alkalified water in construction site such as installation of water tank to collect water from concrete works for neutralization To stipulate environmental consideration measures in the technical specification of the construction works 	Design consultant and Contractor	MOWRAM and Contractor
3	Waste Management by Construction Works	<ul style="list-style-type: none"> Operation of construction equipment and vehicles Rehabilitation works of canals/drainages and other related facilities 	<ul style="list-style-type: none"> To comply with relevant laws pertaining to the management and disposal of solid waste, hazardous waste and re-waste. To arrange suitable sites for disposal of solid waste prior to the construction works. To avoid dumping in the area of private property without written consent of the owner To carry out recycle use of disposed soil as much as possible 	Design consultant and Contractor	MOWRAM and Contractor
4	Water Pollution (Operation Phase)	<ul style="list-style-type: none"> Utilization of irrigation water 	<ul style="list-style-type: none"> To conduct support programs regarding appropriate agricultural management To control the amount of fertilizer and pesticide through the training farmers To introduce check system among the FWUC members regarding agricultural management To monitor water quality and agricultural activities regularly 	MOWRAM, and FWUC	MOWRAM, and FWUC
Natural Environment					
5	Soil Erosion	<ul style="list-style-type: none"> Operation and maintenance of water resource facilities and canals/drainage 	<ul style="list-style-type: none"> To implement maintenance of canals by adequate methods and appropriate timing To design main canal and related structures to consider alleviation of soil erosion To adopt concrete lining to main canals 	MOWRAM, PDOWRAM and FWUC	MOWRAM and FWUC
6	Flora, fauna and biodiversity	<ul style="list-style-type: none"> Rehabilitation works of canals/drainages and other related facilities 	<ul style="list-style-type: none"> To make choice environmentally friendly design for main canals To consider aquatic ecosystem by maintenance and operation measures 	MOWRAM, PDOWRAM and FWUC	MOWRAM and FWUC
Social Environment					
7	Involuntary Resettlement	<ul style="list-style-type: none"> Rehabilitation works of canals/drainages and other related facilities 	<ul style="list-style-type: none"> To conduct a detailed socio-economic survey of the affected families/people before the D/D Stage; To establish joint committee as IRC to implement land adjustment process, members of which consist of: (i) executing agencies (MOWRAM, PDOWRAM, PDA), (ii) related agencies (PDLMUPC etc.) and (iii) local authorities (commune council, village chief, etc.) To prepare the abbreviated RAP based on the results of the survey and meetings described above; To compensate for all the losses at an adequate rate ; 	Design consultant, MOWRAM, PDOWRAM, Local authorities, and IRC	MOWRAM, MEF, RD and IRC

Impact	Activity	Mitigation/Management Measures	Organization		
			Planning and Implementation	Supervision and Responsible	
		<ul style="list-style-type: none"> - To prepare realistic schedule of land acquisition and inform the affected families/people of the schedule well in advance; and - To monitor the process of recovery of living/livelihood conditions of the affected families/people. 			
8	Land use and utilization of local resources	<ul style="list-style-type: none"> - Rehabilitation works of canals/drainages and other related facilities - Design of main/secondary canals, drainages and other water resource facilities 	<ul style="list-style-type: none"> - To design canals/drainage by minimizing land acquisition as much as possible during D/D - To conduct detailed socio-economic survey for affected persons to identify all losses from land acquisition before D/D Phase - To fairly compensate to all affected persons, including those without title to land, for all their losses at replacement rates, if any - To establish joint committee as IRC to implement land adjustment process, members of which consist of: (i) executing agencies (MOWRAM, PDOWRAM, PDA), (ii) related agencies (PDLMUPC etc.) and (iii) local authorities (commune council, village chief, etc) - To conduct stakeholder meetings with affected people on: (i) project purpose, (ii) compensation measures, (iii) support programs to build consensus among the people especially the affected people through involvement of village chief - To prepare adequate and realistic schedule of land acquisition through joint committee and inform affected people early - To prepare Abbreviation RAP based on above surveys and meeting results. - To monitor recovery condition of the affected people and the community - To properly restore the affected area after construction works 	Design consultant, MOWRAM, PDOWRAM, Local authorities, and IRC	MOWRAM, MEF, RD and IRC
9	Existing social infrastructures and services	<ul style="list-style-type: none"> - Operation of construction equipment and vehicles 	<ul style="list-style-type: none"> - To hold a series of public consultation meetings for surrounding people in order to explain, discuss and find the way of passage restriction - To educate construction workers for adequate traffic rule of construction vehicles - To post a bill to inform impassable duration to commune council, village chief by means of, such like, social facilities including schools, pagodas and hospitals, after the work schedule is fixed with people's consensus 	Contractor	MOWRAM
10	Socially Vulnerable Groups such as the Poor, Indigenous and Ethnic People	<ul style="list-style-type: none"> - Rehabilitation works of canals/drainages and other related facilities - Design of main/secondary canals, drainages and other water resource facilities 	<ul style="list-style-type: none"> - To fairly compensate to all affected persons, including those without title to land, for all their losses at replacement rates, if any - To conduct stakeholder meetings with affected people to hear their opinion - To prepare adequate and realistic schedule of land acquisition through joint committee and inform affected people - To monitor recovery life condition of the affected people and the community - To pay special attention to vulnerable groups by operation phase 	MOWRAM, PDOWRAM, Local authorities, and IRC	MOWRAM, and IRC
11	Sanitation	<ul style="list-style-type: none"> - Operation of construction equipment and vehicles - Rehabilitation works of canals/drainages and other related facilities 	<ul style="list-style-type: none"> - To improve sanitary condition of workers by proper arrangement of accommodation, installation of toilets and proper water supply - To implement education programs for workers about sanitation, security and rules/discipline of daily activities - To implement safety education and training for construction works - To implement periodical patrol of workers in order to avoid both occurrence of local conflict and epidemics of diseases - To hold a series of stakeholder meetings for surrounding people in order to explain construction works and its schedule. - To stipulate environmental consideration measures in the technical specification of the construction works 	Contractor	MOWRAM
12	Hazardous (risk) infectious diseases such as HIV/AIDS				
13	Accident				

Source: JICA Survey Team

Table AH-3 2.2.4 Environmental Management and Responsibilities for MC35RSP

Impact	Activity	Mitigation/Management Measures	Organization		
			Planning and Implementation	Supervision and Responsible	
Pollution Control					
1	Air pollution and Noise and Vibration (Construction Phase)	<ul style="list-style-type: none"> - Operation of construction equipment and vehicles - Rehabilitation of existing main/secondary canals and other facilities - Construction of new main/secondary canals and other related facilities 	<ul style="list-style-type: none"> - To educate construction workers on minimizing idling of construction machinery - To restricted construction time. e.g. during daytime only - To hold stakeholder meetings to build consensus about the construction time - To stipulate environmental consideration measures in the technical specification of the construction works 	Design consultant and Contractor	MOWRAM and Contractor
2	Water Pollution by Construction Works (Construction Phase)	<ul style="list-style-type: none"> - Operation of construction equipment and vehicles - Rehabilitation of existing main/secondary canals and other facilities - Construction of new main/secondary canals and other related facilities 	<ul style="list-style-type: none"> - To dilute or neutralize alkalified water from concrete mixer trucks by pooling in regulating pond before discharging - To pool discharging water from the concrete plant for dilution or neutralization - To install adequate treatment system for muddy and alkalified water in construction site such as installation of water tank to collect water from concrete works for neutralization - To avoid implementation of earthwork during rainy season - To stipulate environmental consideration measures in the technical specification of the construction works 	Design consultant and Contractor	MOWRAM and Contractor
3	Waste Management by Construction Works (Construction Phase)	<ul style="list-style-type: none"> - Operation of construction equipment and vehicles - Rehabilitation of existing main/secondary canals and other facilities - Construction of new main/secondary canals and other related facilities 	<ul style="list-style-type: none"> - To comply with relevant laws pertaining to the management and disposal of solid waste, hazardous waste and re-waste. - To arrange suitable sites for disposal of solid waste prior to the construction works, - To avoid dumping in the area of private property without written consent of the owner - To carry out recycle use of disposed soil as much as possible 	Design consultant and Contractor	MOWRAM and Contractor
4	Water Pollution (Operation Phase)	<ul style="list-style-type: none"> - Utilization of irrigation water 	<ul style="list-style-type: none"> - To conduct support programs regarding appropriate agricultural management - To control the amount of fertilizer and pesticide through the training farmers - To introduce check system among the FWUC members regarding agricultural management - To monitor water quality and agricultural activities regularly 	MOWRAM, and FWUC	MOWRAM, and FWUC
Natural Environment					
5	Soil Erosion	<ul style="list-style-type: none"> - Operation and maintenance of main/secondary canals and drainages 	<ul style="list-style-type: none"> - To implement maintenance of canals by adequate methods and appropriate timing - To design main canal and related structures to consider alleviation of soil erosion. 	MOWRAM, PDOWRAM and FWUC	MOWRAM and FWUC
Social Environment					
6	Land use and utilization of local resources	<ul style="list-style-type: none"> - Rehabilitation of existing main/secondary canals and other facilities 	<ul style="list-style-type: none"> - To design the canals/drainages to minimize the possible adverse effects by land acquisition in the D/D phase - To establish joint committee as IRC to implement land adjustment process, members of which consist of: (i) executing agencies (MOWRAM, PDOWRAM, PDA), (ii) related agencies (PDLMUPC etc.) and (iii) local authorities (commune council, village chief, etc) - To conduct a detailed socio-economic survey of affected families/persons to identify all the losses from land acquisition before the D/D Phase - To fairly compensate all affected families/persons, including those without a legal title to land, for all their losses at reasonable rates or replacement rates, if any;- - To hold stakeholder meetings with affected families/people; - To prepare a realistic schedule of land acquisition and inform affected families/ of the schedule well in advance 	Design consultant, MOWRAM, PDOWRAM, Local authorities, and IRC	MOWRAM, MEF, RD and IRC

Impact	Activity	Mitigation/Management Measures	Organization	
			Planning and Implementation	Supervision and Responsible
7	Existing social infrastructures and services	- Operation of construction equipment and vehicles	Contractor	MOWRAM
8	Sanitation	- Operation of construction equipment and vehicles - Rehabilitation works of canals/drainages and other related facilities	Contractor	MOWRAM
9	Hazardous (risk) infectious diseases such as HIV/AIDS			
10	Accident			

Source: JICA Survey Team

Table AH-3 2.2.5 Environmental Management and Responsibilities for SPWRRSP

Impact	Activity	Mitigation/Management Measures	Organization	
			Planning and Implementation	Supervision and Responsible
Pollution Control				
1	Air pollution and Noise and Vibration (Construction Phase)	- Operation of construction equipment and vehicles - Rehabilitation of reservoir	Design consultant and Contractor	MOWRAM and Contractor
2	Water Pollution by Construction Works (Construction Phase)	- Operation of construction equipment and vehicles - Rehabilitation of reservoir	Design consultant and Contractor	MOWRAM and Contractor
3	Waste Management by Construction Works (Construction Phase)	- Operation of construction equipment and vehicles - Rehabilitation of reservoir	Design consultant and Contractor	MOWRAM and Contractor
4	Water Pollution (Operation Phase)	- Rehabilitation of reservoir	MOWRAM, and FWUC	MOWRAM, and FWUC

Impact	Activity	Mitigation/Management Measures	Organization		
			Planning and Implementation	Supervision and Responsible	
Natural Environment					
5	Flora, fauna and biodiversity	- Rehabilitation of reservoir	- To maintain surrounding natural environment	MOWRAM, PDOWRAM and FWUC	MOWRAM and FWUC
Social Environment					
6	Local Economy such as Employment and Livelihood, etc.	- Rehabilitation of reservoir	<ul style="list-style-type: none"> - To conduct a detailed socio-economic survey of affected families/people in the beginning of the project preparatory stage to estimate the extent of the impact on their household economy - To establish joint committee as IRC to implement land adjustment process, members of which consist of: (i) executing agencies (MOWRAM, PDOWRAM, PDA), (ii) related agencies (PDLMUPC etc.) and (iii) local authorities (commune council, village chief, etc) - To conduct stakeholder meetings with affected families/people and village chiefs to explain and discuss: (i) project purpose, (ii) compensation measures, and (iii) support programs, so as to build consensus on the sub-project and compensation for their losses - To fairly compensate all affected families / people including those without a legal title to land. 	MOWRAM, PDOWRAM, Local authorities, and IRC	MOWRAM, MEF, RD and IRC
7	Land use and utilization of local resources	- Rehabilitation of reservoir	<ul style="list-style-type: none"> - To conduct a detailed socio-economic survey of affected families/persons to clarify their socio-economic conditions and estimate the potential impact before the D/D Phase - To fairly compensate all affected families/persons, including those without a title to land, for all their losses at replacement rates, if any - To hold stakeholder meetings with affected families/people - To prepare a realistic schedule of land acquisition and inform affected families/people of the schedule well in advance - To monitor the living conditions of the affected families/people during the sub-project as well as in the post-project period - To properly restore the affected area after construction works 	MOWRAM, PDOWRAM, PDA, Local authorities, and IRC	MOWRAM, MEF, RD and IRC
8	Socially Vulnerable Groups such as the Poor, Indigenous and Ethnic People (including Gender matter)				
9	Local Conflict of interests				
10	Existing social infrastructures and services	- Operation of construction equipment and vehicles	<ul style="list-style-type: none"> - To hold a series of public consultation meetings for surrounding people in order to explain, discuss and find the way of passage restriction - To educate construction workers for adequate traffic rule of construction vehicles - To post a bill to inform impassable duration to commune council, village chief by means of, such like, social facilities including schools, pagodas and hospitals, after the work schedule is fixed with people's consensus 	Contractor	MOWRAM
11	Misdistribution of Benefit and Damage	- Rehabilitation of reservoir	<ul style="list-style-type: none"> - To conduct detailed socio-economic survey of affected people during early stage of project preparation to identify all losses from land acquisition - To conduct stakeholder meetings with local people including affected people on project contents - To compensate affected persons, including those without title to land. 	MOWRAM, PDOWRAM, Local authorities, and IRC	MOWRAM, MEF, RD and IRC
12	Sanitation	- Operation of construction equipment and vehicles - Rehabilitation of reservoir	<ul style="list-style-type: none"> - To improve sanitary condition of workers by proper arrangement of accommodation, installation of toilets and proper water supply - To implement education programs for workers about sanitation, security and rules/discipline of daily activities - To implement safety education and training for construction workers - To implement periodical patrol of workers in order to avoid both occurrence of local conflict and epidemics of diseases - To hold a series of stakeholder meetings for surrounding people in order to explain construction works and its schedule - To stipulate environmental consideration measures in the technical specifications of the construction works. 	Contractor	MOWRAM
13	Hazardous (risk) infectious diseases such as HIV/AIDS				
14	Accident				

Table AH-3 2.2.6 Environmental Management and Responsibilities for DPISRSP

Impact	Activity	Mitigation/Management Measures	Organization		
			Planning and Implementation	Supervision and Responsible	
Pollution Control					
1	Air pollution and Noise and Vibration	<ul style="list-style-type: none"> - Operation of construction equipment and vehicles - Rehabilitation of existing main/secondary canals and other facilities - Construction of new headworks and its related facilities 	<ul style="list-style-type: none"> - To educate construction workers on minimizing idling of construction machinery - To restricted construction time. e.g. during daytime only - To hold stakeholder meetings to build consensus about the construction time - To stipulate environmental consideration measures in the technical specification of the construction works. 	Design consultant and Contractor	MOWRAM and Contractor
2	Water Pollution by Construction Works (Construction Phase)	<ul style="list-style-type: none"> - Operation of construction equipment and vehicles - Rehabilitation of existing main/secondary canals and other facilities - Construction of new headworks and its related facilities 	<ul style="list-style-type: none"> - To dilute or neutralize alkalified water from concrete mixer trucks by pooling in regulating pond before discharging - To pool discharging water from the concrete plant for dilution or neutralization - To install adequate treatment system for muddy and alkalified water in construction site such as installation of water tank to collect water from concrete works for neutralization - To stipulate environmental consideration measures in the technical specification of the construction works. 	Design consultant and Contractor	MOWRAM and Contractor
3	Waste Management by Construction Works	<ul style="list-style-type: none"> - Operation of construction equipment and vehicles - Rehabilitation of existing main/secondary canals and other facilities - Construction of new headworks and its related facilities 	<ul style="list-style-type: none"> - To comply with relevant laws pertaining to the management and disposal of solid waste, hazardous waste and re-waste - To arrange suitable sites for disposal of solid waste prior to the construction works - To avoid dumping in the area of private property without written consent of the owner - To carry out recycle use of disposed soil as much as possible. 	Design consultant and Contractor	MOWRAM and Contractor
4	Water Pollution (Operation Phase)	<ul style="list-style-type: none"> - Utilization of irrigation water 	<ul style="list-style-type: none"> - To conduct support programs regarding appropriate agricultural management - To introduce check system among the FWUC members regarding agricultural management - To control the amount of fertilizer and pesticide through the training farmers - To monitor water quality and agricultural activities regularly 	MOWRAM, and FWUC	MOWRAM, and FWUC
Natural Environment					
5	Soil Erosion	<ul style="list-style-type: none"> - Operation and maintenance of main / secondary canals 	<ul style="list-style-type: none"> - To implement maintenance of canals by adequate methods and appropriate timing - To design main canal and related structures to consider alleviation of soil erosion 	MOWRAM, PDOWRAM and FWUC	MOWRAM and FWUC
6	Flora, fauna and biodiversity	<ul style="list-style-type: none"> - Construction of new headworks and its related facilities 	<ul style="list-style-type: none"> - To ensure the river maintenance flow to keep a certain level of water in the wet season - To restrict water intake from the river during the dry season - To ensure adequate and proper operation and maintenance of the new head works by FWUC 	MOWRAM, PDOWRAM and FWUC	MOWRAM and FWUC
Social Environment					
7	Land use and utilization of local resources	<ul style="list-style-type: none"> - Rehabilitation of existing main/secondary canals and other facilities 	<ul style="list-style-type: none"> - To realign and design the irrigation and drainage canals to minimize the scale of land acquisition caused by the sub-project during the D/D Phase 	MOWRAM, PDOWRAM, Local authorities, and IRC	MOWRAM, MEF, RD and IRC
8	Local conflict of interests	<ul style="list-style-type: none"> - Construction of new headworks and its related facilities 	<ul style="list-style-type: none"> - To establish joint committee as IRC to implement land adjustment process, members of which consist of: (i) executing agencies (MOWRAM, PDOWRAM, PDA), (ii) related agencies (PDLMUPC etc.) and (iii) local authorities (commune council, village chief, etc) - To conduct a detailed socio-economic survey of affected families/people to identify/estimate all the potential losses from land acquisition before the D/D Phase - To fairly compensate all affected families/persons, including those without a 	MOWRAM, PDOWRAM, Local authorities, and IRC	MOWRAM, MEF, RD and IRC

No.	Environment Component	Parameters	Monitoring Location	Duration /Frequency	Institutional Responsibility	Sub-project	Unit Cost
1	Water Monitoring	<ul style="list-style-type: none"> - Temperature of air/water - Flow rate, color, odor, appearance - Transparency (turbidity) - Physico-chemical properties (pH, EC, TSS, BOD, DO) - Total Nitrogen - Total Phosphorus - Micro-organisms (bacteria, coliform group) 	<ul style="list-style-type: none"> - Surface water at two points for (upstream and downstream of construction area) canals and rivers - Rivers where are intaked by SPPIDRIP 	- Quarterly (Rainy season and dry season)	MOWRAM and FWUC	All	KHR. 502,000 /location
2	Soil Erosion	<ul style="list-style-type: none"> - Canal status 	<ul style="list-style-type: none"> - All canals (except concreat lining canal) 	-Monthly	FWUC	RCHRSP, USUSRSP, KSBISRSP, MC35RSP, DPISRSP	N/A
3	Borrow area	<ul style="list-style-type: none"> - Borrow areas re-develop-ment 	<ul style="list-style-type: none"> - Borrow area 	-After construction	Construction contractor	All	N/A

Note: Negative impact of Air pollution by construction is very limited and temporary, because each construction scale is not large. Then, no necessary to monitor air quality itself

Monitoring Form E-1: Monitoring of Noise and Vibration

a) Type of work: _____

b) Monitoring Frequency: 1st / 2nd / 3 rd

c) Monitoring Period From Date Month Year

To Date Month Year

		Item		Unit	Date1	Date2	Date3	Remark (Date)	
					DD/MM /YY	DD/MM /YY	DD/MM /YY		
		Day Time (6:00-18:00)							
		Noise - Residential Area :60 dB(A)							
		Noise - Commercial Area: 70dB(A)							
No.1	(Detail of Location)	Noise-1	L_{eq}	dB(A)					
		Noise-2	L_{min}	dB(A)					
		Noise-3	L_{max}	dB(A)					
		Vib-1	L_{10}	dB					
No.2	(Detail of Location)	Noise-1	L_{eq}	dB(A)					
		Noise-2	L_{min}	dB(A)					
		Noise-3	L_{max}	dB(A)					
		Vib-1	L_{10}	dB					
No.3	(Detail of Location)	Noise-1	L_{eq}	dB(A)					
		Noise-2	L_{min}	dB(A)					
		Noise-3	L_{max}	dB(A)					
		Vib-1	L_{10}	dB					
	(Detail of Location)	Noise-1	L_{eq}	dB(A)					
		Noise-2	L_{min}	dB(A)					
		Noise-3	L_{max}	dB(A)					
		Vib-1	L_{10}	dB					

Source: prepared by JICA Survey Team based on JICA guideline

Monitoring Form E-3: Monitoring of Construction Vehicle/Machine

a) Detail of location: _____

b) Type of work: _____

c) Monitoring Period From Date Month Year

To Date Month Year

	Working Time		Number				Type of construction
			Construction vehicle		Construction machine		
(Week)	Start	Finish	Plan	Actual	Plan	Actual	
Day/Month (Mon)							
Day/Month (Tue)							
Day/Month (Wed)							
Day/Month (Thu)							
Day/Month (Fri)							
Total							

Source: prepared by JICA Survey Team based on JICA guideline

Monitoring Form E-4: Monitoring of Waste Management

a) Detail of location: _____

b) Type of work: _____

c) Monitoring Period From Date Month Year

To Date Month Year

S.N.	Type of waste	Volume (Unit)	Detail	Treatment Measure	Remark
1	Construction soil	(ton)			
2	Concrete	(ton)			
3	.....			
4					
5					

Source: prepared by JICA Survey Team based on JICA guideline

Monitoring Form E-5: Monitoring of Soil Erosion

a) Detail of location: _____

b) Type of work: _____

c) Monitoring Times : 1st / 2nd / 3rdd) Monitoring Period From Date _____ Month _____ Year _____To Date _____ Month _____ Year _____

S.N.	Items	Unit	Detail	Remark
1	Current land use			
2	Size of soil erosion	Km x Km.		
3	Reason of soil erosion			
4	Past record	DD/MM/YY		
5	Nearest water source (if any)	Nos., kind		

Source: prepared by JICA Survey Team based on JICA guideline

Monitoring Form E-6: Monitoring of Borrow Area

a) Location: _____

b) Monitoring Times: 1st / 2nd / 3rdc) Monitoring Period From Date _____ Month _____ Year _____To Date _____ Month _____ Year _____

S.N.	Items	Unit	Detail	Remark
1	Current land use			
2	Size of borrow area	km x km.		
3	No. of settlement in the borrow area	Nos.		
4	No. of trees in the borrow area	Nos.		
5	Scale of haul road in the borrow area (if any)	Nos. x Length(km) x Width (m)		
6	Detail of the existing structure (if any)	Nos., kind		
7	Detail of the existing infrastructure (if any)	Nos., kind		
8	Nearest water source (if any)	Nos., kind		

Source: prepared by JICA Survey Team based on JICA guideline

AH-3.3.2 Environmental Monitoring Plan for Social Environment

(1) Monitoring Plan of Social Environmental Impact

Almost social environmental impacts will be caused by resettlement and land acquisition issues. Project monitoring will be the responsibility of the Resettlement Unit of MOWRAM and IRC for SPPIDRIP who will prepare the monthly progress reports. The report will compare the progress of SPPIDRIP to the target's setup at the commencement of SPPIDRIP. The list of impact performance indicators will be used to monitor project objectives. The socioeconomic survey conducted will provide the benchmarks for comparison.

The monitoring indicators can be divided into the following 6 primary categories, which would provide insight to 3 types such as process, output and impact. The indicators are shown in Table AH-3.3.2.1.

AH-3.3.2.1 Monitoring Indicators

(1) Preparation of RAP
1) Number of Identified Eligible Persons
2) Size of Owner Identified land to be acquired
3) Size of evaluated land to be acquired
4) Number of evaluated structures to be acquired
5) Progress of finalization of resettlement budget
6) Progress of Preparing the RAP
(2) Physical Indicators
1) Extent of land acquired
2) No. of structures demolished
3) Number of land owner's and users and private structure for which owner paid compensation
4) Number of families affected
5) Number of families approaching for purchase of agricultural land
6) Number of affected person's receiving assistance or compensation
7) Number of affected persons provided with transport facilities/shifting allowance/transition allowance.
(3) Social Indicators
1) Taken care of displacement of Vulnerable people.
2) Number of information of Grievance system for Vulnerable people
(4) Economic Indicators
1) Status of payment for PAP's cash
2) Overall livelihood
(5) Grievance
1) Cases of land acquisition referred to court which are pending and settled
2) Number of Stakeholder meeting for Grievance
3) Number of cases disposed by IRC to the satisfaction of PAP's
(6) Financial Indicators
1) Amount of compensation paid for land/structure
2) Cash grant for shifting outsets
3) Amount paid for one time financial assistance
4) Amount paid for community structure development

Source: JICA Survey Team

Monitoring Form S-1: Preparation and Implementation Period

Name of village:	
Date:	
Monitoring period:	
Name of person in charge of filling this form (name of agency):	
1. Consultation with PAP	
Planned period:	Implemented period:
a) Describe the consultation activities conducted during the monitoring period:	
b) Result of the consultation (reactions, opinions, objections, etc.):	
c) Main reason(s) for delay of progress (if delayed):	
2. Agreement from PAP	
Planned period:	Implemented period:
a) Number of households who agreed to be resettled: households	
b) Main reason(s) for delay of the negotiations (if delayed):	
3. Compensation payment	
Planned period:	Implemented period:
a) Number of households who received compensation: households	
b) Main reason(s) for delay (if delayed):	
4. Relocation of PAP	
Planned period:	Implemented period:
a) Number of households already relocated: households	
b) Main reason(s) for delay (if delayed):	
5. Grievance Status	
Planned period:	Implemented period:
1) Cases of land acquisition referred to court which are pending and settled	
2) Number of Stakeholder meeting for Grievance	
3) Number of cases disposed by IRC to the satisfaction of PAP's	
6. Status of Vulnerable people.	
Planned period:	Implemented period:
1) Taken care of displacement of Vulnerable people	
2) Number of information of Girevance system for Vulnerable people	

Note: Monitoring for these items should be implemented from the start of the resettlement procedure to the end of all procedures of the physical resettlement with monthly frequency.

This monitoring form should be prepared for each village.

This is a guideline monitoring form which indicates the major items to be monitored. The consolidated IRC-wise monitoring forms which are more practical and user-friendly at the field level are proposed abbreviation RAP or Land acquisition plan by MOWRAM and IRC.

Source: JICA Survey Team

Monitoring Form S-2 Land Acquisition and Resettlement (Preparation and Implementation Period)

Preparation of the RAP

Province Jurisdiction	Date	Resettlement workers (man-months)	Training and monilization (No. of trained personel)	socio-economic surveyed persons (No.)	Identified eligible persons (No.)	Distribution of information brochure (No. of distributed)	Holding Public constlation (No. of held)
Kandal							
Kampong Speu							
Takeo							

Province Jurisdiction	Date	Land to be acquired (ha)	Owner identified land to be acquired (ha)	Not owner identified land to be acquired (ha)	Evaluated land to be acquired (ha)	Not evaluated land to be acquired (ha)	Identified structures to be acquired (No.)	Evaluated structures to be acquired (No.)	Identified Eligible persons (No.)	Finalization of the budget for the RAP (%)	Preparation of the RAP (%)	approval of the RAP (done)
Kandal												
Kampong Speu												
Takeo												

Implementation of the RAP

Province Jurisdiction	Date	Land to be acquired (ha)	No of affected Household /Commercial Structures/Common Property	Land already acquired (ha)	Household/Com mercial Structures/. Common Property already relocated	Land remaining to be acquired (ha)	Household/C ommercial Structures/. Common Property to be relocated	Payment Status	Expected date of completion
Kandal									
Kampong Speu									
Takeo									

1. Land acquisition	
Planned completion date:	Actual completion date:
Main reason(s) for delay (if delayed):	
2. Relocation Status of Common Property Resources	
Planned period:	Actual completion date
a) Water facilities b) School c) Health centre d) Social hall e) Access road f) Cultural Centre g) Main reason(s) for delay (if delayed)	
3. Compensation payment	
Planned completion date:	Actual completion date:
Main reason(s) for delay (if delayed):	
4. Relocation of PAPs	
Planned completion date:	Actual completion date:
Main reason(s) for delay (if delayed):	

Note: This is a guideline monitoring form which indicates the major items to be monitored. The consolidated IRC-wise monitoring forms which are more practical and user-friendly at the field level are proposed abbreviation RAP or Land acquisition plan by MOWRAM and IRC..

Source: JICA Survey Team

(2) Grievance Redress Mechanism

As for Grievance Redress Mechanism (GRM) is a mechanism by which Project Affected People (PAPs) concerns complains and grievances are settle in transparent and fair manner. PAPs will be able to access to the mechanism at no cost. Basic GRM of land acquisition in Cambodia is shown below.

<Grievance Redress Mechanism of land acquisition in Cambodia>	
(1)	IRC requests Provincial Governor to establish Grievance Redress Committee,
(2)	Provincial Grievance Redress Committee (PGRC) is established by Provincial Governor based on IRC's Request,
(3)	If PAPs have any grievance for land acquisition of the Project, IRC-working group (IRC-WG), Provincial Resettlement Sub-Committee (PRSC) -working group (PRSC-WG) or Commune/Sangkat receives grievance from PAP. Necessary items for grievance are following;
	i) Name of the owner of and/or holder of real right to the immovable property,
	ii) Address and telephone number,
	iii) Reason for the complaint (elaboration of the grievance),
	iv) Description of the legalities regarding the property, and
	v) Interests of the owner of and/or holder of real right to their property
(4)	IRC-WG, PRSC-WG or Commune/Sangkat settle the grievance within 15 working days. If not, tell PAP's to move on to the next step,
(5)	Districts/Khan Office receives the above unsolved grievance case,
(6)	Districts/Khan Office settles the grievance 15 working days. If not, tell PAP's to move on to the next step,
(7)	PGRC Office receives the above unsolved grievance case,
(8)	PGRC settles the grievance 30 working days. If not, implement administrative procedures and tell PAP's to move on to the next step,
(9)	Court receives the above unsolved grievance case lodged by the PAPs, and
(10)	Court makes a final decision to the grievance. Both Government side and PAPs follow the decision

Source: JICA Survey Team based on based on Ministry of Economic and Finance supported by JICA (2002), Basic Resettlement Procedure

Above mention, IRC-WG and PRSC-WG are implementation organizations for land acquisition under IRC. PGRC is established by Provincial Governor based on IRC's Request. Proposed members of PGRC are shown in Table AH-3.3.2.2.

Table AH-3.3.2.2 Proposed Member of Provincial Grievance Redress Committee

	Proposed member	Position
1	Provincial Governnor and/or First Deputy Provincial Governor (Kandal, Kampong Speu, Kampong Chhnang, Takeo)	Chairman
2	Director/Deputy Director of Relevant Provincial(Kandal, Kampong Speu, Kampong Chhnang, Takeo) Departments	Vice Chairman
3	Chief/Deputy Chief of State Property Office of MEF	Member
4	Chief/Deputy Chief of Light Criminal Office of the Relevant Provincial(Kandal, Kampong Speu, Kampong Chhnang, Takeo) Departments	
5	Chief/Deputy Chief of the Relevant Provincial(Kandal, Kampong Speu, Kampong Chhnang, Takeo) Military Police Headquater	
6	Relevant District Governor	
7	Relevant Commune and Village Chief	
8	Representatives of NGOs	

Source: JICA Survey Team based on based on Ministry of Economic and Finance supported by JICA (2002), Basic Resettlement Procedure

Monitoring form specified by JICA is shown in Attachment 1.

CHAPTER AH-4 ENVIRONMENTAL CHECKLIST BASED ON JICA GUIDELINES ON CONFIRMATION OF ENVIRONMENTAL AND SOCIAL CONSIDERATION

AH-4.1 Roleang Chrey Headworks Rehabilitation Sub-project

Table AH-4.1.1 Environmental Checklist based on JICA Guidelines on Confirmation of Environmental and Social Consideration on RCHRSP

Category	Environmental Item	Main Check Items	Yes:Y No:N	Confirmation of Environmental Considerations
I. Permits and Explanation	(1) EIA and Environmental Permits	(a) Have EIA reports been already prepared in official process? (b) Have EIA reports been approved by authorities of the host country's government? (c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(a) N (b) N (c) N (d) N	(a) The Sub-decree on Environmental Impact Assessment Process explains that irrigation development with more than 5,000 ha is required to carry out EIA for approval from MOE prior the implementation. However, RCHRSP focuses only on rehabilitation of existing structures consisting of regulator, its appurtenant structures, upstream of main canals and on-farm development covering 570 ha of Model Area, therefore, no EIA will be required. (b) In the survey, preliminary environmental study is carried out from the view point of: (i) pollution control, (ii) natural environment and (iii) pollution. On this basis, environmental impact from the RCHRSP is small and limited. (c) Not applicable. Because no EIA is required. (d) Not applicable. No other approval is required for RCHRSP.
	(2) Explanation to the Local Stakeholders	(a) Have contents of RCHRSP and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders? (b) Have the comment from the stakeholders (such as local residents) been reflected to the project design?	(a) Y (b) N	(a) MOWRAM have already explained the RCHRSP necessity and proposed plan to stakeholders during F/S (2003). (b) Farmers have fully agreed to of the proposed plan of RCHRSP.
	(2) Explanation of Alternatives	(a) Have alternative plans of RCHRSP been examined with social and environmental considerations?	(a)N	(a) RCHRSP is the rehabilitation works to maintain water supply to its command area. The facilities have been seriously deteriorated, and if left as they are, it is sure that the water supply to the command area would be difficult in the near future, which would create social conflict over water usage among upstream and downstream farmers in the command area. It is, therefore, difficult to consider effective alternatives of RCHRSP other than originally proposed plan in the survey. If zero option is considered for RCHRSP, irrigation water will not be ensured in the command area. Since farmers will have to depend only on rainfed cultivation, crop production will be drastically decreased.

Category	Environmental Item	Main Check Items	Yes:Y No:N	Confirmation of Environmental Considerations
2. Pollution Control	(1) Water Quality	(a) Are considerations given to water pollution of the surrounding water bodies, such as rivers and groundwater by effluents or leachates from agricultural lands? Are adequate use/disposal standards for fertilizers, agrochemicals, and livestock wastes established? Is a framework established to increase awareness of the standards among farmers? (b) Is a framework monitoring established for water pollution of rivers and groundwater?	(a) Y (b) Y	(a) In relation to water quality control, following activities are proposed under RCHRSP: (i) to conduct support programs regarding appropriate agricultural management, (ii) to introduce composting to the farmers, (iii) to introduce check system among the FWUC members regarding farming management, (iv) to monitor water quality and agricultural activities regularly. (b) Sub-decree on Water Pollution Control stipulates water quality standard in Cambodia. MOE has the responsibility for monitoring the pollution sources and the situation of the water pollution in public water bodies. In addition, monitoring of RCHRSP is proposed to be carried out under the responsibility of contractor, PDOWRAM, MOWRAM during construction phase, and FWUC, PDOWRAM, MOWRAM during operation phase.
	(2) Waste	(a) Are wastes properly treated and disposed of in accordance with the country's regulations?	(a) Y	(a) It is proposed that construction waste will be properly disposed under the responsibility of contractors based on relevant laws pertaining to the management and disposal of solid waste, hazardous waste and re-waste.
	(3) Soil Contamination	(a) Is there a possibility that impacts in irrigated lands, such as salinization of soils will result? (b) Are adequate measures taken to prevent soil contamination of irrigated lands by agrochemicals, heavy metals and other hazardous substances? (c) Are any agrochemicals management plans prepared? Are any usages or any implementation structures organized for proper use of the plans?	(a) N (b) Y (c) Y	(a) Not applicable. The command area has low possibilities of being affected by salinization. (b) It is proposed that training of farmers for appropriate application of chemicals and fertilizer under soft component program of DPISRSP. (c) The command area of Roleang Chrey Regulator has been already developed as paddy field, however, socio-economic survey disclosed that usage of agro-chemicals and fertilizer is limited at present due to those high cost. As mentioned above, following activities are proposed under RCHRSP related to agrochemicals management: (i) to conduct support programs regarding appropriate agricultural management and (ii) to introduce check system among the FWUC members regarding agricultural management
	(4) Subsidence	(a) In the case of extraction of a large volume of groundwater, is there a possibility that the extraction of groundwater will cause subsidence?	(a) N	(a) Not applicable since water source of RCHRSP depend on river run-off.
	(5) Odor	(a) Are there any odor sources? Is there a possibility that odor problems will occur to the inhabitants?	(a) N	(a) Not applicable since no odor source is near the command area.
3. Natural Environment	(1) Protected Areas	(a) Is the RCHRSP site or discharge area located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that SPPIDRIP will affect the protected areas?	(a) N	(a) Not applicable since the RCHRSP Area is located in the outside of any Protected Areas.
	(2) Ecosystem	(a) Does SPPIDRIP site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)?	(a) N (b) N (c) N (d) N (e) N	

Category	Environmental Item	Main Check Items	Yes:Y No:N	Confirmation of Environmental Considerations
3. Natural Environment		<p>(b) Does SPPIDRIP site or discharge area encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions?</p> <p>(c) Is there a possibility that SPPIDRIP will result in the loss of breeding and feeding grounds for valuable wildlife? If they are lost, are there substitutes for the grounds near the original locations?</p> <p>(d) Is there a possibility that overgrazing will cause ecological degradation, such as impacts on wildlife habitats and desertification?</p> <p>(e) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem?</p>		<p>(a) Not applicable.</p> <p>(b) Not applicable.</p> <p>(c) Not applicable since RCHRSP Area already have developed as agriculture land.</p> <p>(d) Not applicable since the purpose of RCHRSP is the rehabilitation of existing irrigation facilities.</p> <p>(e) Not applicable since the purpose of RCHRSP is the rehabilitation of existing irrigation facilities, and not include the scope of new land reclamation.</p>
4. Social Environment	(1) Resettlement	<p>(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement?</p> <p>(b) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement?</p> <p>(c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement?</p> <p>(d) Is the compensations going to be paid prior to the resettlement?</p> <p>(e) Is the compensation policies prepared in document?</p> <p>(f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples?</p> <p>(g) Are agreements with the affected people obtained prior to resettlement?</p> <p>(h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan?</p> <p>(i) Are any plans developed to monitor the impacts of resettlement?</p> <p>(j) Is the grievance redress mechanism established?</p>	<p>(a) Y</p> <p>(b) N</p> <p>(c) N</p> <p>(d) N</p> <p>(e) N</p> <p>(f) N</p> <p>(g) N</p> <p>(h) N</p> <p>(i) N</p> <p>(j) N</p>	<p>(a) Involuntary resettlement is not anticipated under RCHRSP since the sub-project aims to rehabilitate existing facilities and no large scale expansion works are included. However, land acquisition is necessary for: (i) temporary diversion channels and other temporary facilities for construction works and (ii) drainage extending 3km. The land acquisition process will be implemented through proper impact mitigation measures with adequate compensation by MOWRAM.</p> <p>(b)-(j) Not applicable. Mitigation measures for land acquisition are to refer to item (2) Living and Livelihood.</p>
	(2) Living and Livelihood	<p>(a) Is there a possibility that SPPIDRIP will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary?</p>	<p>(a) Y</p> <p>(b) Y</p> <p>(c) Y</p> <p>(d) Y</p> <p>(e) N</p>	<p>(a) No significant adverse impact will be expected since RCHRSP aims to rehabilitate existing facilities and no large scale expansion works are included. In addition, following measures are proposed to reduce any negative impacts; (i) to design temporary diversion channels and canals/ drainages by minimizing land acquisition during D/D Phase, (ii) to fairly compensate to all affected person for land acquisition based on relevant regulations and guidelines, (iii) to establish a temporary bridge during construction phase, and (iv) to disseminate information on the limitation period of transportation due to construction works to commune council and others.</p>

Category	Environmental Item	Main Check Items	Yes:Y No:N	Confirmation of Environmental Considerations
4. Social Environment		<p>(b) Is proper allotment made for rights to agricultural land use? Is there a possibility that the allotment will result in inequitable distribution or usurpation of land and available resources?</p> <p>(c) Are proper allotments, such as water rights allotment in SPPIDRIP area made? Is there a possibility that the allotments will result in inequitable distribution or usurpation of water rights and available resources?</p> <p>(d) Is there a possibility that the amount of water used (surface water, groundwater) by SPPIDRIP will adversely affect the downstream fisheries and water uses?</p> <p>(e) Is there a possibility that water-borne or water-related diseases (e.g., schistosomiasis, malaria, filariasis) will be introduced? Is adequate consideration given to public health education, if necessary?</p>		<p>(b) RCHRSP is not included allotment of land use right since RCHRSP is just rehabilitation work of existing water supply facilities, no large scale expansion work are included. Therefore, no significant adverse impact will be expected since RCHRSP.</p> <p>(c) Soft component is proposed to strengthen FWUC in order to establish institutional set-up to properly manage irrigation water within the Model Area (570 ha) of RCHRSP. Monitoring and evaluation for FWUC activities will be carried out by PDOWRAM supported by MOWRAM.</p> <p>(d) In the proposed plan, river maintenance water is considered to the downstream of Roleang Chrey Headworks on Prek Thnot River in order to avoid any adverse impact in the downstream areas.</p> <p>(e) No significantly negative impact will be anticipated since RCHRSP is just rehabilitation project.</p>
	(3) Heritage	(a) Is there a possibility that SPPIDRIP will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a) N	(a) Not applicable since there are not local archeological, historical, cultural, and religious heritage near RCHRSP Area.
	(4) Landscape	(a) Is there a possibility that SPPIDRIP will adversely affect the local landscape? Are necessary measures taken?	(a) N	(a) Not applicable since RCHRSP aims to rehabilitate existing facilities and no large scale expansion works are included.
	(5) Ethnic Minorities and Indigenous Peoples	<p>(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples?</p> <p>(b) Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources respected?</p>	<p>(a) N</p> <p>(b) N</p>	<p>(a) Not applicable since there is no ethnic minority living in RCHRSP Area</p> <p>(b) Ditto</p>
	(6) Working Condition	<p>(a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in SPPIDRIP?</p> <p>(b) Are tangible safety considerations in place for individuals involved in SPPIDRIP, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials?</p> <p>(c) Are intangible measures being planned and implemented for individuals involved in SPPIDRIP, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.?</p> <p>(d) Are appropriate measures taken to ensure that security guards involved in SPPIDRIP not to violate safety of other individuals involved, or local residents?</p>	<p>(a) Y</p> <p>(b) Y</p> <p>(c) Y</p> <p>(d) Y</p>	<p>(a) RCHRSP will be implemented in compliance with the Labor Law stipulated by RGC.</p> <p>(b) Following measures are proposed to implement construction works in safe manner: (i) organization of education program about sanitation, security and rules/discipline and daily activity to construction labors, (ii) implementation of safety education and training for labors, and (iii) conduct of periodical patrol of working conditions.</p> <p>(c) Ditto</p> <p>(d) As mentioned above, not only security guards but also all construction labors will be trained by education program for social consideration. In addition, periodical patrol of workers will be implemented to avoid local conflict.</p>
	5. Others	(1) Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)?	<p>(a) Y</p> <p>(b) Y</p> <p>(c) Y</p>	(a) Following measures are proposed to reduce impacts by the construction: (i) air pollution, noise and the vibration; limit construction time (e.g. at daytime only), (ii) water pollution; proper treatment before

Category	Environmental Item	Main Check Items	Yes:Y No:N	Confirmation of Environmental Considerations
5. Others		<p>(b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts?</p> <p>(c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?</p>		<p>discharging and monitoring during construction phase, (iii) organization of education program to construction labors and (iv) inclusion of the environmental consideration matters in the technical specification of the construction works.</p> <p>(b) Most of the construction works are small scale and therefore their impacts toward natural environment (ecosystem) is limited. In addition, proper treatment of disposed water is proposed to minimize the influence on river ecosystem by the rehabilitation works.</p> <p>(c) Most of the construction works are small scale and therefore impact of construction is limited. In addition, mitigation measures proposed are: (i) to educate construction workers about environment impacts, (ii) to stipulate environmental consideration measures in the technical specification of the construction works, (iii) to limit construction time to avoid disturbance of community life, (iv) to explain purpose and periods of construction to rural community, (v) to recycle materials from construction works. The education program for construction workers are to be organized by the Contractors.</p>
	(2) Monitoring	<p>(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts?</p> <p>(b) What are the items, methods and frequencies of the monitoring program?</p> <p>(c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)?</p> <p>(d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?</p>	<p>(a) Y (b) Y (c) Y (d) N</p>	<p>(a) Water quality monitoring is proposed for monitoring impact of RCHRSP.</p> <p>(b) The water quality monitoring will commence prior to the construction works. Monitoring items are; (i) pH, (ii) transparency (turbidity), (iii) water temperature, (iv) odor, and (v) appearance, which are proposed to be conducted once a month with two-year period. Methods are observation and instrumental measurement in the field.</p> <p>(c) Monitoring is proposed to be carried out under the responsibility of MOWRAM and PDOWRAM. And also, IRC of SPPIDRIP is responsible for monitoring of land acquisition process, too.</p> <p>(d) At present, the format and the frequency of the report are not provided from regulatory authorities.</p>
6. Note	Reference to Checklist of Other Sectors	<p>(a) Where necessary, pertinent items described in the Forestry checklist should also be checked.</p> <p>(b) For SPPIDRIP including construction of large-scale weirs, reservoirs, and dams, where necessary, pertinent items described in the Hydropower, Dams and Reservoirs checklist should also be checked.</p>	<p>(a) N (b) N</p>	<p>(a) Not applicable since RCHRSP aims to rehabilitate existing facilities and no large scale expansion works are included.</p> <p>(b) -ditto</p>
	Note on Using Environmental Checklist	<p>(a) If necessary, the impacts to transboundary or global issues should be confirmed (e.g., SPPIDRIP includes factors that may cause problems, such as transboundary waste treatment, acid rain,</p>	<p>(a) N</p>	<p>(a) Not applicable since RCHRSP aims to rehabilitate existing facilities and no large scale expansion works are included.</p>

Category	Environmental Item	Main Check Items	Yes:Y No:N	Confirmation of Environmental Considerations
		destruction of the ozone layer, or global warming).		

Note:

- 1) Regarding the term "Country's Standards" mentioned in the above table, in the event that environmental standards in the country where SPPIDRIP is located diverge significantly from international standards, appropriate environmental considerations are required to be made. In cases where local environmental regulations are yet to be established in some areas, considerations should be made based on comparisons with appropriate standards of other countries (including Japan's experience)
- 2) Environmental checklist provides general environmental items to be checked. It may be necessary to add or delete an item taking into account the characteristics of SPPIDRIP and the particular circumstances of the country and locality in which SPPIDRIP is located.

AH-4.2 Upper Slakou Irrigation System Rehabilitation Sub-project

Table AH-4.2.1 Environmental Checklist based on JICA Guidelines on Confirmation of Environmental and Social Consideration on USISRSP

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations
1. Permits and Explanation	(1) EIA and Environmental Permits	(a) Have EIA reports been already prepared in official process? (b) Have EIA reports been approved by authorities of the host country's government? (c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(a) N (b) N (c) N (d) N	(a) The Sub-decree on Environmental Impact Assessment Process explains that irrigation development with more than 5,000 ha is required to carry out EIA for approval from MOE prior the implementation. The command area of USISRSP is 3,500 ha, less than 5,000 ha. Therefore, EIA process will not be required for USISRSP by MOE. (b) In the survey, preliminary environmental study is carried out from the view point of: (i) pollution control, (ii) natural environment and (iii) pollution. On this basis, environmental impact from the USISRSP is small and limited. (c) Not applicable. Because no EIA is required. (d) Not applicable. No other approval is required for USISRSP.
	(2) Explanation to the Local Stakeholders	(a) Have contents of USISRSP and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders? (b) Have the comment from the stakeholders (such as local residents) been reflected to the project design?	(a) Y (b) Y	(a) MOWRAM already explained to stakeholders the USISRSP necessity and plan during F/S and in this year (2011). In addition, MOWRAM will deliver new information of USISRSP to local people through stakeholder meeting. (b) MOWRAM mentioned that local people and farmers fully agreed to implementation of USISRSP.
	(3) Explanation of Alternatives	(a) Have alternative plans of USISRSP been examined with social and environmental considerations?	(a) N	(a) USISRSP is the rehabilitation works to maintain water supply to its command area. The facilities have been seriously deteriorated, and if left as they are, it is sure that the water supply to the command area would be difficult in the near future, which would create social conflict over water usage among upstream and downstream farmers in the command area. In M/P (2002), twelve development alternatives for combination of various water resources were examined. In addition, draft resettlement framework (2012) by MOWRAM-RU proposed new alignment of 3D to avoid large impact to surrounding area. In D/D Phase, the technical availability must be re-considered.

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations
2. Pollution Control	(1) Water Quality	(a) Are considerations given to water pollution of the surrounding water bodies, such as rivers and groundwater by effluents or leachates from agricultural lands? Are adequate use/disposal standards for fertilizers, agrochemicals, and livestock wastes established? Is a framework established to increase awareness of the standards among farmers? (b) Is a framework monitoring established for water pollution of rivers and groundwater?	(a) Y (b) Y	(a) In relation to water quality control, following activities are proposed under USISRSP: (i) to conduct support programs regarding appropriate agricultural management, (ii) to introduce composting to the farmers, (iii) to introduce check system among the FWUC members regarding farming management, (iv) to monitor water quality and agricultural activities regularly. (b) Sub-decree on Water Pollution Control stipulates water quality standard in Cambodia. MOE has the responsibility for monitoring the pollution sources and the situation of the water pollution in public water bodies. In addition, monitoring of SPPIDRIP is proposed to be carried out under the responsibility of contractor, PDOWRAM, MOWRAM during construction phase, and FWUC, PDOWRAM, MOWRAM during operation phase.
	(2) Waste	(a) Are wastes properly treated and disposed of in accordance with the country's regulations?	(a) Y	(a) It is proposed that construction waste will be properly disposed under the responsibility of contractors based on relevant laws pertaining to the management and disposal of solid waste, hazardous waste and re-waste.
	(3) Soil Contamination	(a) Is there a possibility that impacts in irrigated lands, such as salinization of soils will result? (b) Are adequate measures taken to prevent soil contamination of irrigated lands by agrochemicals, heavy metals and other hazardous substances? (c) Are any agrochemicals management plans prepared? Are any usages or any implementation structures organized for proper use of the plans?	(a) N (b) Y (c) Y	(a) Not applicable. The command area has low possibilities of being affected by salinization. (b) It is proposed that training of farmers for appropriate application of chemicals and fertilizer under soft component program of USISRSP. (c) The command area of USISRSP has been already developed as paddy field, however, socio-economic survey disclosed that usage of agro-chemicals and fertilizer is limited at present due to those high cost. As mentioned above, following activities are proposed under USISRSP related to agrochemicals management: (i) to conduct support programs regarding appropriate agricultural management and (ii) to introduce check system among the FWUC members regarding agricultural management
	(4) Subsidence	(a) In the case of extraction of a large volume of groundwater, is there a possibility that the extraction of groundwater will cause subsidence?	(a) N	(a) Not applicable since water source of USISRSP depend on river run-off.
	(5) Odor	(a) Are there any odor sources? Is there a possibility that odor problems will occur to the inhabitants?	(a) N	(a) Not applicable since no odor source is near the command area.
	3. Natural Environment	(1) Protected Areas	(a) Is the USISRSP site or discharge area located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that USISRSP will affect the protected areas?	(a) N	(a) Not applicable since the USISRSP Area is located in the outside of any protected areas.
(2) Ecosystem		(a) Does the USISRSP site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (b) Does the USISRSP site or discharge area encompass the protected habitats of endangered species designated by	(a) N (b) N (c) N (d) N (e) N	(a) Not applicable. (b) Not applicable. (c) Not applicable since the USISRSP Area is already developed as agriculture land. (d) Not applicable since the purpose of USISRSP is the rehabilitation of

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations
		<p>the country's laws or international treaties and conventions?</p> <p>(c) Is there a possibility that USISRSP will result in the loss of breeding and feeding grounds for valuable wildlife? If they are lost, are there substitutes for the grounds near the original locations?</p> <p>(d) Is there a possibility that overgrazing will cause ecological degradation, such as impacts on wildlife habitats and desertification?</p> <p>(e) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem?</p>		<p>existing irrigation facilities.</p> <p>(e) No significant adverse impact will be expected since the purpose of USISRSP is the rehabilitation of existing irrigation facilities, and not include the scope of new land reclamation.</p>
4. Social Environment	(1) Resettlement	<p>(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement?</p> <p>(b) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement?</p> <p>(c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement?</p> <p>(d) Is the compensations going to be paid prior to the resettlement?</p> <p>(e) Is the compensation policies prepared in document?</p> <p>(f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples?</p> <p>(g) Are agreements with the affected people obtained prior to resettlement?</p> <p>(h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan?</p> <p>(i) Are any plans developed to monitor the impacts of resettlement?</p> <p>(j) Is the grievance redress mechanism established?</p>	<p>(a) Y (b) Y (c) Y (d) Y (e) Not clear (f) Y (g) Y (h) Y (i) Y (j) Y</p>	<p>(a) USISRSP might involve no large involuntary resettlement however, small scale resettlement might be occurred by USISRSP as the case may be. Affected buildings and other facilities including canal crossings might be over 200 in number along main canal and secondary canal area. And paddy field illegally cultivated inside the Tumnup Lok Reservoir will be submerged if the reservoir is constructed. In order to mitigate social impact engendered from USISRSP, it is proposed that canals be designed to minimize affected areas for land acquisition as much as possible during D/D. Also, the land acquisition process is proposed to be implemented properly through environmentally-sound policy by MOWRAM.</p> <p>(b) MOWRAM has already explained abovementioned matter to affected people during January to February 2012.</p> <p>(c) MOWRAM-RU conducted detailed socio-economic and inventory of losses (IOL) survey to identify all losses from land acquisition and prepare the draft resettlement framework (2012).</p> <p>(d) All the arrangement will be completed before the land acquisition.</p> <p>(e) MOWRAM-RU already prepared draft resettlement framework (2012) including compensation policy. The document will be revised according to project phase.</p> <p>(f) The draft resettlement framework (2012) have prepared by MOWRAM-RU The framework included particular attention to vulnerable groups such as additional cash payment.</p> <p>(g) Agreement with affected people was obtained through stakeholder meeting for draft resettlement framework (2012).</p> <p>(h) MOWRAM has already established MOWRAM-RU to conduct environmental and social analysis for the project implementation. MOWRAM and IRC of USISRSP have experiences of implementing resettlement and land acquisition of</p>

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations
				<p>the similar project.</p> <p>(i) The draft resettlement framework stipulated monitoring and evaluation process and monitoring responsible organization as social and environmental unit (SEU) of MOWRAM.</p> <p>(j) The draft resettlement framework includes grievance redress mechanism. The responsible organization is Grievance Committee under Provincial Resettlement Sub-committee</p>
4. Social Environment	(2) Living and Livelihood	<p>(a) Is there a possibility that USISRSP will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary?</p> <p>(b) Is proper allotment made for rights to agricultural land use? Is there a possibility that the allotment will result in inequitable distribution or usurpation of land and available resources?</p> <p>(c) Are proper allotments, such as water rights allotment in the USISRSP area made? Is there a possibility that the allotments will result in inequitable distribution or usurpation of water rights and available resources?</p> <p>(d) Is there a possibility that the amount of water used (surface water, groundwater) by USISRSP will adversely the downstream fisheries and water uses?</p> <p>(e) Is there a possibility that water-borne or water-related diseases (e.g., schistosomiasis, malaria, filariasis) will be introduced? Is adequate consideration given to public health education, if necessary?</p>	<p>(a) Y (b) Y (c) Y (d) Y</p>	<p>(a) Except for voluntary land acquisition, no significant adverse impact will be expected since USISRSP aims to rehabilitate existing facilities and no large scale expansion works are included. In addition, major mitigation measures to alleviate any negative impacts proposed are; (i) to design canals/drainages by minimizing land acquisition/acquisition during D/D Phase, (ii) to conduct detailed socio-economic survey of affected people and prepare abbreviation RAP based on relevant regulations and guidelines, (iii) to establish IRC as decision making body to implement land acquisition, (iv) to conduct stakeholder meeting with affected people, (v) to design and re-construct canal crossings as much as possible, and (vi) to enact the local rules to construct new canal crossings by themselves.</p> <p>(b) No significant adverse impact will be expected since USISRSP aims to rehabilitate existing facilities and no large scale expansion works are included. Because farmers under the command area will be directly benefitted from USISRSP, minor concern only remain is feelings of inequality in non-farmers outside USISRSP. In this regard, MOWRAM will conduct stakeholder meetings including non-farmers to explain the objective of USISRSP and its contribution to local economy in the long term.</p> <p>(c) Soft component is proposed to strengthen FWUC in order to establish institutional set-up to properly manage irrigation water within the all command area (3.500 ha) of USISRSP. Monitoring and evaluation for FWUC activities will be carried out by PDOWRAM supported by MOWRAM.</p> <p>(d) In the proposed plan, river maintenance flow is considered to the downstream of Tumnu Lok Reservoir on Slakou River in order to avoid any adverse impact in the downstream areas.</p> <p>(e) No significantly negative impact will be anticipated since USISRSP is just rehabilitation project.</p>

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations
4. Social Environment	(3) Heritage	(a) Is there a possibility that USISRSP will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a) N	(a) Not applicable since there are not local archeological, historical, cultural, and religious heritage near USISRSP Area.
	(4)Landscape	(a) Is there a possibility that USISRSP will adversely affect the local landscape? Are necessary measures taken?	(a) N	(a) Not applicable since USISRSP aims to rehabilitate existing facilities and no large scale expansion works are included.
	(5)Ethnic Minorities and Indigenous Peoples	(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples? (b) Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources respected?	(a) N (b) N	(a) Not applicable since there is no ethnic minority living in the USISRSP Area (b) Ditto
	(6) Working Condition	(a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in USISRSP? (b) Are tangible safety considerations in place for individuals involved in USISRSP, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials? (c) Are intangible measures being planned and implemented for individuals involved in USISRSP, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.? (d) Are appropriate measures taken to ensure that security guards involved in USISRSP not to violate safety of other individuals involved, or local residents?	(a) Y (b) Y (c) Y (d) Y	(a) USISRSP will be implemented in compliance with the Labor Law stipulated by RGC. (b) Following measures are proposed to implement construction works in safe manner: (i) organization of education program about sanitation, security and rules/discipline and daily activity to construction labors, (ii) implementation of safety education and training for labors, and (iii) conduct of periodical patrol of working conditions. (c) Ditto (d) As mentioned above, not only security guards but also all construction labors will be trained by education program for social consideration. In addition, periodical patrol of workers will be implemented to avoid local conflict.
5. Others	(1) Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)? (b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts? (c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?	(a) Y (b) Y (c) Y	(a) Following measures are proposed to reduce impacts by the construction: (i) air pollution, noise and the vibration; limit construction time (e.g. at daytime only), (ii) water pollution; proper treatment before discharging and monitoring during construction phase, (iii) organization of education program to construction labors and (iv) inclusion of the environmental consideration matters in the technical specification of the construction works. (b) Most of the construction works are small scale and therefore their impacts toward natural environment (ecosystem) is limited. In addition, proper treatment of disposed water is proposed to minimize the influence on river ecosystem by the rehabilitation works. (c) Most of the construction works are small scale and therefore impact of construction is limited. In addition, mitigation measures proposed are: (i) to educate construction workers about environment impacts, (ii) to stipulate environmental consideration measures in the technical specification

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations
				of the construction works, (iii) to limit construction time to avoid disturbance of community life, (iv) to explain purpose and periods of construction to rural community, (v) to recycle materials from construction works. The education program for construction workers are to be organized by the contractors.
5. Others	(2) Monitoring	<p>(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts?</p> <p>(b) What are the items, methods and frequencies of the monitoring program?</p> <p>(c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)?</p> <p>(d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?</p>	<p>(a) Y (b) N (c) N (d) N</p>	<p>(a) Water quality monitoring and land acquisition process monitoring is proposed for monitoring impact of USISRSP.</p> <p>(b) The water quality monitoring will commence prior to the construction works. Monitoring items are; (i) pH, (ii) transparency (turbidity), (iii) water temperature, (iv) odor, and (v) appearance, which are proposed to be conducted once a month with two-year period. The methods are observation and instrumental measurement in the field. In addition monitoring items of operation phase add laboratory analysis items. Land acquisition process monitoring will commence before construction phase. Monitoring items are; (i) confirmation of joint committee activities, (ii) management for progress of voluntary land acquisition, (iii) confirmation of payment schedule e.g. compensation, and (iv) status of grievance redress. Method of above activities are generally interview survey to affected people and local authorities.</p> <p>(c) Monitoring is proposed to be carried out under the responsibility of MOWRAM and PDOWRAM. And also, IRC are responsible for monitoring of land acquisition process, too.</p> <p>(d) At present, the format and the frequency of the report are not provided from regulatory authorities.</p>
6. Note	Reference to Checklist of Other Sectors	<p>(a) Where necessary, pertinent items described in the Forestry checklist should also be checked.</p> <p>(b) For USISRSP including construction of large-scale weirs, reservoirs, and dams, where necessary, pertinent items described in the Hydropower, Dams and Reservoirs checklist should also be checked.</p>	<p>(a) N (b) N</p>	<p>(a) Not applicable since USISRSP aims to rehabilitate existing facilities and no large scale expansion works are included.</p> <p>(b) Ditto</p>
	Note on Using Environmental Checklist	<p>(a) If necessary, the impacts to transboundary or global issues should be confirmed (e.g., USISRSP includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming).</p>	<p>(a) N</p>	<p>(a) Not applicable since USISRSP aims to rehabilitate existing facilities and no large scale expansion works are included.</p>

Note:

- 1) Regarding the term "Country's Standards" mentioned in the above table, in the event that environmental standards in the country where SPPIDRIP is located diverge significantly from international standards, appropriate environmental considerations are required to be made. In cases where local environmental regulations are yet to be established in some areas, considerations should be made based on comparisons with appropriate standards of other countries (including Japan's experience)
- 2) Environmental checklist provides general environmental items to be checked. It may be necessary to add or delete an item taking into account the characteristics of USISRSP and the particular circumstances of the country and locality in which USISRSP is located.

AH-4.3 Kandal Stung-Bati Irrigation System Rehabilitation Sub-project

Table AH-4.3.1 Environmental Checklist based on JICA Guidelines on Confirmation of Environmental and Social Consideration on KSBISRSP

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations
1. Permits and Explanation	(1) EIA and Environmental Permits	(a) Have EIA reports been already prepared in official process? (b) Have EIA reports been approved by authorities of the host country's government? (c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(a) N (b) N (c) N (d) N	(a) The Sub-decree on Environmental Impact Assessment Process explains that irrigation development with more than 5,000 ha is required to carry out EIA for approval from MOE prior the implementation. The command area of KSBISRSP is 3,350 ha, less than 5,000 ha. Therefore, EIA process will not be required for KSBISRSP by MOE. (b) In the survey, preliminary environmental study is carried out from the view point of: (i) pollution control, (ii) natural environment and (iii) social environment. On this basis, environmental impact from KSBISRSP is small and limited. (c) Not applicable. (d) Not applicable. No other environmental approval is required for KSBISRSP.
	(2) Explanation to the Local Stakeholders	(a) Have contents of KSBISRSP and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders? (b) Have the comment from the stakeholders (such as local residents) been reflected to the project design?	(a) Y (b) N	(a) MOWRAM hardly explained to stakeholders KSBISRSP necessity and plan in former F/S study (1995). In existing situation, MOWRAM delivered information of KSBISRSP to local people through village leaders. (b) Not yet.
	(3) Explanation of Alternatives	(a) Have alternative plans of KSBISRSP been examined with social and environmental considerations?	(a) Y	(a) Basic concept of KSBISRSP is to the rehabilitation works of existing water supply system of the Khmer Rouge's reign. Therefore, possible alternatives are limited compared to new projects. Selected rehabilitation point of canals and related facilities were decided to minimize negative impact in view of social and environmental consideration.
2. Pollution Control	(1) Water Quality	(a) Are considerations given to water pollution of the surrounding water bodies, such as rivers and groundwater by effluents or leachates from agricultural lands? Are adequate use/disposal standards for fertilizers, agrochemicals, and livestock wastes established? Is a framework established to increase awareness of the standards among farmers? (b) Is a framework monitoring established for water pollution of rivers and groundwater?	(a) Y (b) Y	(a) In relation to water quality control, following activities are proposed in KSBISRSP: (i) to conduct support programs regarding appropriate agricultural management, (ii) to introduce composting to the farmers, (iii) to introduce check system among the FWUC members regarding farming management, (iv) to monitor water quality and agricultural activities regularly. (b) Sub-decree on Water Pollution Control stipulates water quality standard in Cambodia. MOE has the responsibility for monitoring the pollution sources and the situation of the water pollution in public water bodies. In addition, monitoring of SPPIRIDIP is proposed to be carried out under the responsibility of contractor, PDOWRAM, MOWRAM during construction phase, and FWUC, PDOWRAM, MOWRAM during operation phase.

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations
2. Pollution Control	(2) Waste	(a) Are wastes properly treated and disposed of in accordance with the country's regulations?	(a) Y	(a) It is proposed that construction waste will be properly disposed under the responsibility of contractors based on relevant laws pertaining to the management and disposal of solid waste, hazardous waste and re-waste.
	(3) Soil Contamination	(a) Is there a possibility that impacts in irrigated lands, such as salinization of soils will result? (b) Are adequate measures taken to prevent soil contamination of irrigated lands by agrochemicals, heavy metals and other hazardous substances? (c) Are any agrochemicals management plans prepared? Are any usages or any implementation structures organized for proper use of the plans?	(a) N (b) Y (c) Y	(a) Not applicable. The command area has low possibilities of being affected by salinization. (b) It is proposed that training of farmers for appropriate application of chemicals and fertilizer under soft component program of KSBISRSP. (c) The command area of KSBISRSP has been already developed as paddy field. In general, usage of agro-chemicals and fertilizer in rural area of Cambodia is limited at present due to those high cost. However, the usage amount might increase after SPPIDRIP. As mentioned above, following activities are proposed under KSBISRSP related to agrochemicals management: (i) to conduct support programs regarding appropriate agricultural management and (ii) to introduce check system among the FWUC members regarding agricultural management
	(4) Subsidence	(a) In the case of extraction of a large volume of groundwater, is there a possibility that the extraction of groundwater will cause subsidence?	(a) N	(a) Not applicable since water source of SPPIDRIP depend on river run-off.
	(5) Odor	(a) Are there any odor sources? Is there a possibility that odor problems will occur to the inhabitants?	(a) N	(a) Not applicable since no odor source is near the command area.
3. Natural Environment	(1) Protected Areas	(a) Is SPPIDRIP site or discharge area located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that KSBISRSP will affect the protected areas?	(a) N	(a) Not applicable since KSBISRSP command area is located in the outside of any protected areas.
	(2) Ecosystem	(a) Does the KSBISRSP site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (b) Does the KSBISRSP site or discharge area encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (c) Is there a possibility that KSBISRSP will result in the loss of breeding and feeding grounds for valuable wildlife? If they are lost, are there substitutes for the grounds near the original locations? (d) Is there a possibility that overgrazing will cause ecological degradation, such as impacts on wildlife habitats and desertification? (e) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem?	(a) N (b) N (c) N (d) N (e) N	(a) Not applicable since the KSBISRSP Area is already developed as agriculture land, not include forest area. (b) Ditto (c) Ditto (d) Not applicable since the KSBISRSP Area is not used as grazing land. (e) No significant adverse impact will be expected since the purpose of KSBISRSP is the main rehabilitation of existing irrigation facilities, and not include the scope of new large scale land reclamation.
4. Social Environment	(1) Resettlement	(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement?	(a) Y (b) Y (c) Y (d) Y (e) Not clear (f) Y (g) Y	(a) It is expected that a small scale involuntary resettlement (Five residential houses to be displaced) will be caused by KSBISRSP, even though the canal design and alignment is planned to minimize the scale of the involuntary resettlement. All affected houses are located on dike of the

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations
4. Social Environment		(b) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement? (c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement? (d) Is the compensations going to be paid prior to the resettlement? (e) Is the compensation policies prepared in document? (f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples? (g) Are agreements with the affected people obtained prior to resettlement? (h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan? (i) Are any plans developed to monitor the impacts of resettlement? (j) Is the grievance redress mechanism established?	(h) Y (i) N (j) N	MC-1 canals in Bati Area. Affected households flowed in from near village recently and have no land title. Also, land acquisition will be required along the existing canal area to expand canal width as necessary. (b) All affected households already were explained about brief description of KSBISRSP by village chiefs. They made agreement to their relocation because they had known their own illegal occupancy. But, they would like to know the schedule and need to support for their relocation. (c) MOWRAM will conduct detailed socio-economic survey and IOL survey of affected households to identify all losses from land acquisition during early stage of project preparation. And also, they should prepare abbreviation RAP includes compensation policy through joint committee as decision making body to implement the land acquisition process. (d) All compensation will be paid before resettlement. (e) Compensation policy for KSBISRSP has not been formulated yet. MOWRAM should prepare abbreviation RAP including compensation policy before D/D Phase. (f) The resettlement plan and land acquisition policy will be prepared by MOWRAM-RU together with IRC and local opinion leaders. The policy will consider necessity of particular attention to vulnerable groups as necessary. (g) As interview survey to affected people, they made agreement to their relocation but need to official support for their relocation. Official agreement with affected people will be obtained through joint committee and stakeholder meeting by MOWRAM before D/D Phase. (h) MOWRAM has already established RU to conduct land acquisition and resettlement. RU has experiences of implementing resettlement and land acquisition of similar projects. MOWRAM will ensure the budgets through consultation with MEF. (i) Not yet. MOWRAM will prepare abbreviation RAP included monitoring plan before D/D Phase. (j) Not yet. MOWRAM will prepare abbreviation RAP included grievance redress mechanism.
	(2) Living and Livelihood	(a) Is there a possibility that KSBISRSP will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary?		(a) Except for voluntary resettlement and land acquisition, no significant adverse impact will be expected since KSBISRSP aims to rehabilitate existing facilities and no large scale expansion works are included. In addition, major mitigation measures to alleviate any negative impacts proposed are; (i) to design canals/

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations
4. Social Environment		<p>(b) Is proper allotment made for rights to agricultural land use? Is there a possibility that the allotment will result in inequitable distribution or usurpation of land and available resources?</p> <p>(c) Are proper allotments, such as water rights allotment in the KSBISRSP area made? Is there a possibility that the allotments will result in inequitable distribution or usurpation of water rights and available resources?</p> <p>(d) Is there a possibility that the amount of water used (surface water, groundwater) by KSBISRSP will adversely affect the downstream fisheries and water uses?</p> <p>(e) Is there a possibility that water-borne or water-related diseases (e.g., schistosomiasis, malaria, filariasis) will be introduced? Is adequate consideration given to public health education, if necessary?</p>	<p>(a) Y (b) Y (c) N (d) Y</p>	<p>drainages by minimizing land acquisition during D/D Phase, (ii) to conduct detailed socio-economic survey of affected people and prepare abbreviation RAP and compensation policy based on relevant regulations and guidelines, (iii) to establish IRC as decision making body to implement land acquisition, and (iv) to conduct stakeholder meeting with affected people.</p> <p>(b) No significant adverse impact will be expected since KSBISRSP aims to rehabilitate existing facilities and no large scale expansion works are included. Because farmers of the command area will be directly benefitted from KSBISRSP.</p> <p>(c) Soft component is proposed to strengthen FWUC in order to establish institutional set-up to properly manage irrigation water within the all command area (3,350 ha) of KSBISRSP. Monitoring and evaluation for FWUC activities will be carried out by PDOWRAM supported by MOWRAM.</p> <p>(d) As result of water balance analysis, no significantly negative impact will be anticipated.</p> <p>(e) No significantly negative impact will be anticipated since MC35RSP is just rehabilitation project.</p>
	(3) Heritage	(a) Is there a possibility that SPPIDRIP will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a) N	(a) Not applicable since there are not local archeological, historical, cultural, and religious heritage near KSBISRSP Area.
	(4) Landscape	(a) Is there a possibility that KSBISRSP will adversely affect the local landscape? Are necessary measures taken?	(a) N	(a) Not applicable since KSBISRSP aims to rehabilitate existing facilities and no large scale expansion works are included.
	(5) Ethnic Minorities and Indigenous Peoples	<p>(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples?</p> <p>(b) Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources respected?</p>	<p>(a) N (b) N</p>	<p>(a) Not applicable since no ethnic minority live in KSBISRSP Area.</p> <p>(b) Ditto</p>
	(6) Working Condition	<p>(a) Is KSBISRSP proponent not violating any laws and ordinances associated with the working conditions of the country which KSBISRSP proponent should observe in KSBISRSP?</p> <p>(b) Are tangible safety considerations in place for individuals involved in KSBISRSP, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials?</p> <p>(c) Are intangible measures being planned and implemented for individuals involved in KSBISRSP, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.?</p> <p>(d) Are appropriate measures taken to ensure that security guards involved in KSBISRSP not to violate safety of other individuals involved, or local residents?</p>	<p>(a) Y (b) Y (c) Y (d) Y</p>	<p>(a) KSBISRSP will be implemented in compliance with the Labor Law stipulated by RGC.</p> <p>(b) Following measures are proposed to implement construction works in safe manner: (i) organization of education program about sanitation, security and rules/discipline and daily activity to construction labors, (ii) implementation of safety education and training for labors, and (iii) conduct of periodical patrol of working conditions.</p> <p>(c) Ditto</p> <p>(d) As mentioned above, not only security guards but also all construction labors will be trained by education program for social consideration. In addition, periodical patrol of workers will be implemented to avoid local conflict.</p>

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations
5. Others	(1) Impacts during Construction	<p>(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)?</p> <p>(b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts?</p> <p>(c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?</p>	<p>(a) Y</p> <p>(b) Y</p> <p>(c) Y</p>	<p>(a) Following measures are proposed to reduce impacts by the construction: (i) air pollution, noise and the vibration; limit construction time (e.g. at daytime only), (ii) water pollution; proper treatment before discharging and monitoring during construction phase, (iii) organization of education program to construction labors and (iv) inclusion of the environmental consideration matters in the technical specification of the construction works.</p> <p>(b) Most of the construction works are small scale and therefore their impacts toward natural environment (ecosystem) is limited. In addition, proper treatment of disposed water is proposed to minimize the impact on river ecosystem by the rehabilitation works.</p> <p>(c) Most of the construction works are small scale and therefore impact of construction is limited. In addition, mitigation measures proposed are: (i) to educate construction workers about environment impacts, (ii) to stipulate environmental consideration measures in the technical specification of the construction works, (iii) to limit construction time to avoid disturbance of community life, (iv) to explain purpose and periods of construction to rural community, (v) to recycle materials from construction works. The education program for construction workers are to be organized by the Contractors.</p>
	(2) Monitoring	<p>(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts?</p> <p>(b) What are the items, methods and frequencies of the monitoring program?</p> <p>(c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)?</p> <p>(d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?</p>	<p>(a) Y</p> <p>(b) Y</p> <p>(c) N</p> <p>(d) N</p>	<p>(a) Water quality monitoring, resettlement and land acquisition process monitoring is proposed for monitoring impact of KSBISRSP.</p> <p>(b) The water quality monitoring will commence prior to the construction works. Monitoring items are: (i) pH, (ii) transparency (turbidity), (iii) water temperature, (iv) odor, and (v) appearance, which are proposed to be conducted once a month with two-year period. Methods are observation and instrumental measurement in the field. In addition monitoring items of operation phase add laboratory analysis items. Land acquisition process monitoring will commence before construction phase. Monitoring items are: (i) confirmation of joint committee activities, (ii) management for progress of voluntary land acquisition, (iii) confirmation of payment schedule e.g. compensation, and (iv) status of grievance redress. Methods of above activities are generally interview survey to affected people and local authorities.</p> <p>(c) Monitoring is proposed to be carried out under the responsibility of MOWRAM and PDOWRAM. And also, IRC are responsible for monitoring of land acquisition process, too.</p>

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations
				(d) At present, the format and the frequency of the report are not provided from regulatory authorities.
6. Note	Reference to Checklist of Other Sectors	(a) Where necessary, pertinent items described in the Forestry checklist should also be checked. (b) For KSBISRSP including construction of large-scale weirs, reservoirs, and dams, where necessary, pertinent items described in the Hydropower, Dams and Reservoirs checklist should also be checked.	(a) N (b) N	(a) Not applicable since KSBISRSP aims to rehabilitate existing facilities and no large scale expansion works are included. (b) Ditto
	Note on Using Environmental Checklist	(a) If necessary, the impacts to transboundary or global issues should be confirmed (e.g., KSBISRSP includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming).	(a) N	(a) Not applicable since KSBISRSP aims to rehabilitate existing facilities and no large scale expansion works are included.

Note:

- Regarding the term "Country's Standards" mentioned in the above table, in the event that environmental standards in the country where SPPIDRIP is located diverge significantly from international standards, appropriate environmental considerations are required to be made. In cases where local environmental regulations are yet to be established in some areas, considerations should be made based on comparisons with appropriate standards of other countries (including Japan's experience)
- Environmental checklist provides general environmental items to be checked. It may be necessary to add or delete an item taking into account the characteristics of KSBISRSP and the particular circumstances of the country and locality in which KSBISRSP is located.

AH-4.4 Main Canal 35 Rehabilitation Sub-project

Table AH-4.4.1 Environmental Checklist based on JICA Guidelines on Confirmation of Environmental and Social Consideration on MC35RSP

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations
1. Permits and Explanation	(1) EIA and Environmental Permits	(a) Have EIA reports been already prepared in official process? (b) Have EIA reports been approved by authorities of the host country's government? (c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(a) N (b) N (c) N (d) N	(a) The Sub-decree on Environmental Impact Assessment Process explains that irrigation development with more than 5,000 ha is required to carry out EIA for approval from MOE prior the implementation. The command area of MC35RSP is 850 ha, less than 5,000 ha and too small. Therefore, EIA process will not be required for MC35RSP by MOE. (b) In the survey, preliminary environmental study is carried out from the view point of: (i) pollution control, (ii) natural environment and (iii) social environment. On this basis, environmental impact from the MC35RSP is small and limited. (c) Not applicable. Because no EIA is required. (d) Not applicable. No other approval is required for MC35RSP.
	(2) Explanation to the Local Stakeholders	(a) Have contents of MC35RSP and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders? (b) Have the comment from the stakeholders (such as local residents) been reflected to the project design?	(a) Y (b) N	(a) According to village chiefs of upstream area, local people living in and around MC35RSP area were already explained about MC35RSP by MOWRAM. (b) Not yet. When canal alignment will be finalized in D/D Phase, comment from stakeholders will be able to be reflect to the plan.

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations
1. Permits and Explanation	(3) Explanation of Alternatives	(a) Have alternative plans of MC35RSP been examined with social and environmental considerations?	(a) Y	(a) MC35RSP is the only rehabilitation works to maintain water supply to its command area. The project design makes consider the canal alignments to minimize negative impact as much as possible.
2. Pollution Control	(1) Water Quality	(a) Are considerations given to water pollution of the surrounding water bodies, such as rivers and groundwater by effluents or leachates from agricultural lands? Are adequate use/disposal standards for fertilizers, agrochemicals, and livestock wastes established? Is a framework established to increase awareness of the standards among farmers? (b) Is a framework monitoring established for water pollution of rivers and groundwater?	(a) Y (b) Y	(a) In relation to water quality control, following activities are proposed under MC35RSP: (i) to conduct support programs regarding appropriate agricultural management, (ii) to introduce composting to the farmers, (iii) to introduce check system among the FWUC members regarding farming management, (iv) to monitor water quality and agricultural activities regularly. (b) Sub-decree on Water Pollution Control stipulates water quality standard in Cambodia. MOE has the responsibility for monitoring the pollution sources and the situation of the water pollution in public water bodies. In addition, monitoring of MC35RSP is proposed to be carried out under the responsibility of contractor, PDOWRAM, MOWRAM during construction phase, and FWUC, PDOWRAM, MOWRAM during operation phase.
	(2) Waste	(a) Are wastes properly treated and disposed of in accordance with the country's regulations?	(a) Y	(a) It is proposed that construction waste will be properly disposed under the responsibility of contractors based on relevant laws pertaining to the management and disposal of solid waste, hazardous waste and re-waste.
	(3) Soil Contamination	(a) Is there a possibility that impacts in irrigated lands, such as salinization of soils will result? (b) Are adequate measures taken to prevent soil contamination of irrigated lands by agrochemicals, heavy metals and other hazardous substances? (c) Are any agrochemicals management plans prepared? Are any usages or any implementation structures organized for proper use of the plans?	(a) N (b) Y (c) Y	(a) Not applicable. The command area has low possibilities of being affected by salinization. (b) It is proposed that training of farmers for appropriate application of chemicals and fertilizer under soft component program of MC35RSP. (c) The command area of MC35RSP has been already developed as paddy fields. According to village leaders' usage of agro-chemicals and fertilizer is limited at present due to those high cost. As mentioned above, following activities are proposed under MC35RSP related to agrochemicals management: (i) to conduct support programs regarding appropriate agricultural management and (ii) to introduce check system among the FWUC members regarding agricultural management
	(4) Subsidence	(a) In the case of extraction of a large volume of groundwater, is there a possibility that the extraction of groundwater will cause subsidence?	(a) N	(a) Not applicable since water source of MC35RSP depend on river run-off.
	(5) Odor	(a) Are there any odor sources? Is there a possibility that odor problems will occur to the inhabitants?	(a) N	(a) Not applicable since no odor source is near the command area.

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations
3. Natural Environment	(1) Protected Areas	(a) Is the MC35RSP site or discharge area located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that MC35RSP will affect the protected areas?	(a) N	(a) Not applicable since the MC35RSP Area is located in the outside of any Protected Areas.
	(2) Ecosystem	(a) Does MC35RSP site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (b) Does the MC35RSP site or discharge area encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (c) Is there a possibility that MC35RSP will result in the loss of breeding and feeding grounds for valuable wildlife? If they are lost, are there substitutes for the grounds near the original locations? (d) Is there a possibility that overgrazing will cause ecological degradation, such as impacts on wildlife habitats and desertification? (e) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem?	(a) N (b) N (c) N (d) N (e) N	(a) Not applicable. (b) Not applicable. (c) Not applicable since the MC35RSP Area is already developed as agriculture land. (d) Not applicable since KSBISRSP Area is not used as grazing land. (e) No significant adverse impact will be expected since the purpose of KSBISRSP is the main rehabilitation of existing irrigation facilities, and not include the scope of new large scale land reclamation.
4. Social Environment	(1) Resettlement	(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement? (b) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement? (c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement? (d) Is the compensations going to be paid prior to the resettlement? (e) Is the compensation policies prepared in document? (f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples? (g) Are agreements with the affected people obtained prior to resettlement? (h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan? (i) Are any plans developed to monitor the impacts of resettlement? (j) Is the grievance redress mechanism established?	(a) Y (b) N (c) N (d) N (e) N (f) N (g) N (h) N (i) N (j) N	(a) MC35RSP will involve no involuntary resettlement. However, some land acquisitions is necessary to expand and rehabilitate old canals in area along the canals. In order to mitigate social impact engendered from MC35RSP, it is proposed that canals be designed to minimize affected areas for land acquisition as much as possible during D/D. Also, the land acquisition process is proposed to be implemented properly through environmentally-sound policy by MOWRAM. (b)-(j) Not applicable. Mitigation measures for land acquisition are to refer to item (2) Living and Livelihood.

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations
4. Social Environment	(2) Living and Livelihood	<p>(a) Is there a possibility that MC35RSP will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary?</p> <p>(b) Is proper allotment made for rights to agricultural land use? Is there a possibility that the allotment will result in inequitable distribution or usurpation of land and available resources?</p> <p>(c) Are proper allotments, such as water rights allotment in the MC35RSP area made? Is there a possibility that the allotments will result in inequitable distribution or usurpation of water rights and available resources?</p> <p>(d) Is there a possibility that the amount of water used (surface water, groundwater) by MC35RSP will adversely the downstream fisheries and water uses?</p> <p>(e) Is there a possibility that water-borne or water-related diseases (e.g., schistosomiasis, malaria, filariasis) will be introduced? Is adequate consideration given to public health education, if necessary?</p>	<p>(a) Y</p> <p>(b) Y</p> <p>(c) Y</p> <p>(d) Y</p> <p>(e) Y</p>	<p>(a) Except for voluntary land acquisition, no significant adverse impact will be expected since MC35RSP aims to rehabilitate existing facilities and no large scale expansion works are included. In addition, major mitigation measures to alleviate any negative impacts proposed are; (i) to design canals/drainages by minimizing land acquisition during D/D, (ii) to conduct detailed socio-economic survey of affected people and prepare abbreviation RAP based on relevant regulations and guidelines, (iii) to establish IRC as decision making body to implement land acquisition, (iv) to conduct stakeholder meeting with affected people, (v) to design and re-construct canal crossings as much as possible, and (vi) to enact the local rules to construct new canal crossings by themselves.</p> <p>(b) No significant adverse impact will be expected since MC35RSP aims to rehabilitate existing facilities and no large scale expansion works are included. Because farmers of the command area will be directly benefitted from MC35RSP..</p> <p>(c) According to village leaders, their commune already have established their own water management system similar to FWUC. Soft component is proposed to strengthen FWUC in order to establish institutional set-up to properly manage irrigation water within the all command area of MC35RSP. Monitoring and evaluation for FWUC activities will be carried out by PDOWRAM supported by MOWRAM.</p> <p>(d) As result of water balance analysis, no significantly negative impact will be anticipated.</p> <p>(e) No significantly negative impact will be anticipated since MC35RSP is just rehabilitation project.</p>
	(3) Heritage	<p>(a) Is there a possibility that MC35RSP will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?</p>	<p>(a) N</p>	<p>(a) Not applicable since there are not local archeological, historical, cultural, and religious heritage near MC35RSP Area.</p>
	(4) Landscape	<p>(a) Is there a possibility that MC35RSP will adversely affect the local landscape? Are necessary measures taken?</p>	<p>(a) N</p>	<p>(a) Not applicable since MC35RSP is only rehabilitation work of existing water supply facilities. The local landscape would be no affected by MC35RSP.</p>
	(5) Ethnic Minorities and Indigenous Peoples	<p>(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples?</p> <p>(b) Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources respected?</p>	<p>(a) N</p> <p>(b) N</p>	<p>(a) Not applicable since there is no ethnic minority living in MC35RSP Area</p> <p>(b) Ditto</p>

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations
4. Social Environment	(6) Working Condition	<p>(a) Is the MC35RSP proponent not violating any laws and ordinances associated with the working conditions of the country which the MC35RSP proponent should observe in MC35RSP?</p> <p>(b) Are tangible safety considerations in place for individuals involved in MC35RSP, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials?</p> <p>(c) Are intangible measures being planned and implemented for individuals involved in MC35RSP, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.?</p> <p>(d) Are appropriate measures taken to ensure that security guards involved in MC35RSP not to violate safety of other individuals involved, or local residents?</p>	<p>(a) Y</p> <p>(b) Y</p> <p>(c) Y</p> <p>(d) Y</p>	<p>(a) MC35RSP will be implemented in compliance with the Labor Law stipulated by RGC.</p> <p>(b) Following measures are proposed to implement construction works in safe manner: (i) organization of education program about sanitation, security and rules/discipline and daily activity to construction labors, (ii) implementation of safety education and training for labors, and (iii) conduct of periodical patrol of working conditions.</p> <p>(c) Ditto</p> <p>(d) As mentioned above, not only security guards but also all construction labors will be trained by education program for social consideration. In addition, periodical patrol of workers will be implemented to avoid local conflict.</p>
	(1) Impacts during Construction	<p>(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)?</p> <p>(b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts?</p> <p>(c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?</p>	<p>(a) Y</p> <p>(b) Y</p> <p>(c) Y</p>	<p>(a) Following measures are proposed to reduce impacts by the construction: (i) air pollution, noise and the vibration; limit construction time (e.g. at daytime only), (ii) water pollution; proper treatment before discharging and monitoring during construction phase, (iii) organization of education program to construction labors and (iv) inclusion of the environmental consideration matters in the technical specification of the construction works.</p> <p>(b) Most of the construction works are small scale and therefore their impacts toward natural environment (ecosystem) is limited. In addition, proper treatment of disposed water is proposed to minimize the influence on river ecosystem by the rehabilitation works.</p> <p>(c) Most of the construction works are small scale and therefore impact of construction is limited. In addition, mitigation measures proposed are: (i) to educate construction workers about environment impacts, (ii) to stipulate environmental consideration measures in the technical specification of the construction works, (iii) to limit construction time to avoid disturbance of community life, (iv) to explain purpose and periods of construction to rural community, (v) to recycle materials from construction works. The education program for construction workers are to be organized by the Contractors.</p>
5. Others	(2) Monitoring	<p>(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts?</p> <p>(b) What are the items, methods and</p>	<p>(a) Y</p> <p>(b) N</p> <p>(c) N</p> <p>(d) N</p>	<p>(a) Water quality monitoring and land acquisition process monitoring is proposed for monitoring impact of MC35RSP.</p> <p>(b) The water quality monitoring will</p>

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations
		frequencies of the monitoring program?		commence prior to the construction
5. Others		<p>(c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)?</p> <p>(d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?</p>		<p>works. Monitoring items are; (i) pH, (ii) transparency (turbidity), (iii) water temperature, (iv) odor, and (v) appearance, which are proposed to be conducted once a month with two-year period. Methods are observation and instrumental measurement in the field. In addition monitoring items of operation phase add laboratory analysis items. Land acquisition process monitoring will commence before construction phase. Monitoring items are; (i) confirmation of joint committee activities, (ii) management for progress of voluntary land acquisition, (iii) confirmation of payment schedule e.g. compensation, and (iv) status of grievance redress. Methods of above activities are generally interview survey to affected people and local authorities.</p> <p>(c) Monitoring is proposed to be carried out under the responsibility of MOWRAM and PDOWRAM. And also, IRC are responsible for monitoring of land acquisition process, too.</p> <p>(d) At present, the format and the frequency of the report are not provided from regulatory authorities.</p>
6. Note	Reference to Checklist of Other Sectors	<p>(a) Where necessary, pertinent items described in the Forestry checklist should also be checked.</p> <p>(b) For MC35RSP including construction of large-scale weirs, reservoirs, and dams, where necessary, pertinent items described in the Hydropower, Dams and Reservoirs checklist should also be checked.</p>	<p>(a) N</p> <p>(b) N</p>	<p>(a) Not applicable since MC35RSP aims to rehabilitate existing facilities and no large scale expansion works are included.</p> <p>(b) -ditto</p>
	Note on Using Environmental Checklist	<p>(a) If necessary, the impacts to transboundary or global issues should be confirmed (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming).</p>	<p>(a) N</p>	<p>(a) Not applicable since MC35RSP aims to rehabilitate existing facilities and no large scale expansion works are included.</p>

Note:

- 1) Regarding the term "Country's Standards" mentioned in the above table, in the event that environmental standards in the country where the project is located diverge significantly from international standards, appropriate environmental considerations are required to be made. In cases where local environmental regulations are yet to be established in some areas, considerations should be made based on comparisons with appropriate standards of other countries (including Japan's experience)
- 2) Environmental checklist provides general environmental items to be checked. It may be necessary to add or delete an item taking into account the characteristics of the project and the particular circumstances of the country and locality in which the project is located.

AH-4.5 Sras Prambai Water Recession Rehabilitation Sub-project

Table AH-4.5.1 Environmental Checklist based on JICA Guidelines on Confirmation of Environmental and Social Consideration on SPWRRSP

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations
1. Permits and Explanation	(1) EIA and Environmental Permits	(a) Have EIA reports been already prepared in official process? (b) Have EIA reports been approved by authorities of the host country's government? (c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(a) N (b) N (c) N (d) N	(a) The Sub-decree on Environmental Impact Assessment Process explains that irrigation development with more than 5,000 ha is required to carry out EIA for approval from MOE prior the implementation. The command area of SPWRRSP is 700 ha, less than 5,000 ha a. Therefore, EIA process will not be required for SPWRRSP by MOE. (b) In the survey, preliminary environmental study is carried out from the view point of: (i) pollution control, (ii) natural environment and (iii) social environment. On this basis, environmental impact from the SPWRRSP is small and limited. (c) Not applicable. (d) Not applicable. No other approval is required for SPWRRSP.
	(2) Explanation to the Local Stakeholders	(a) Have contents of SPWRRSP and the potential impacts been adequately explained to the local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the local stakeholders? (b) Have the comment from the stakeholders (such as local residents) been reflected to the project design?	(a) N (b) N	(a) According to village leaders, MOWRAM already explained to village leaders about SPWRRSP description. However, almost local stakeholders have not received the explanation yet. (b) Ditto.
	(3) Explanation of Alternatives	(a) Have alternative plans of SPWRRSP been examined with social and environmental considerations?	(a) N	(a) SPWRRSP is the rehabilitation works to maintain existing dike and intake structures. If SPWRRSP would not implement, the parts of facilities have been deteriorated, and if left as they are, it is sure that the water supply to the command area would be difficult in the near future.
2. Pollution Control	(1) Water Quality	(a) Are considerations given to water pollution of the surrounding water bodies, such as rivers and groundwater by effluents or leachates from agricultural lands? Are adequate use/disposal standards for fertilizers, agrochemicals, and livestock wastes established? Is a framework established to increase awareness of the standards among farmers? (b) Is a framework monitoring established for water pollution of rivers and groundwater?	(a) Y (b) Y	(a) In relation to water quality control, following activities are proposed under SPWRRSP: (i) to conduct support programs regarding appropriate agricultural management, (ii) to introduce composting to the farmers, (iii) to introduce check system among the FWUC members regarding farming management, (iv) to monitor water quality and agricultural activities regularly. (b) Sub-decree on Water Pollution Control stipulates water quality standard in Cambodia. MOE has the responsibility for monitoring the pollution sources and the situation of the water pollution in public water bodies. In addition, monitoring of the project is proposed to be carried out under the responsibility of contractor, PDOWRAM, MOWRAM during construction phase, and FWUC, PDOWRAM, MOWRAM during operation phase.

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations
2. Pollution Control	(2) Waste	(a) Are wastes properly treated and disposed of in accordance with the country's regulations?	(a) Y	(a) It is proposed that construction waste will be properly disposed under the responsibility of contractors based on relevant laws pertaining to the management and disposal of solid waste, hazardous waste and re-waste.
	(3) Soil Contamination	(a) Is there a possibility that impacts in irrigated lands, such as salinization of soils will result? (b) Are adequate measures taken to prevent soil contamination of irrigated lands by agrochemicals, heavy metals and other hazardous substances? (c) Are any agrochemicals management plans prepared? Are any usages or any implementation structures organized for proper use of the plans?	(a) N (b) Y (c) Y	(a) Not applicable. The command area has low possibilities of being affected by salinization. (b) It is proposed that training of farmers for appropriate application of chemicals and fertilizer under soft component program of SPWRRSP. (c) Following activities are proposed under SPWRRSP related to agrochemicals management: (i) to conduct support programs regarding appropriate agricultural management and (ii) to introduce check system among the FWUC members regarding agricultural management.
	(4) Subsidence	(a) In the case of extraction of a large volume of groundwater, is there a possibility that the extraction of groundwater will cause subsidence?	(a) N	(a) Not applicable since water source of the project depend on flood water of Bassac river.
	(5) Odor	(a) Are there any odor sources? Is there a possibility that odor problems will occur to the inhabitants?	(a) N	(a) Not applicable since no odor source is near the command area.
3. Natural Environment	(1) Protected Areas	(a) Is the project site or discharge area located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(a) N	(a) Not applicable since SPWRRSP Area is located in the outside of any Protected Areas.
	(2) Ecosystem	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (b) Does the project site or discharge area encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (c) Is there a possibility that SPWRRSP will result in the loss of breeding and feeding grounds for valuable wildlife? If they are lost, are there substitutes for the grounds near the original locations? (d) Is there a possibility that overgrazing will cause ecological degradation, such as impacts on wildlife habitats and desertification? (e) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem?	(a) N (b) N (c) Y (d) N (e) N	(a) Not applicable since SPWRRSP Area is already developed as agriculture land. During the rainy season, planned reservoir area is submerged as flood plains, during the dry season, the area become paddy field, bush land and part of the area is wetland. (b) Not applicable. (c) Proposed reservoir area is unique environment as floodplain area. The area will return to reservoir by rehabilitation work of SPWRRSP. However, large surrounding area is similar natural environment of proposed reservoir area. Wildlife habitats and existing ecosystem would be effected no large impact by SPWRRSP. (d) Not applicable since the area will be used as grazing land. (e) No significant adverse impact will be expected since the purpose of SPWRRSP is the rehabilitation of existing irrigation facilities, and not include the scope of new land reclamation.

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations
4. Social Environment	(1) Resettlement	<p>(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement?</p> <p>(b) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement?</p> <p>(c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement?</p> <p>(d) Is the compensations going to be paid prior to the resettlement?</p> <p>(e) Is the compensation policies prepared in document?</p> <p>(f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples?</p> <p>(g) Are agreements with the affected people obtained prior to resettlement?</p> <p>(h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan?</p> <p>(i) Are any plans developed to monitor the impacts of resettlement?</p> <p>(j) Is the grievance redress mechanism established?</p>	<p>(a) Y (b) N (c) N (d) N (e) N (f) N (g) N (h) N (i) N (j) N</p>	<p>(a) Involuntary resettlement is not anticipated under SPWRRSP since the sub-project aims to rehabilitate existing facilities and no large scale expansion works are included. However, there are large scale illegally paddy fields inside the planned reservoir area. The area will be submerged until the end of dry season after SPWRRSP. According to village chiefs, the people who cultivated inside the reservoir have no land title of the area and understood their own illegal use. Also, most of them have another plots of land outside of the reservoir area. However, existing status is not clear. Therefore, first of all, MOWRAM should conduct socio-economic and IOL survey to grasp existing status.</p> <p>(b)-(j) Not applicable. Mitigation measures for land acquisition are to refer to item (2) Living and Livelihood.</p>
	(2) Living and Livelihood	<p>(a) Is there a possibility that SPWRRSP will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary?</p> <p>(b) Is proper allotment made for rights to agricultural land use? Is there a possibility that the allotment will result in inequitable distribution or usurpation of land and available resources?</p> <p>(c) Are proper allotments, such as water rights allotment in the project area made? Is there a possibility that the allotments will result in inequitable distribution or usurpation of water rights and available resources?</p> <p>(d) Is there a possibility that the amount of water used (surface water, groundwater) by SPWRRSP will adversely the downstream fisheries and water uses?</p> <p>(e) Is there a possibility that water-borne or water-related diseases (e.g., schistosomiasis, malaria, filariasis) will be introduced? Is adequate consideration given to public health education, if necessary?</p>	<p>(a) Y (b) Y (c) Y (d) Y</p>	<p>(a) Except for voluntary land acquisition, no significant adverse impact will be expected since SPWRRSP aims to rehabilitate existing facilities and no large scale expansion works are included. In addition, major mitigation measures to alleviate any negative impacts proposed are; (i) to conduct detailed socio-economic survey of affected people and prepare compensation policy based on relevant regulations and guidelines, (ii) to establish IRC as decision making body to implement land acquisition, and (iii) to conduct stakeholder meeting with affected people.</p> <p>(b) No significant adverse impact will be expected since SPWRRSP aims to rehabilitate existing facilities and no large scale expansion works are included. However, people using inside the reservoir area will be affected by SPWRRSP. MOWRAM will conduct stakeholder meeting with these affected people to explain SPWRRSP and its contribution to local economy in the long term.</p> <p>(c) SPWRRSP provides a substantial improvement in water supply condition of the command area. In addition, soft component is proposed</p>

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations
4. Social Environment				<p>to strengthen FWUC in order to establish institutional set-up to properly manage irrigation water within the all command area of SPWRRSP. Monitoring and evaluation for FWUC activities will be carried out by PDOWRAM supported by MOWRAM.</p> <p>(d) As result of water balance analysis, no significantly negative impact will be anticipated in surrounding area. Fisherman of the area will also make a benefit by SPWRRSP since they will be able to use the reservoir in year around.</p> <p>(e) No significantly negative impact will be anticipated since SPWRRSP is just rehabilitation project.</p>
	(3) Heritage	(a) Is there a possibility that SPWRRSP will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a) N	(a) Not applicable since there are not local archeological, historical, cultural, and religious heritage near SPWRRSP Area.
	(4)Landscape	(a) Is there a possibility that SPWRRSP will adversely affect the local landscape? Are necessary measures taken?	(a) N	(a) Not applicable since SPWRRSP aims to rehabilitate existing facilities and no large scale expansion works are included.
	(5)Ethnic Minorities and Indigenous Peoples	<p>(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples?</p> <p>(b) Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources respected?</p>	<p>(a) Y</p> <p>(b) Y</p>	<p>(a) According to village chiefs, some Vietnamese families are living in SPWRRSP Area. Their main livelihoods are agriculture and fishery and their lifestyle is almost same as other villagers. MOWRAM grasp their existing status by socio-economic survey to reduce impact to them as necessary.</p> <p>(b) All of the rights of ethnic minorities and indigenous in relation to land and resources will be respected by land acquisition policy same as others.</p>
	(6) Working Condition	<p>(a) Is the SPWRRSP proponent not violating any laws and ordinances associated with the working conditions of the country which the SPWRRSP proponent should observe in SPWRRSP?</p> <p>(b) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials?</p> <p>(c) Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.?</p> <p>(d) Are appropriate measures taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents?</p>	<p>(a) Y</p> <p>(b) Y</p> <p>(c) Y</p> <p>(d) Y</p>	<p>(a) SPWRRSP will be implemented in compliance with the Labor Law stipulated by RGC.</p> <p>(b) Following measures are proposed to implement construction woks in safe manner: (i) organization of education program about sanitation, security and rules/discipline and daily activity to construction labors, (ii) implementation of safety education and training for labors, and (iii) conduct of periodical patrol of working conditions.</p> <p>(c) Ditto</p> <p>(d) As mentioned above, not only security guards but also all construction labors will be trained by education program for social consideration. In addition, periodical patrol of workers will be implemented to avoid local conflict.</p>

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations
5.Others	(1) Impacts during Construction	<p>(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)?</p> <p>(b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts?</p> <p>(c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?</p>	<p>(a) Y</p> <p>(b) Y</p> <p>(c) Y</p>	<p>(a) Following measures are proposed to reduce impacts by the construction: (i) air pollution, noise and the vibration; limit construction time (e.g. at daytime only), (ii) water pollution; proper treatment before discharging and monitoring during construction phase, (iii) organization of education program to construction labors and (iv) inclusion of the environmental consideration matters in the technical specification of the construction works.</p> <p>(b) Most of the construction works are small scale and therefore their impacts toward natural environment (ecosystem) is limited. In addition, proper treatment of disposed water is proposed to minimize the influence on river ecosystem by the rehabilitation works.</p> <p>(c) Most of the construction works are small scale and therefore impact of construction is limited. In addition, mitigation measures proposed are: (i) to educate construction workers about environment impacts, (ii) to stipulate environmental consideration measures in the technical specification of the construction works, (iii) to limit construction time to avoid disturbance of community life, (iv) to explain purpose and periods of construction to rural community ,(v) to recycle materials from construction works. The education program for construction workers are to be organized by the Contractors.</p>
	(2) Monitoring	<p>(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts?</p> <p>(b) What are the items, methods and frequencies of the monitoring program?</p> <p>(c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)?</p> <p>(d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?</p>	<p>(a) Y</p> <p>(b) N</p> <p>(c) N</p> <p>(d) N</p>	<p>(a) Water quality monitoring and land acquisition process monitoring is proposed for monitoring impact of SPWRRSP.</p> <p>(b) The water quality monitoring will commence prior to the construction works. Monitoring items are; (i) pH, (ii) transparency (turbidity), (iii) water temperature, (iv) odor, and (v) appearance, which are proposed to be conducted once a month with two–year period. Methods are observation and instrumental measurement in the field. In addition monitoring items of operation phase add laboratory analysis items. Land acquisition process monitoring will commence before construction phase. Monitoring items are; (i) confirmation of joint committee activities, (ii) management for progress of voluntary land acquisition, (iii) confirmation of payment schedule e.g. compensation, and (iv) status of grievance redress. Methods of above activities are generally interview survey to affected people and local authorities.</p> <p>(c) Monitoring is proposed to be carried out under the responsibility of MOWRAM and PDOWRAM. And</p>

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations
				also, IRC are responsible for monitoring of land acquisition process, too. (d) At present, the format and the frequency of the report are not provided from regulatory authorities.
6. Note	Reference to Checklist of Other Sectors	(a) Where necessary, pertinent items described in the Forestry checklist should also be checked. (b) For the projects including construction of large-scale weirs, reservoirs, and dams, where necessary, pertinent items described in the Hydropower, Dams and Reservoirs checklist should also be checked.	(a) N (b) N	(a) Not applicable since SPWRRSP aims to rehabilitate existing facilities and no large scale expansion works are included. (b) Ditto
	Note on Using Environmental Checklist	(a) If necessary, the impacts to transboundary or global issues should be confirmed (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming).	(a) N	(a) Not applicable since SPWRRSP aims to rehabilitate existing facilities and no large scale expansion works are included.

Note:

- 1) Regarding the term "Country's Standards" mentioned in the above table, in the event that environmental standards in the country where the project is located diverge significantly from international standards, appropriate environmental considerations are required to be made. In cases where local environmental regulations are yet to be established in some areas, considerations should be made based on comparisons with appropriate standards of other countries (including Japan's experience)
- 2) Environmental checklist provides general environmental items to be checked. It may be necessary to add or delete an item taking into account the characteristics of SPWRRSP and the particular circumstances of the country and locality in which SPWRRSP is located.

AH-4.6 Daun Pue Irrigation System Rehabilitation Sub-project

Table AH-4.6.1 Environmental Checklist based on JICA Guidelines on Confirmation of Environmental and Social Consideration on DPISRSP

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations
1. Permits and Explanation	(1) EIA and Environmental Permits	(a) Have EIA reports been already prepared in official process? (b) Have EIA reports been approved by authorities of the host country's government? (c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(a) N (b) N (c) N (d) N	(a) The Sub-decree on Environmental Impact Assessment Process explains that irrigation development with more than 5,000 ha is required to carry out EIA for approval from MOE prior the implementation. The command area of DPISRSP is 1,151 ha, less than 5,000 ha. Therefore, EIA process will not be required for DPISRSP by MOE. (b) Not applicable. Because no EIA is required. (c) Ditto. (d) Not applicable. No other approval is required for DPISRSP.
	(2) Explanation to the Local Stakeholders	(a) Have contents of DPISRSP and the potential impacts been adequately explained to the local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the local stakeholders? (b) Have the comment from the stakeholders (such as local residents) been reflected to the project design?	(a) N (b) N	(a) Not yet. (b) Ditto.
	(3) Explanation of Alternatives	(a) Have alternative plans of DPISRSP been examined with social and environmental considerations?	(a) N	(a) In this study, it is considered that alternative canal alignment to minimize impact by the project. As the result, existing canals plan was selected.

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations
2. Pollution Control	(1) Water Quality	(a) Are considerations given to water pollution of the surrounding water bodies, such as rivers and groundwater by effluents or leachates from agricultural lands? Are adequate use/disposal standards for fertilizers, agrochemicals, and livestock wastes established? Is a framework established to increase awareness of the standards among farmers? (b) Is a framework monitoring established for water pollution of rivers and groundwater?	(a) Y (b) Y	(a) In relation to water quality control, following activities are proposed under DPISRSP: (i) to conduct support programs regarding appropriate agricultural management, (ii) to introduce composting to the farmers, (iii) to introduce check system among the FWUC members regarding farming management, (iv) to monitor water quality and agricultural activities regularly. (b) Sub-decree on Water Pollution Control stipulates water quality standard in Cambodia. MOE has the responsibility for monitoring the pollution sources and the situation of the water pollution in public water bodies. In addition, monitoring of the project is proposed to be carried out under the responsibility of contractor, PDOWRAM, MOWRAM during construction phase, and FWUC, PDOWRAM, MOWRAM during operation phase.
	(2) Waste	(a) Are wastes properly treated and disposed of in accordance with the country's regulations?	(a) Y	(a) It is proposed that construction waste will be properly disposed under the responsibility of contractors based on relevant laws pertaining to the management and disposal of solid waste, hazardous waste and re-waste.
	(3) Soil Contamination	(a) Is there a possibility that impacts in irrigated lands, such as salinization of soils will result? (b) Are adequate measures taken to prevent soil contamination of irrigated lands by agrochemicals, heavy metals and other hazardous substances? (c) Are any agrochemicals management plans prepared? Are any usages or any implementation structures organized for proper use of the plans?	(a) N (b) Y (c) Y	(a) Not applicable. The command area has low possibilities of being affected by salinization. (b) It is proposed that training of farmers for appropriate application of chemicals and fertilizer under soft component program of DPISRSP. (c) The command area of DPISRSP has been already developed as paddy field. Hearing to commune chief and local farmers, usage of agro-chemicals and fertilizer is limited at present due to those high cost, they normally practice with compost. As mentioned above, following activities are proposed under DPISRSP related to agrochemicals management: (i) to conduct support programs regarding appropriate agricultural management and (ii) to introduce check system among the FWUC members regarding agricultural management.
	(4) Subsidence	(a) In the case of extraction of a large volume of groundwater, is there a possibility that the extraction of groundwater will cause subsidence?	(a) N	(a) Not applicable since water source of DPISRSP depend on river run-off.
	(5) Odor	(a) Are there any odor sources? Is there a possibility that odor problems will occur to the inhabitants?	(a) N	(a) Not applicable since no odor source is near the command area.
3. Natural Environment	(1) Protected Areas	(a) Is the project site or discharge area located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(a) N	(a) Not applicable since DPISRSP Area is located in the outside of any Protected Areas.

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations
3. Natural Environment	(2) Ecosystem	<p>(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)?</p> <p>(b) Does the project site or discharge area encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions?</p> <p>(c) Is there a possibility that the project will result in the loss of breeding and feeding grounds for valuable wildlife? If they are lost, are there substitutes for the grounds near the original locations?</p> <p>(d) Is there a possibility that overgrazing will cause ecological degradation, such as impacts on wildlife habitats and desertification?</p> <p>(e) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem?</p>	<p>(a) N</p> <p>(b) N</p> <p>(c) N</p> <p>(d) N</p> <p>(e) N</p>	<p>(a) Not applicable.</p> <p>(b) Not applicable.</p> <p>(c) Not applicable since DPISRSP Area is already developed as agriculture land.</p> <p>(d) Not applicable since DPISRSP Area is not used as grazing land.</p> <p>(e) No significant adverse impact will be expected since the purpose of DPISRSP is the main rehabilitation of existing irrigation facilities, and not include the scope of new large scale land reclamation.</p>
	(1) Resettlement	<p>(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement?</p> <p>(b) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement?</p> <p>(c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement?</p> <p>(d) Is the compensations going to be paid prior to the resettlement?</p> <p>(e) Is the compensation policies prepared in document?</p> <p>(f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples?</p> <p>(g) Are agreements with the affected people obtained prior to resettlement?</p> <p>(h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan?</p> <p>(i) Are any plans developed to monitor the impacts of resettlement?</p> <p>(j) Is the grievance redress mechanism established?</p>	<p>(a) Y</p> <p>(b) N</p> <p>(c) N</p> <p>(d) N</p> <p>(e) N</p> <p>(f) N</p> <p>(g) N</p> <p>(h) N</p> <p>(i) N</p> <p>(j) N</p>	<p>(a) Involuntary resettlement is not anticipated under DPISRSP since the sub-project aims to rehabilitate existing facilities and no large scale expansion works are included. However, land acquisition is necessary for area along proposed canal/drainage. The land acquisition process will be implemented through proper impact mitigation measures with adequate compensation by MOWRAM.</p> <p>(b)-(j) Not applicable. Mitigation measures for land acquisition are to Refer to item (2) Living and Livelihood.</p>
4. Social Environment	(2) Living and Livelihood	<p>(a) Is there a possibility that DPISRSP will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary?</p> <p>(b) Is proper allotment made for rights to agricultural land use? Is there a possibility that the allotment will result in inequitable distribution or usurpation of land and available resources?</p>	<p>(a) Y</p> <p>(b) Y</p> <p>(c) Y</p> <p>(d) Y</p>	<p>(a) Except for voluntary land acquisition, no significant adverse impact will be expected since DPISRSP aims to rehabilitate existing facilities and no large scale expansion works are included. However, village leaders worried that a part of existing proposed alignment might meet with strong opposition from local people since the proposed alignment pass through</p>

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations
4. Social Environment		<p>(c) Are proper allotments, such as water rights allotment in the DPISRSP area made? Is there a possibility that the allotments will result in inequitable distribution or usurpation of water rights and available resources?</p> <p>(d) Is there a possibility that the amount of water used (surface water, groundwater) by DPISRSP will adversely affect the downstream fisheries and water uses?</p> <p>(e) Is there a possibility that water-borne or water-related diseases (e.g., schistosomiasis, malaria, filariasis) will be introduced? Is adequate consideration given to public health education, if necessary?</p>		<p>near their residential area. Therefore, the part of alignment must be re-considered during D/D Phase even if no technical issue. In addition, major mitigation measures to alleviate any negative impacts proposed are; (i) to design canals/drainages by minimizing land acquisition during D/D Phase, (ii) to conduct detailed socio-economic survey of affected people and prepare abbreviation RAP based on relevant regulations and guidelines, (iii) to establish IRC as decision making body to implement land acquisition, and (iv) to conduct stakeholder meeting with affected people.</p> <p>(b) No significant adverse impact will be expected since DPISRSP aims to rehabilitate existing facilities and no large scale expansion works are included. Because farmers under the command area will be directly benefitted from DPISRSP, minor concern only remain is feelings of inequality in non-farmers outside DPISRSP. In this regard, MOWRAM will conduct stakeholder meetings including non-farmers to explain the objective of DPISRSP and its contribution to local economy in the long term.</p> <p>(c) Soft component is proposed to strengthen FWUC in order to establish institutional set-up to properly manage irrigation water within the all command area (1,150 ha) of DPISRSP. Monitoring and evaluation for FWUC activities will be carried out by PDOWRAM supported by MOWRAM.</p> <p>(d) In the proposed plan, river maintenance flow is considered to the downstream of Tumnup Lok Reservoir on Slakou River in order to avoid any adverse impact in the downstream areas.</p> <p>(e) No significantly negative impact will be anticipated since DPISRSP is just rehabilitation project.</p>
	(3) Heritage	(a) Is there a possibility that DPISRSP will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a) N	(a) Not applicable since there are not local archeological, historical, cultural, and religious heritage near DPISRSP Area.
	(4) Landscape	(a) Is there a possibility that DPISRSP will adversely affect the local landscape? Are necessary measures taken?	(a) N	(a) Not applicable since DPISRSP aims to rehabilitate existing facilities and no large scale expansion works are included.
	(5) Ethnic Minorities and Indigenous Peoples	(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples?	(a) N	(a) Not applicable. According to village leaders, no ethnic minority living in DPISRSP Area.
		(b) Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources respected?	(b) N	(b) Ditto

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations
4. Social Environment	(6) Working Condition	<p>(a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project?</p> <p>(b) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials?</p> <p>(c) Are intangible measures being planned and implemented for individuals involved in DPISRSP, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.?</p> <p>(d) Are appropriate measures taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents?</p>	<p>(a) Y</p> <p>(b) Y</p> <p>(c) Y</p> <p>(d) Y</p>	<p>(a) DPISRSP will be implemented in compliance with the Labor Law stipulated by RGC.</p> <p>(b) Following measures are proposed to implement construction works in safe manner: (i) organization of education program about sanitation, security and rules/discipline and daily activity to construction labors, (ii) implementation of safety education and training for labors, and (iii) conduct of periodical patrol of working conditions.</p> <p>(c) Ditto</p> <p>(d) As mentioned above, not only security guards but also all construction labors will be trained by education program for social consideration. In addition, periodical patrol of workers will be implemented to avoid local conflict.</p>
5. Others	(1) Impacts during Construction	<p>(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)?</p> <p>(b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts?</p> <p>(c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?</p>	<p>(a) Y</p> <p>(b) Y</p> <p>(c) Y</p>	<p>(a) Following measures are proposed to reduce impacts by the construction: (i) air pollution, noise and the vibration; limit construction time (e.g. at daytime only), (ii) water pollution; proper treatment before discharging and monitoring during construction phase, (iii) organization of education program to construction labors and (iv) inclusion of the environmental consideration matters in the technical specification of the construction works.</p> <p>(b) Most of the construction works are small scale and therefore their impacts toward natural environment (ecosystem) is limited. In addition, proper treatment of disposed water is proposed to minimize the influence on river ecosystem by the rehabilitation works.</p> <p>(c) Most of the construction works are small scale and therefore impact of construction is limited. In addition, mitigation measures proposed are: (i) to educate construction workers about environment impacts, (ii) to stipulate environmental consideration measures in the technical specification of the construction works, (iii) to limit construction time to avoid disturbance of community life, (iv) to explain purpose and periods of construction to rural community, (v) to recycle materials from construction works. The education program for construction workers are to be organized by the Contractors.</p>

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations
5. Others	(2) Monitoring	<p>(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts?</p> <p>(b) What are the items, methods and frequencies of the monitoring program?</p> <p>(c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)?</p> <p>(d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?</p>	<p>(a) Y</p> <p>(b) N</p> <p>(c) N</p> <p>(d) N</p>	<p>(a) Water quality monitoring and land acquisition process monitoring is proposed for monitoring impact of DPISRSP.</p> <p>(b) The water quality monitoring will commence prior to the construction works. Monitoring items are; (i) pH, (ii) transparency (turbidity), (iii) water temperature, (iv) odor, and (v) appearance, which are proposed to be conducted once a month with two-year period. Methods are observation and instrumental measurement in the field. In addition monitoring items of operation phase add laboratory analysis items. Land acquisition process monitoring will commence before construction phase. Monitoring items are; (i) confirmation of joint committee activities, (ii) management for progress of voluntary land acquisition, (iii) confirmation of payment schedule e.g. compensation, and (iv) status of grievance redress. Methods of above activities are generally interview survey to affected people and local authorities.</p> <p>(c) Monitoring is proposed to be carried out under the responsibility of MOWRAM and PDOWRAM. And also, IRC are responsible for monitoring of land acquisition process, too.</p> <p>(d) At present, the format and the frequency of the report are not provided from regulatory authorities.</p>
6. Note	Reference to Checklist of Other Sectors	<p>(a) Where necessary, pertinent items described in the Forestry checklist should also be checked.</p> <p>(b) For the projects including construction of large-scale weirs, reservoirs, and dams, where necessary, pertinent items described in the hydropower, dams and reservoirs checklist should also be checked.</p>	<p>(a) N</p> <p>(b) N</p>	<p>(a) Not applicable since DPISRSP aims to rehabilitate existing facilities and no large scale expansion works are included.</p> <p>(b) -Ditto</p>
	Note on Using Environmental Checklist	<p>(a) If necessary, the impacts to transboundary or global issues should be confirmed (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming).</p>	<p>(a) N</p>	<p>(a) Not applicable since DPISRSP aims to rehabilitate existing facilities and no large scale expansion works are included.</p>

Note:

- 1) Regarding the term "Country's Standards" mentioned in the above table, in the event that environmental standards in the country where the project is located diverge significantly from international standards, appropriate environmental considerations are required to be made. In cases where local environmental regulations are yet to be established in some areas, considerations should be made based on comparisons with appropriate standards of other countries (including Japan's experience)
- 2) Environmental checklist provides general environmental items to be checked. It may be necessary to add or delete an item taking into account the characteristics of DPISRSP and the particular circumstances of the country and locality in which DPISRSP is located.

ANNEX H
Attachment

ANNEX H
Attachment 1

Monitoring Form

Monitoring Form

-If environmental reviews indicate the need of monitoring by JICA, JICA undertakes monitoring for necessary items that are decided by environmental reviews. JICA undertakes monitoring based on regular reports including measured data submitted by the project proponent. When necessary, the project proponent should refer to the following monitoring form for submitting reports.

-When monitoring plans including monitoring items, frequencies and methods are decided, project phase or project life cycle (such as construction phase and operation phase) should be considered.

1. Natural Environment

(Construction Phase)

- Noise / Vibration

Item	Unit	Measured Value (Mean)	Measured Value (Max.)	Country's Standards	Remarks (Measurement Point, Frequency, Method, etc.)
Noise level				Day Time (6:00-18:00) -Residential Area :60 dB(A) -Commercial Area: 70dB(A)	
Vibration level				-	

- Water Quality (Effluent/Wastewater/Ambient Water Quality)

Item	Unit	Measured Value (Mean)	Measured Value (Max.)	Country's Standards	Remarks (Measurement Point, Frequency, Method, etc.)
pH				-	
TSS (Total Suspended Solid)	mg/l			-	
Odor				-	
Appearance				-	
Temperature	°C			-	

- Construction Vehicle and machine

Monitoring Item	Monitoring Results during Report Period
Number of construction vehicle and machine	
Working time	

- Construction Waste

Monitoring Item	Monitoring Results during Report Period
Construction Waste management	

(Operation Phase)**- Water Quality (Effluent/Wastewater/Ambient Water Quality)**

Item	Unit	Measured Value (Mean)	Measured Value (Max.)	Country's Standards	Remarks (Measurement Point, Frequency, Method, etc.)
Temperature	°C			-	
Flow rate	Cubic/m			-	
Color				-	
Odor				-	
Appearance				-	
Transparency	NTU			-	
pH				-	
SS (Suspended Solid)	mg/l			25 - 100	
BOD/COD	mg/l			1 - 10/1-8	
DO	mg/l			2.0-7.5	
Total Nitrogen	mg/l			0.1 - 0.6	
Total Phosphorus	mg/l			0.005 - 0.05	
Micro-organisms	MPN/100 ml			< 5,000	

- Soil Erosion

Monitoring Item	Monitoring Results during Report Period
Canal Status	

- Borrow Area

Monitoring Item	Monitoring Results during Report Period
Borrow areas re-development	

2. Social Environment

- Resettlement/ Living / Livelihood

Monitoring Item	Monitoring Results during Report Period
(1) Physical Indicators	
1) Extent of land acquired	
2) No. of structures demolished	
3) Number of land owner's and users and private structure for which owner paid compensation	
4) Number of families affected	
5) Number of families approaching for purchase of agricultural land	
6) Number of affected person's receiving assistance or compensation	
7) Number of affected persons provided with transport facilities/shifting allowance/transition allowance.	
(2) Social Indicators	
1) Taken care of displacement of Vulnerable people.	
2) Number of information of Grievance system for Vulnerable people	
(3) Economic Indicators	
1) Entitlement of PAP's cash	
2) Overall livelihood	
(4) Grievance	
1) Cases of land acquisition referred to court which are pending and settled	
2) Number of the Resettlement and Rehabilitation/Stakeholder meeting for Grievance	
3) Number of cases disposed by IRC to the satisfaction of PAP's	
(5) Financial Indicators	
1) Amount of compensation paid for land/structure	
2) Cash grant for shifting outsets	
3) Amount paid for one time financial assistance	
4) Amount paid for community structure development	

ANNEX I

Technical Assistance

PREPARATORY SURVEY
FOR
IRRIGATION AND DRAINAGE SYSTEM
REHABILITATION AND IMPROVEMENT PROJECT
IN
THE KINGDOM OF CAMBODIA

ANNEX I
TECHNICAL ASSISTANCE

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ANNEX I

TECHNICAL ASSISTANCE

CHAPTER AI-1 TENTATIVE TERMS OF REFERENCE OF CONSULTING SERVICES

AI-1.1 Demarcation of Services

The technical services consist of two types. One is the services by technical consultant consisting of foreign and national consultants, and the other is the services by MOWRAM. The demarcation of these services is tabulated below:

Table AI-1.1.1 Demarcation of Services by Technical Consultant and MOWRAM

Services by Technical Consultant	Services by MOWRAM
<ul style="list-style-type: none"> - Review of previous studies - Preparation of definitive development plan - Execution of additional survey - Detailed design for large scale structures and major canal system - Preparation of prequalification documents and tender documents for construction - Execution of prequalification and tender evaluations for construction - Construction supervision for large scale structures and major canal system - Capacity development of MOWRAM and PDOWRAM staff on O&M - Capacity development of PDA staff on agricultural extension services - Preparation of relevant reports 	<ul style="list-style-type: none"> - Preparation of tertiary canal system development plan by employing national consultant - Execution of topographic survey for tertiary canals by employing national consultant - Detailed design for tertiary canal system by employing national consultant - Execution of tendering and evaluation for construction - Construction supervision for tertiary canal system by employing national consultant - Formation and strengthening of FWUCs by PDOWRAM trained - Strengthening of agricultural extension services by PDA trained under coordination by MOWRAM

Source: JICA Survey Team

AI-1.2 Scope of Services by Foreign Consultant

AI-1.2.1 Purpose

Services by foreign consultant will be carried out under two concepts, namely task concept and assistant concept. Purpose of consulting services under task concept is that foreign consultant will execute the services with full responsibility for MOWRAM. On the other hand, that of consulting services under assistant concept is that foreign consultants will assist and advise MOWRAM in fulfilling the works.

AI-1.2.2 Outline of Consulting Services

Outline of consulting services under task concept and assistant concept is tabulated below:

Table AI-1.2.2.1 Outline of Consulting Services

Concept	Description	
Task concept	All Stages	- Overall project management, monitoring and coordination among MOWRAM, PDOWRAM. PDA and other agencies concerned
	Detailed Design Stage	<ul style="list-style-type: none"> - Review of previous studies - Preparation of definitive development plan - Detailed design - Prequalification and tender documents - Preparation of reports

Concept	Description	
	Construction Stage	<ul style="list-style-type: none"> - Quality control - Progress control - Quantity control - Safety control - Capacity development for MOWRAM and PDOWRAM staff on O&M - Preparation of reports
Assistant Concept	All Stages	- To assist and advise PMU and PIUs in preparation of implementation schedule
	Detailed Design Stage	- To assist and advise PMU and PIUs in holding public consultation meeting
	Construction Stage	<ul style="list-style-type: none"> - To assist and advise PMU in prequalification and tender evaluation works - To assist and advise PMU in issuing variation order - To assist and advise PMU in settling contractors' claims.

Source: JICA Survey Team

AI-1.2.3 Tentative Terms of Reference for Consulting Services

AI-1.2.3.1 Overall Project Management

Task Concept

- To execute overall project management, monitoring and coordination among MOWRAM, PDOWRAM, JICA, and other agencies concerned for the purpose of smooth implementation of the Project,
- To monitor, evaluate and individually authorize tender process, contracts, physical and financial progress, and to prepare a regular progress report, and
- To monitor and individually authorize the disbursement of fund and collate those data.

Assistant Concept

- To assist and advise project director and national project manager at PMU and provincial project manager at PIUs of each Province in preparation of implementation schedule of Sub-projects and annual budget arrangement, ,
- To assist and advise PMUs in preparation of implementation schedule of sub-projects and annual budget arrangement,
- To assist and advise PMU and PIUs in organizing and operating PIU Coordination Committee, and
- To assist and advise PMU and PIUs in coordination with PDA on strengthening of agricultural extension services.

AI-1.2.3.2 Detailed Design

Task Concept

- To review the previous studies,
- To prepare definitive development plan,
- To prepare design criteria,
- To prepare detailed topographic maps for large-scaled structure sites,
- To execute additional soil mechanical survey,
- To make route survey for major canals,
- To make construction material survey,
- To make detailed design of irrigation and drainage facilities including preparation of detailed drawings,

- To review the existing environmental studies,
- To estimate work quantities, unit cost and construction cost,
- To prepare construction schedule including construction packages,
- To prepare prequalification and tender documents
- To prepare the reports including progress report, design report and service completion report

Assistant Concept

- To assist and advise PMU and PIUs in holding public consultation meeting for project implementation and O&M

AI-1.2.3.3 Construction

Task Concept

- To carry out construction supervision of construction works for the Sub-projects for the following items to the extent of such powers that will be delegated to the Consultant by the national project manager of PMU:
- To prepare the quality control manuals for earth works, concrete works, stone works and other important construction works and to apply such manual for quality control in the field,
- To check and approve construction drawings and shop drawings to be prepared by the contractor,
- To check and approve the setting-out lines and levels, and control points established by the contractor,
- To check and approve the construction plan proposed by the contractor which includes construction materials, equipment arrangement, construction method, labor arrangement and other related matters required for the works,
- To supervise field tests, sampling and laboratory tests to be carried out by the contractor,
- To inspect the construction method, equipment use, workmanship at the site, and to attend shop inspection and manufacturing test in accordance with the technical specifications,
- To issue a site instruction or other instruction to the contractor, as the necessity arises, on the way of clarification of construction drawings and technical specifications, and the construction supervision,
- To attend the regular meetings to check and confirm the construction method, work performance, work progress, status of equipment and materials, work schedule, and problems to be solved,
- To survey and measure the work output performed by the contractor,
- To check and certify the advance payment and progress payment claimed by the contractor for approval of the project manager of sub-project,
- To keep proper records necessary for preparation of the project completion report,
- To check as-built drawings prepared by the contractor,
- To perform the final inspection of the works together with the sub-project office and recommend to issue the completion certificate, and
- To prepare O&M manual for each Sub-project.

Assistant Concept

- To assist and advise PMU in pre-qualification of construction firms,
- To assist and advise PMU in tendering of construction firms,

- To assist and advise in modifying original detailed designs, technical specifications and drawings, related calculation and cost estimate as the necessity arises in accordance with the actual site condition,
- To assist and advise in issuing variation order, and
- To assist and advise in settlement of the contractor's claim and disputes on the basis of the analysis of the Consultant hereof in accordance with the civil work contract.

AI-1.2.3.4 Capacity Development of MOWRAM and PDOWRAM Staff on O&M

Task Concept

- To prepare O&M Manual for each Sub-project,
- To make training and lecture to MOWRAM and PDOWRAM staff based on O&M Manual for each Sub-project,
- Arrangement of attendance as seminar and/or lecture to be executed by TSC,

AI-1.2.3.5 Reports

The Consultants shall prepare and submit to MOWRAM the following reports in English during the Services period.

- Inception Report (10 sets)
Inception Report, to be submitted 3 months after the commencement of the Services, contains overall work schedule, work plan, administrative arrangement, results of review of existing designs during the inception period, and so on.
- Design Criteria (10 sets)
Prior to commencement of detailed design, the Consultants shall prepare and submit the design criteria to PMU.
- Monthly Progress Report and Quarterly Progress Report (10 sets)
Monthly Progress Report or Quarterly Progress Report, to be prepared at the end of every month or every quarter, shall contain detailed information of physical and financial progress of sub-projects, issues and problems, Consultant's input and activities, and work schedule of works for the next period.
- Design Report of Each Sub-project (10 sets)
Design report shall be prepared immediately after the completion of detailed design of each Sub-project.
- Prequalification Documents and Tender Documents of Each Sub-project (10 sets)
Prequalification documents and tender documents shall be prepared immediately after the completion of detailed design of each Sub-project.
- Operation and Maintenance Manuals of Each Sub-project (10 sets)
The O&M report is prepared after the completion of construction works of each Sub-project. The report contains manual and procedure for O&M of all Sub-project facilities to achieve the most effective use of water resources and to keep the Sub-project facilities functional within its designated lifetime. The report shall be written in English.
- Service Completion Report (10 sets)
The Service Completion Report shall be prepared after completion of detailed design. The report will mention the works executed, consumed man-month (M/M) of Consultants,

expenditures, products and other necessary information related to execution of the Services at detailed design stage.

- Project Completion Report (Executive Summary) (10 sets)

Based on the record of the construction works of each sub-project, the Consultant shall prepare and submit the project completion report which covers the results of all sub-projects.

- Technical Reports (10 sets)

Technical Reports, as required, should be prepared on the specific technical issues with the aim to enhance and upgrade technical understandings and skill of the executing agencies and managing agency concerned for the project implementation.

AI-1.2.4 Services by MOWRAM

MOWRAM will arrange and execute the Services on (i) tertiary canal system development, (ii) strengthening of agricultural services and (iii) strengthening of FWUCs in the following manners:

AI-1.2.4.1 Tertiary Canal System Development

PMU established in MOWRAM shall be responsible for tertiary canal system development including land acquisition for canal construction. The following works shall be carried out by PMU:

(1) Employment of National Consultant

PMU will select the national consultant in order to realize the tertiary canal system development in each Sub-project.

(2) Control to National Consultants on Design of Tertiary Canal System

The development plan and design of tertiary canal system in each Sub-project will be conducted by employing the selected national consultants under supervision of PMU. The development plan shall include the development concept, implementation schedule and design criteria. The design of tertiary canal system including preparation of tender document for LCB shall be conducted by the national consultants based on the criteria approved.

(3) Execution of Land Acquisition

PMU shall be responsible for timely execution of land acquisition for tertiary canal construction in cooperation with PDOWRAMs, to avoid any delay in construction works.

(4) Selection of National Contractors for Construction of Tertiary Canal System

Construction of tertiary canal system will be executed by LCB. Thus, PMU shall select the national contractor to undertake the construction of tertiary canal system through LCB.

(5) Control to National Consultants for Supervision to Tertiary Canal System Construction

Supervision for tertiary canal system construction will be conducted by employing the national consultants. Thus, PDOWRAMs, under PMU, shall control the national consultants so as to smoothly progress the construction works for tertiary canal system.

AI-1.2.4.2 Strengthening of Agricultural Extension Services

PMU shall also be responsible for strengthening of agricultural extension services to accomplish the improvement of agricultural productivity. The following works shall be carried out by PMU:

(1) Necessary Arrangement for Agricultural Extension Services

The agricultural extension services are included in the Project scope as soft component, aiming to improve the agricultural productivity, especially for rice. It is planned that the agricultural extension services will be provided to beneficial farmers by PDA in cooperation with PDOWRAM. Thus, PMU shall keep the close communication with PDA, and make the necessary arrangement including budgetary matter, so that PDA could take the required actions smoothly.

(2) Close communication between PDOWRAM and PDA

To realize the effective agricultural extension services, it is essential to keep the close communication between PDOWRAM and PDA. Thus, PDOWRAM is requested to provide PDA with timely information on progress and location of construction works. Consequently, PDA will be able to prepare the schedule of agricultural extension services.

AI-1.2.4.3 Strengthening of FWUCs

As mentioned previously, RGC stresses participation of FWUCs in irrigated agricultural project in his relevant policies. In the Project, it is proposed to apply the TOT system for strengthening of FWUCs to make cost saving and to keep the sustainability on strengthening of FWUCs. Firstly, PMU will select and employ the national consultant or NGO to train PDOWRAM staff. The employed national consultant or NGO will prepare the schedule of training to PDOWRAM staff. Thereafter, the trained PDOWRAM staff will train FWUCs in the light of progress of construction works.

CHAPTER AI-2 PROJECT ORGANIZATION

AI-2.1 Project Executing Agency

MOWRAM is the executing agency of the Project. The PMU will assume the direct administrative responsibility for the Project. The Project Director at the central level is appointed in MOWRAM, who will be responsible for implementation of the Project under MOWRAM.

At each sub-project level, the PIU is established under the PDOWRAM. The chives under PIUs monitor and control the physical progress of the sub-projects. Pre-qualification, tendering will be carried out by PMU at the central level while the control of contractor of each sub-project is conducted jointly by PMU and PIUs at the provincial level and approved at the central level.

AI-2.2 Consultant's Organization

The Consultant shall establish a central office in Phnom Penh. Further, the Consultant shall set a provincial office at each province.

The Consultant is represented by Team Leader and is responsible for executing the consulting services as a whole. The Consultant's central office executes project management, and progress and quality control as a whole. The Consultant's central office shall supervise and advise provincial offices.

Under the Team Leader, engineers are assigned for the daily management and supervision of the implementation of the Sub-projects. They will be stationed in Phnom Penh and regularly make the site inspection of the sub-projects for instruction and guidance of the Consultant's sub-project teams and the Contractors together with coordinating with and advising to the Sub-project offices.

The provincial offices shall be stationed at each province, and are under supervision of the central office. A consultant provincial office is represented by a provincial leader. A provincial office is, in general, responsible for execution of daily construction supervision for Sub-project in collaboration with relevant government project office.

AI-2.3 Experts Required

The total required expert M/M for the Services excluding tertiary canal system development shall not exceed 735 M/M consisting of 177 M/M of Professional A experts, and 558 M/M of Professional B experts.

Sub-professionals like construction assistant are also required. The required M/M for them is estimated at 186 M/M.

Further, office supporting staff such as secretary, administration officer, interpreters/typists, CAD operators and drivers will be required in main office. The Consultant should make provision in his financial proposal for such costs.

The man-months of foreign consultant and national consultants mentioned above are further discussed as follows:

(1) Detailed Design Stage

The services period for detailed design would be 1.5 years including mapping, topographic survey for main and secondary canals and major related structures and geological investigation for headworks. The assignment of foreign consultant and national consultant in design works is in principle determined based on the following considerations:

- Team Leader is periodically assigned only.
- Foreign Senior Design Engineer 1 will be in charge of control of all design works, especially 2 headworks together with 2 National Design Engineers.
- Foreign Senior Design Engineer 2 will be in charge of design works for 3 Sub-projects such as USISRSP, KSBISRSP and MC35RSP, together with 5 National Design Engineers.
- Foreign Senior Design Engineer 3 will be engaging in design works for 3 Sub-projects such as RCHRSP, SPWRRSP and DPISRSP together with 3 National Design Engineers.
- One National Design Engineer will be in charge of design works for SPWRRSP and MC35RSP.
- Other foreign consultants assigned for specific fields will execute their duties independently.

Terms of reference for respective experts assigned are as follows:

Table AI-2.3.1 Terms of Reference of Consultant Staff for Detailed Design

Position	M/M	Terms of Reference
Foreign Consultant		
(a) Team Leader	6	Three times visiting (2 M/M for each) is planned, say beginning time, middle time and end time for the following duties: <ul style="list-style-type: none"> - Preparation of working plan and execution of administrative works - Check of work progress and modification of work plan if necessary - Check of products and administrative works - Preparation of service completion report
(b) Hydrologist	2	<ul style="list-style-type: none"> - Investigate of water sources and clarification of current progress of each project - Execute of water balance study for Prek Thnot River Basin - Preparation of technical report
(c) Senior Design Engineer 1	18	<ul style="list-style-type: none"> - Overall control of detailed design works - Preparation of design criteria - Site investigation for headworks (RCHRSP and DPISRSP) - Detailed design of headworks (RCHRSP and DPISRSP) including hydraulic calculation and structural calculation - Control of Design Engineers 1 and 2 - Preparation of progress report - Preparation of design report - Preparation of tender drawings for headworks (RCHRSP and DPISRSP)
(d) Senior Design Engineer 2	16	<ul style="list-style-type: none"> - Detailed design of main and secondary canal systems for USISRSP, KSBISRSP and MC35RSP including hydraulic calculation and structural calculation - Control of Design Engineers 3,4, 5, 6 and 9 - Preparation of progress report - Preparation of design report - Preparation of tender drawings for main and secondary canal systems for USISRSP, KSBISRSP and MC35RSP
(e) Senior Design Engineer 3	12	<ul style="list-style-type: none"> - Detailed design of main and secondary canal systems for RCHRSP, SPWRRSP and DPISRSP including hydraulic calculation and structural calculation - Control of Design Engineers 7, 8 and 9 - Preparation of progress report - Preparation of design report - Preparation of tender drawings for main and secondary canal systems for RCHRSP, SPWRRSP and DPISRSP
(f) Geodetic Engineer	4	<ul style="list-style-type: none"> - Preparation of contract documents for mapping and topographic survey for 6 Sub-projects - Supervision of mapping and topographic survey for 6 Sub-projects - Check of products for 6 Sub-projects
(g) Gate Engineer	3	<ul style="list-style-type: none"> - Preparation of pro-to-type drawings for large gates for RCHRSP and DPISRSP - Preparation of pro-to-type drawings for small gates for 6 Sub-projects - Preparation of technical specifications for gates - Preparation of technical report - Preparation of progress report
(h) Soil Mechanical Engineer	2	<ul style="list-style-type: none"> - Investigation of soil conditions for 6 Sub-projects - Supervision of soil mechanical test - Determination of borrowed areas for 6 Sub-projects - Preparation of technical report - Preparation of progress report

Position	M/M	Terms of Reference
(i) Pump Engineer	1	<ul style="list-style-type: none"> - Preparation of pro-to-type drawings for pumps for KSBISRSP - Preparation of detailed drawing for pump house - Preparation of technical specifications for pumps - Preparation of technical report - Preparation of progress report
(j) Cost Estimator	2	<ul style="list-style-type: none"> - Arrangement of work quantities for 6 Sub-projects - Execution of unit price analysis - Cost estimate for 6 Sub-projects - Preparation of technical report - Preparation of progress report
(k) Specification Writer	2	<ul style="list-style-type: none"> - Preparation of tender documents for 2 construction packages
National Consultant		
(a) Design Engineer 1	6	<ul style="list-style-type: none"> - Site investigation with Senior Design Engineer 1 - Design of headworks for RCHRSP including hydraulic calculation and structural calculation under control of Senior Design Engineer 1 - Work volume estimate - Preparation of tender drawings for headworks for RCHRSP
(b) Design Engineer 2	6	<ul style="list-style-type: none"> - Site investigation with Senior Design Engineer 1 - Design of headworks for DPISRSP including hydraulic calculation and structural calculation under control of Senior Design Engineer 1 - Work volume estimate - Preparation of tender drawings for headworks for DPISRSP
(c) Design Engineer 3	16	<ul style="list-style-type: none"> - Site investigation with Senior Design Engineer 2 - Detailed design of main and secondary canal systems for USISRSP including hydraulic calculation and structural calculation - Work volume estimate - Preparation of tender drawings for headworks for USISRSP
(d) Design Engineer 4	16	<ul style="list-style-type: none"> - Site investigation with Senior Design Engineer 2 - Detailed design of main and secondary canal systems for USISRSP including hydraulic calculation and structural calculation - Work volume estimate - Preparation of tender drawings for main and secondary canal systems for USISRSP
(e) Design Engineer 5	16	<ul style="list-style-type: none"> - Site investigation with Senior Design Engineer 2 - Detailed design of main and secondary canal systems for KSBISRSP including hydraulic calculation and structural calculation - Work volume estimate - Preparation of tender drawings for main and secondary canal systems for KSBISRSP
(f) Design Engineer 6	16	<ul style="list-style-type: none"> - Site investigation with Senior Design Engineer 2 - Detailed design of main and secondary canal systems for KSBISRSP including hydraulic calculation and structural calculation - Work volume estimate - Preparation of tender drawings for main and secondary canal systems for KSBISRSP
(g) Design Engineer 7	16	<ul style="list-style-type: none"> - Site investigation with Senior Design Engineer 2 - Detailed design of main and secondary canal systems for RCHRSP including hydraulic calculation and structural calculation - Work volume estimate - Preparation of tender drawings for main and secondary canal systems for RCHRSP
(h) Design Engineer 8	16	<ul style="list-style-type: none"> - Site investigation with Senior Design Engineer 2 - Detailed design of main and secondary canal systems for DPISRSP including hydraulic calculation and structural calculation - Work volume estimate - Preparation of tender drawings for main and secondary canal systems for DPISRSP
(i) Design Engineer 9	16	<ul style="list-style-type: none"> - Site investigation with Senior Design Engineer 2 and 3 - Detailed design of main and secondary canal systems for MC35RSP and reservoir for SPWRRSP including hydraulic calculation and structural calculation - Work volume estimate - Preparation of tender drawings for main and secondary canal systems for MC35RSP and reservoir for SPWRRSP

Source: JICA Survey Team

(2) Construction Stage

The services period for construction supervision would be 4.0 years from mid.2016 to mid. 2020. The assignment of foreign consultant and national consultant in construction supervision is decided based on the following considerations:

- One foreign consultant should be at least assigned during construction supervision time to sign the monthly itemized statement.
- Team Leader is periodically assigned only.
- Foreign Senior Construction Engineer 1 is in charge of control of construction supervision works, especially headworks together with one National Construction Engineer and 2 National Construction Assistants.
- Foreign Construction Engineer who is assigned for the dry season only, supervise construction works for main and secondary canal system for 6 Sub-project, together with 3 National Construction Engineers and 5 National Construction Assistants.
- Foreign Senior Design Engineer will be periodically assigned to cope with design modification during construction time.
- Other Foreign Consultants for specific fields such as gates, pumps and soil mechanics are assigned as short term experts

Terms of reference for respective experts assigned are as follows:

Table AI-2.3.2 Terms of Reference of Consultant Staff for Construction Supervision

Position	M/M	Terms of Reference
Foreign Consultant		
(a) Team Leader	10	Eight times visiting is planned, including tender evaluation work. <ul style="list-style-type: none"> - Execution of evaluation of ICB tendering - Preparation of tender evaluation report - Determination of administrative staff - Establishment of consultant office - Settlement of problems encountered if any - Preparation of service completion report - Preparation of completion report
(b) Senior Construction Engineer	43	<ul style="list-style-type: none"> - Management of all foreign and national consultants - Supervision of all construction works, especially headworks together with one National Construction Engineer and 2 National Construction Assistants - Check of working drawings to be prepared by contractors - Attendance at tripartite progress meeting among MOWRAM, Consultant and Contractors - Assistance in management of claims from contractor - Check and sign of itemized statement - Preparation of official letters related to construction works - Preparation of progress report - Preparation of completion report
(c) Construction Engineer	24	<ul style="list-style-type: none"> - Supervision of construction works for especially main and secondary canal systems of 6 Sub-projects together with 3 National Construction Engineer and 5 National Construction Assistants - Check of related working drawings to be prepared by contractors - Attendance at tripartite progress meeting among MOWRAM, Consultant and Contractors - Preparation of official letters related to construction works - Preparation of progress report
(d) Senior Design Engineer 1	24	<ul style="list-style-type: none"> - Modification of detailed drawings during construction time - Check of working drawings to be prepared by contractors - Preparation of progress report
(e) Gate Engineer	12	<ul style="list-style-type: none"> - Inspection of gate factory - Check of shop drawings - Inspection of gates delivered - Supervision of installation of gates - Execution of test run - Preparation of operation manual of gates

Position	M/M	Terms of Reference
(f) Pump Engineer	2	<ul style="list-style-type: none"> - Inspection of gate factory - Check of shop drawings - Inspection of gates delivered - Supervision of installation of gates - Execution of test run - Preparation of operation manual of gates
National Consultant		
(a) Design Engineer 1	18	<ul style="list-style-type: none"> - Modification of detailed drawings for headworks during construction time under direction of Senior Construction Engineer and Senior Design Engineer - Check of working drawings to be prepared by contractors under direction of Senior Construction Engineer and Senior Design Engineer
(b) Design Engineer 3	56	<ul style="list-style-type: none"> - Modification of detailed drawings for main and secondary canal systems for RCHRSP, DPISRSP, MC35RSP during construction time under direction of Senior Construction Engineer and Senior Design Engineer - Check of working drawings to be prepared by contractors under direction of Senior Construction Engineer and Senior Design Engineer
(c) Design Engineer 4	56	<ul style="list-style-type: none"> - Modification of detailed drawings for main and secondary canal systems for USISRSP, KSBISRSP and SPWRRSP during construction time under direction of Senior Construction Engineer and Senior Design Engineer - Check of working drawings to be prepared by contractors under direction of Senior Construction Engineer and Senior Design Engineer
(d) Construction Engineer 1	30	<ul style="list-style-type: none"> - Supervision of construction for headworks for RCHRSP and DPISRSP under direction of Foreign Senior Construction Engineer - Record of quality control, progress control and quantity control by supervising 2 National Construction Assistants - Attendance at tripartite progress meeting among MOWRAM, Consultant and Contractors
(e) Construction Engineer 2	34	<ul style="list-style-type: none"> - Supervision of construction for main and secondary canal systems for RCHRSP and DPISRSP under direction of Foreign Senior Construction Engineer - Record of quality control, progress control and quantity control by supervising 2 National Construction Assistants - Attendance at tripartite progress meeting among MOWRAM, Consultant and Contractors
(f) Construction Engineer 3	34	<ul style="list-style-type: none"> - Supervision of construction for main and secondary canal systems for USISRSP and reservoir for SPWRRSP under direction of Foreign Senior Construction Engineer - Record of quality control, progress control and quantity control by supervising 2 National Construction Assistants - Attendance at tripartite progress meeting among MOWRAM, Consultant and Contractors
(g) Construction Engineer 4	34	<ul style="list-style-type: none"> - Supervision of construction for main and secondary canal systems for KSBISRSP and MC35RSP under direction of Foreign Senior Construction Engineer - Record of quality control, progress control and quantity control by supervising 2 National Construction Assistants - Attendance at tripartite progress meeting among MOWRAM, Consultant and Contractors
(h) Construction Assistant 1	18	<ul style="list-style-type: none"> - Execution of quality control for Headworks for RCHRSP under direction of National Construction Engineer 1 - Execution of quantity control for Headworks for RCHRSP under direction of National Construction Engineer 1 - Check and Record of construction consumables such cements, aggregates, fuel and iron bars and labors
(i) Construction Assistant 2	18	<ul style="list-style-type: none"> - Execution of quality control for Headworks for DPISRSP under direction of National Construction Engineer 1 - Execution of quantity control for Headworks for DPISRSP under direction of National Construction Engineer 1 - Check and Record of construction consumables such cements, aggregates, fuel and iron bars and labors
(h) Construction Assistant 3	30	<ul style="list-style-type: none"> - Execution of quality control for main and secondary canal systems for RCHRSP under direction of National Construction Engineer 2 - Execution of quantity control for main and secondary canal systems for RCHRSP under direction of National Construction Engineer 2 - Check and Record of construction consumables such cements, aggregates, fuel and iron bars and labors

Position	M/M	Terms of Reference
(i) Construction Assistant 4	30	<ul style="list-style-type: none"> - Execution of quality control for main and secondary canal systems for USISRSP under direction of National Construction Engineer 3 - Execution of quantity control for main and secondary canal systems for USISRSP under direction of National Construction Engineer 3 - Check and Record of construction consumables such cements, aggregates, fuel and iron bars and labors
(j) Construction Assistant 5	30	<ul style="list-style-type: none"> - Execution of quality control for main and secondary canal systems for KSBISRSP under direction of National Construction Engineer 4 - Execution of quantity control for main and secondary canal systems for KSBISRSP under direction of National Construction Engineer 4 - Check and Record of construction consumables such cements, aggregates, fuel and iron bars and labors
(k) Construction Assistant 6	30	<ul style="list-style-type: none"> - Execution of quality control for main and secondary canal systems for DPISRSP under direction of National Construction Engineer 2 - Execution of quantity control for main and secondary canal systems for DPISRSP under direction of National Construction Engineer 2 - Check and Record of construction consumables such cements, aggregates, fuel and iron bars and labors
(l) Construction Assistant 7	30	<ul style="list-style-type: none"> - Execution of quality control for reservoir SPWRRSP and main and secondary canal systems for MC35RSP under direction of National Construction Engineer 3 and 4, respectively - Execution of quantity control for reservoir SPWRRSP and main and secondary canal systems for MC35RSP under direction of National Construction Engineer 3 and 4, respectively - Check and Record of construction consumables such cements, aggregates, fuel and iron bars and labors

Source: JICA Survey Team

(3) Software Component

The services period for software component, consisting of capacity development of MOWRAM and PDOWRAM staff on O&M, formation and strengthening of FWUC and strengthening of agricultural extension services, would be 7 years from 2014 to 2020. The assignment of foreign consultant and national consultant in the implementation of software component is prepared according to the following considerations.

Capacity Development of MOWRAM and PDOWRAM Staff on O&M

- One Foreign Consultant (O&M Specialist) is assigned for each subproject at the beginning of the program to prepare overall work plan (1.0 M/M) and to conduct trial training (0.5 M/M).
- Two National Consultants consisting of irrigation expert (3.0 M/M) and O&M expert (3.0 M/M) are assigned for each subproject at the initial stage of the program to support MOWRAM and PDOWRAM in the preparation of training materials and establishment of monitoring and evaluation procedure for O&M activities.

Formation and Strengthening of FWUC

- Institutional expert of National Consultant (3.0 M/M) annually for each subproject will be assigned to support MOWRAM and PDOWRAM in preparation of training materials, organization of workshop and training programs etc.

Strengthening of Agricultural Extension Services

- Foreign Consultant (Agronomist/Agricultural Extension Expert) will be assigned for the preparatory work of the program.
- National Consultant (Agronomist/Agricultural Extension Expert) will be assigned to support PDA in the implementation of training program and demonstration farm including monitoring and evaluation.

Terms of reference for respective experts assigned are as follows:

Table AI-2.3.3 Terms of Reference of Consultant Staff for Capacity Development of MOWRAM and PDOWRAM Staff on O&M (Software Component)

Position	M/M	Terms of Reference
Foreign Consultant		
(a) O&M Expert	9	<ul style="list-style-type: none"> - Review of existing training materials in MOWRAM - Preparation of overall work plan - Preparation of sample training materials - Conduct of trial training program - Preparation of training report
National Consultant		
(a) Irrigation Expert	18	<ul style="list-style-type: none"> - Review of existing irrigation training materials in MOWRAM - Support preparation of improved training materials for irrigation - Support MOWRAM and PDOWRAM in the execution of irrigation training programs based on overall work plan - Preparation of training report - Support MOWRAM and PDOWRAM in monitoring and evaluation of irrigation activities in each irrigation system
(b) O&M Expert	18	<ul style="list-style-type: none"> - Review of existing O&M training materials in MOWRAM - Support preparation of improved training materials for O&M - Support MOWRAM and PDOWRAM in the execution of O&M training programs based on overall work plan - Preparation of training report - Support MOWRAM and PDOWRAM in monitoring and evaluation of O&M activities in each irrigation system

Source: JICA Survey Team

Table AI-2.3.4 Terms of Reference of Formation and Strengthening of FWUC (Software Component)

Position	M/M	Terms of Reference
National Consultant		
(a) Institutional Expert	126	<ul style="list-style-type: none"> - Review of existing FWUC organizational development training materials in MOWRAM - Support preparation of improved training materials for institutional development of FWUC - Support MOWRAM and PDOWRAM in the execution of FWUC formation and registration in each irrigation system - Support MOWRAM and PDOWRAM in the execution of FWUC training programs - Preparation of training report - Support MOWRAM and PDOWRAM in monitoring and evaluation of FWUC activities in each irrigation system

Source: JICA Survey Team

Table II-3.6.5.6 Terms of Reference of Strengthening of Agricultural Extension Services (Software Component)

Position	M/M	Terms of Reference
Foreign Consultant		
(a) Agronomist/Agricultural Extension Expert	2	<ul style="list-style-type: none"> - Preparation of guideline for annual action plan - Preparation of guideline for monitoring and evaluation of extension activities - Preparation of annual action plan - Preparation of handouts and other materials to be required - Preparation of guideline for monitoring and evaluation of extension activities
National Consultant		
(a) Agronomist/Agricultural Extension Expert	24	<ul style="list-style-type: none"> - Preparation of guideline for annual action plan - Preparation of guideline for monitoring and evaluation of extension activities - Preparation of annual action plan - Preparation of handouts and other materials to be required - Preparation of guideline for monitoring and evaluation of extension activities - Support in field programs - Support in farmer/farmer Group Training Programs - Support in mass guidance / Workshop: 12 courses - Periodical checking and analysis on work progress and performance of extension activities to be carried out by extension staff of PDA and DAO

Source: JICA Survey Team

CHAPTER AI-3 GENERAL REMARKS

AI-3.1 Location of Offices

The Consultant would have one central office in Phnom Penh and provincial offices at each province. Although the Consultant is assumed to be located in MOWRAM office space, or provincial site office, the Consultant should make provision in his financial proposal for the renting of suitable office space in MOWRAM and provinces for the case MOWRAM would be unable to provide such facilities.

AI-3.2 Language and Weight & Measures

The Consultant will be responsible for the provision of translators as necessary. The metric system will be used for weight and measures and the language employed for the documents/correspondence will be as follows:

- Proposal: in English
- Contract for the consulting services: in English
- Day-to-day correspondence with MOWRAM: in English
- Correspondence to local government: in English
- Reports: as specified in the reporting requirement of the Terms of Reference

AI-3.3 Equipment and Facilities to be provided to the Consultant

The Consultant is entitled to use facilities and equipment to be purchased or rented under the contract exclusively for the purpose of carrying out the Services, and shall hand them over to the client upon completion of the Services.

AI-3.4 Association of the Consultant

The leading consulting firm is encouraged to associate with the Cambodian consulting firm(s), of which the Services should be under the overall technical supervision of the leading consulting firm.

AI-3.5 Close Contact

The Services should be provided in close contact and good cooperation with MOWRAM.

CHAPTER AI-4 GOODS AND FACILITIES TO BE PROVIDED BY THE GOVERNMENT

AI-4.1 Report and Data

Existing reports and data related to the Project will be provided by MOWRAM at free of charge for smooth execution of the Services.

AI-4.2 Accommodation and Office Space

The Consultant's personnel will make all necessary arrangement to organize their own accommodation. Detailed requirements of housing and the costs involved should be stated clearly in the proposal taking the existing conditions in Phnom Penh and the provinces concerned into account.

The Consultant's requirement for office space in Phnom Penh and provincial offices including necessary equipment and utilities, should be stated clearly in the proposal with the cost for renting such office space for the case that MOWRAM would be unable to provide such facilities. The office will be equipped with electricity, communication facilities, water supply and necessary furniture.

AI-4.3 Appointment of Officials

MOWRAM will appoint officials, agents and representative as may be necessary for effective implementation of the Services.

AI-4.4 Visas and Permits

MOWRAM will assist the Consultant's personnel in obtaining necessary entry and exit visa, residence and work permits and travel documents required for their stay in Cambodia.

AI-4.5 Experts Status

Foreign personnel for the Consultant assigned to carry out the Services, will be given the status of experts performing the Services for MOWRAM during their stay in Cambodia. The Consultant shall ensure, however, that their personnel abide by all applicable laws and regulations of the Government and its authorities.

AI-4.6 Taxes and Duties

The Consultant shall comply with the current Government regulations on taxes and duties which are in effect on the date of signing of the contract.

AI-4.7 Cooperation and Counterpart Staff

MOWRAM will issue to its officials, agent and representative concerned, all such instructions as may be necessary or appropriate for effective implementation of the Services.

AI-4.8 Regulation for Use of Foreign Personnel

In accordance with the Government regulations, the Consultant shall submit an application to employ expatriates in Cambodia, prior to the arrival of such personnel, for approval by the Government authority concerned.

Such approval will subsequently be needed to obtain works permits and other immigration documents. MOWRAM will issue a sponsor letter to request and facilitate the prompt clearance of those formalities.

AI-4.9 Ownership of Equipment and Data

Equipment and data supplied by MOWRAM or purchased by the Consultant on behalf of MOWRAM shall remain at all times the property of MOWRAM.

The procedure for inventory and handing over to MOWRAM will be determined by MOWRAM representative in accordance with the established Government regulation.

AI-4.10 Reports and Other Records

MOWRAM or its representative will determine the procedure for recording, indexing, circulation and storage of reports and other records.

ANNEX J

Draft Resettlement Framework for Upper Slakou Irrigation System Rehabilitation Sub-project

THE KINGDOM OF CAMBODIA
Nation Religion King



Ministry of Water Resources and Meteorology

Resettlement Unit

JICA Study Team

**Upper Slakou Irrigation System Rehabilitation
Sub-project in Takeo Province of Cambodia**

DRAFT RESETTLEMENT FRAMEWORK

March 2012

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ACRONYMS AND ABBREVIATIONS

ADB:	Asian Development Bank
AFD:	Agence Française de Développement
APs:	Affected Person (s)
COI:	Corridor of Impact
CPP:	Cambodia People Party
DMS:	Detailed Measurement Survey
DD:	Detail Design
DRP:	Draft Resettlement Plan
DRF:	Draft Resettlement framework
EIA:	Environmental Impact Assessment
EA:	Executing Agency
EL:	Elevation
EMA:	External Monitoring Agent
FWUG:	Farmer Water User Group
FWUC:	Farmer Water User Communities
GRC:	Grievance Redress Committee
HH:	Household
IOL:	Inventory of Losses
IRC:	Inter-ministerial Resettlement Committee
JICA:	Japan International cooperation Agency
Km	Kilo meter
L	Length
m	Meter
m ²	Square meter
MAFF:	Ministry of Agriculture Forestry and Fishery
MC 33:	Main Canal 33
MEF:	Ministry of Economy and Finance
MLMUPC:	Ministry of Land Management, Urban Planning and Construction
MOE:	Ministry of Environment
MOU:	Memorandum of Understanding
MOWRAM:	Ministry of Water Resources and Meteorology
MRD:	Ministry of Rural Development
NGO:	Non-Government Organization
NSLC:	National Social Land Concession
PDAFF:	Provincial Department of Agriculture, Forests and Fisheries
PDF:	Provincial Department of Finance
PDLMUPC:	Provincial Department of Land Management, Urban Planning and Construction
PDOWRAM:	Provincial Department of Water Resources and Meteorology
PIB:	Public Information Booklet
PIU:	Project Implementation Unit
PLUAC:	Provincial Land Use and Allocation Committee
PMU:	Project Management Unit (of MOWRAM)
PRSC:	Provincial Resettlement Subcommittee
RFW:	Resettlement Framework
RGC:	Royal Government of Cambodia
ROW:	Right-of-Way
RU:	Resettlement Unit
SC 3U:	Secondary Canal 3U
SC 3D:	Secondary Canal 3D
SES:	Socio-economic survey
SLC:	Social Land Concession
The reservoir:	Tumnu Lok Reservoir
The project:	Upper Slakou Irrigation System Rehabilitation Sub-Project
TOR:	Terms of Reference

DEFINITION OF TERMS

Resettlement Plan (RP) is a time-bound action plan with budget setting out resettlement strategy, objectives, entitlement, actions, responsibilities, monitoring and evaluation.

Affected Person (AP) indicates any juridical person being as it may an individual, a household, a firm or a private or public who, on account of the execution of the Project, or any of its components or sub-projects or parts thereof would have their:

- (i) right, title or interest in any house, land (including residential, agricultural and grazing land) or any other fixed or moveable asset acquired or possessed, in full or in part, permanently or temporarily; or
- (ii) business, occupation, work, place of residence or habitat adversely affected; or
- (iii) standard of living adversely affected.

Severely Affected Person for this Project is defined as a person who will (a) lose more than 10 percent of total agriculture/aquaculture land holding, and/or (b) relocate and/or lose more than 50 percent of their main residential and/or commercial structure, and/or (c) lose more than 10 percent of total income sources due to the Project.

Land Acquisition means the process whereby a person is compelled by a public agency to alienate all or part of the land s/he owns or possesses, to the ownership and possession of that agency, for public purpose in return for fair compensation.

Replacement Cost means the cost of replacing lost assets and incomes, including cost of transactions. If land, it means the cost of buying a replacement land near the lost land with equal productive potential and same or better legal status, including transaction costs. If structures, the replacement cost is the current fair market price of building materials and required labor cost without depreciation or deductions for salvaged building material or other transaction cost. Market prices will be used for crops, trees and other commodities.

Resettlement Effects mean all negative situations directly caused by the Project/subproject, including loss of land, property, income generation opportunity, and cultural assets.

Relocation means the physical relocation of an AP from her/his pre-Project place of residence.

Rehabilitation means the process to restore income earning capacity, production levels and living standards in a longer term. Rehabilitation measures are provided in the entitlement matrix as an integral part of the entitlements.

Compensation means payment in cash or in kind to replace losses of land, housing, income and other assets caused by a project.

Significant Resettlement Effect for each project means 200 people or more will experience major impacts. "Major" impacts being physical displacement from housing and/or more than 10 percent of the household's productive (income generating) assets are lost.

Compensation Cut-off means Payment in cash or in kind to replace losses of land, housing income, and other assets caused by the Project.

Corridor of Impact means actually area needed to be land clearing for construction of the Project.

Cut-off Date means eligibility for entitlements will be the end of the detailed measurement and census survey following completion of the detailed design of the components.

Indirect Impact means the people, who are not direct impact by the project, but they will lose facilities and conditions for common living such as lose access roads, pagoda, schools, health center, traditional believing places etc...

EXECUTIVE SUMMARY

1. Scope of Land Acquisition and Resettlement: This document is a Draft Resettlement Framework (DRF) UPPER SLAKOU IRRIGATION SYSTEM REHABILITATION SUB-PROJECT in Takeo Province of Cambodia. This DRF provides a detailed and time-bound plan and budget for project affected households (APs) losing land and other assets caused by construction MC 33, SC 3U, SC 3D and Dam & Tumnap Lok Reservoir. The Area survey in 5 m from existing of mouth canals. The resettlement survey was made in 2 cases: 1). Following JICA study team alignment of MC 33(L=7,730 m), SC 3U (L=1,510m) and SC 3D (L= 8,530m), hereafter **original plan** (see Map No.1). 2). Proposed new alignment MC 33 (L=8,888 m) SC 3D (L=7,615 m) by RU/MOWRAM Team, hereafter **proposed plan** (see Map No.2).
2. Based on the IOL carried out dated 19 December 2011 to 17 February 2012 on privately-held lands and other fixed assets inside the area of COI of **original plan** of MC 33, SC 3U, SC 3D was found a total of 39,352 m² of rice land, a total of 40,761 m² residential land, 89 houses, 71 stalls/shops, 1 latrine, 4 granges, 4 dug wells, 8 hand pump wells, 1 pond, 866 m of concrete fences, 238 m of steel fences, 44 m of culvert, 26 concrete bridges (442m), 6 wooden bridges (79m), 48 places of concrete slab (2,402 m²), 2 cemeteries, 4 wooden stairs, 2 concrete stairs, 12 balconies (696 m²), 1 fuel station and 5,717 economic tree belonging to 412 AP households with 2,150 persons, will be impacted by the project construction. Moreover, IOL survey found public assets as: 18 concrete bridges, 1 building of Ang Roka commune health center and 89 m of its concrete fence, steel fence, entrance gate and land compound of Ta Phem Commune Health Center, 295 m² of CPP compound land office and 59 m of its steel fence, 190 m² of commune commercial compound land, and 140 m² of Commune Police compound land will be affected by the original plan rehabilitation. In other to minimize the social impact for rehabilitation of SC 3D the RU/MOWRAM propose to JICA study team to be continued alignment MC 33 to the Ang Rokar Market area with a total length 1,158m and alignment of SC 3D have to change new location with a total SC 3D length of 7615 m (see Map No.3 below). The results of the IOL survey also has identified 67 AP households as falling under one or more of the following vulnerable groups-woman-headed, aged household head, disabled household head, and/or with a monthly household income below the national poverty line.
3. The same as IOL survey on privately-held lands and other fixed assets inside the area of COI of **proposed plan** of MC 33 and SC 3D was found a total of 42,200 m² of rice land, and a total of 31,368 m² residential land, 23 houses, 51 stalls/shops, 1 latrine, 6 granges, 5 dug wells, 6 hand pump wells, 2 ponds, 402 m of concrete fences, 217 of steel fences, 13 m of culvert, 36 concrete bridges (823m), 6 wooden bridges (79m), 31 places of concrete slab (1,800 m²), 2 cemeteries, 4 wooden stairs, 2 concrete stairs, 11 balconies (573 m²), and 5,410 economic tree belonging to 368 AP households with 1,951 persons, will be affected by the project construction. The results of the IOL survey also has identified 63 AP households as falling under one or more of the following vulnerable groups-women-headed, aged household head, disabled household head, and/or with a monthly household income below the national poverty line. Additionally, IOL results also indicated 295 m² of CPP compound land office and 59 m of its steel fence, 190 m² of District Business compound land, and 140 m² of Commune Police compound land will be affected by the proposed plan rehabilitation.
4. Therefore, the **proposed plan** (368 APs) was less negative impact than **original plan** (412 APs).
5. Additionally, briefly impact survey in **Tumnap Lok Reservoir** were found a total of 1,470,314 m² agriculture land, a total of 27,025 m² residential land and a total of 338 economic trees belong to 193 HHs will affect by the reservoir filling. The further impact resulting changing dam dimensions or alignments and from unforeseen flooding from the Tumnap Lok reservoir, a further DMS will be conducted before construction of the dam and reservoir in the detailed design phase of the project. The extent of impact is cleared, and this additional impact will be a subject of further funding from the government to

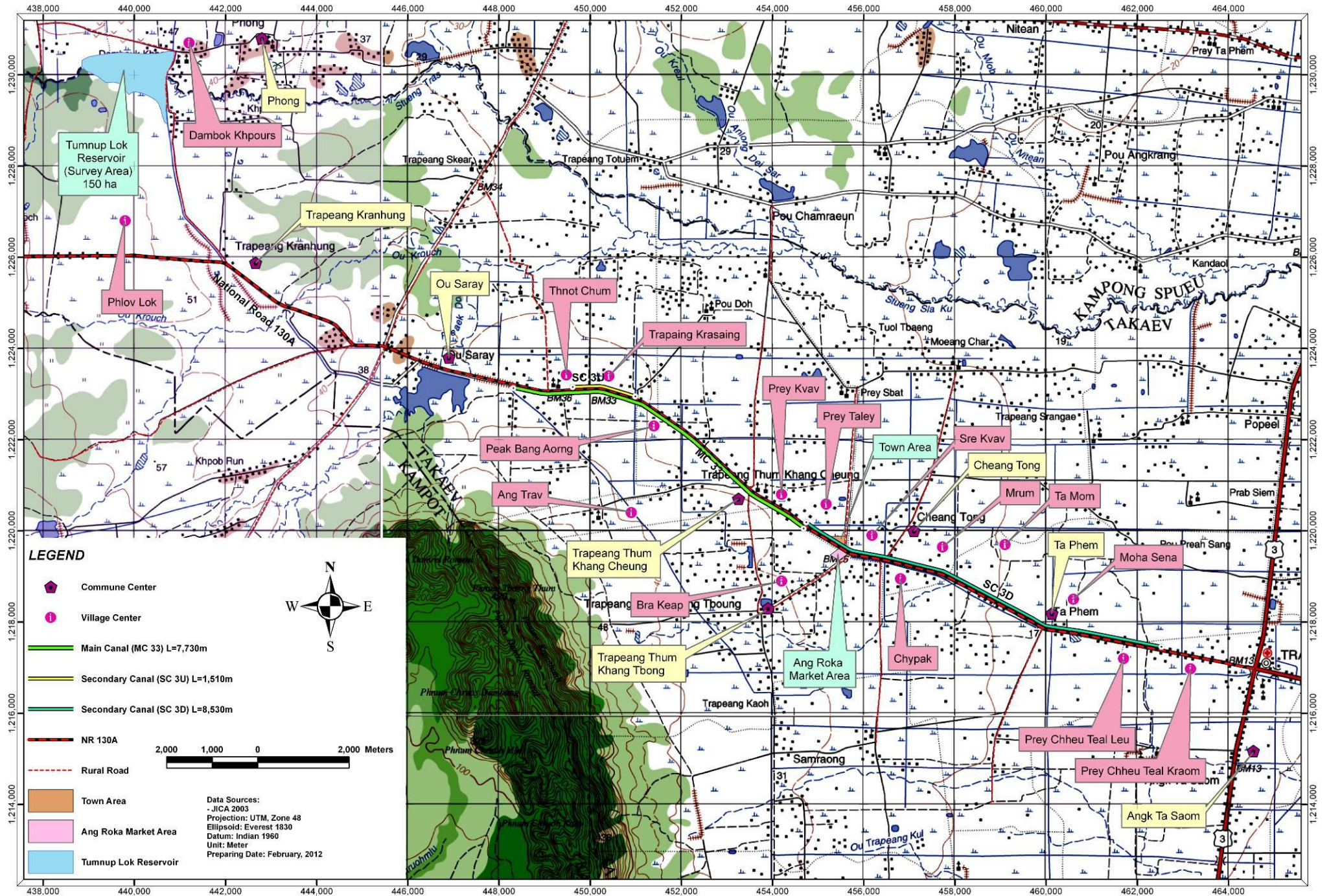
cover the costs of compensation for land losses and other APs entitlements. In the 193 APs there are 46 HHs falling under one and more vulnerability incidences (widower, elder, and disable, and monthly household income below the national poverty line household heads).

6. **Policy Framework, Principles, and Entitlements:** The legal and policy framework for compensation and resettlement under the Project is defined by the relevant laws and regulations of the Royal Government of Cambodia (RGC), the ADB policies on Involuntary Resettlement (1995) and JICA Guidelines for Environmental and Social Considerations (April 2010). Considering that all affected persons (APs) identified within the project infrastructure COI of proposed plan (MC 33, SC 3U and SC 3D) and living or having land inside or outside the reservoirs have no legal documents to claim for land. The Project will ensure that all APs, irrespective of tenure status, will be able to restore or even improve their pre-project socio-economic conditions.
7. Consistent with the Cambodia Policy, the following entitlements will be provided to eligible AP households:
 - a. Cash compensation at replacement cost for all affected agricultural and residential lands, houses and other fixed structures, crops, and trees. Replacement compensation for affected houses and fixed structures are inclusive of the current market costs of similar building/construction materials of the affected structures, plus the cost of labor for dismantling, reconstructing and/or repairing the same, without deduction for depreciation or the value of salvageable materials Tumluup Lok Reservoir.
 - b. A one-time disruption allowance of \$40 to the 368 APs for **proposed plan** and 193 Aps for the reservoir.
 - c. A one-time cash allowance of \$240 compensated to 63 (**proposed plan**) and 46 (**Tumnup Lok reservoir**) of vulnerability of APs (See table 6 and 7 below).
 - d. For the 2 (**Proposed plan**) and 185 (**Tumnup Lok**) AP households losing more than 10% of their total agriculture productive lands, each is entitled to the following income restoration measures:
 - d.1 Short-term employment in the Project activities for construction of project infrastructure as dike, canal related hydraulic structures etc... to be facilitated by the Ministry of Water Resources and Meteorology (MOWRAM), the Executing Agency (EA). The EA will request the civil works contractor to hire the APs in the process construction of the Project.
 - d.2 Transitional allowance of \$412 per hectare of all land lost in the project area for 2 HHs (**Proposed plan**) and 185 HHs (**Tumnup Lok**) who will lose more than 10% of agriculture productive land affected base on rice land with the average yield of rice productivity per year of 1.5 tons per hectare at a current market value of 1100 Riel per kilogram). This transitional allowance covers for their loss of the agricultural productions which was not able to be grown in the year of relocation or replacement places and it will be provided for the other specific transitional period in case it is needed.
 - d.3 Provide advice to APs to help them find and purchase replacement productive land.
8. **Income Restoration and Resettlement Strategy:** The delivery of compensation and other entitlements will be carried out within detail design phase of the project. The income restoration measures for APs losing of their total productive land will also conduct DMS in the same phase. Moreover, the compensation of the losing agricultural product of the affected HHs equivalence of rice 1.5 T/ ha with cost \$US412 /ha.
9. MOWRAM will ensure that the cost of resettlement is approved by the Inter-Ministerial Resettlement Committee, which in turn will ensure that funds for the implementation of this DRP available in a timely and sufficient manner. The total cost of resettlement for the original plan is **US\$ 1,500,462**, for proposed plan is **US\$ 441,803**, and for Tumnup Lok Reservoir is **US\$ 472,571**.

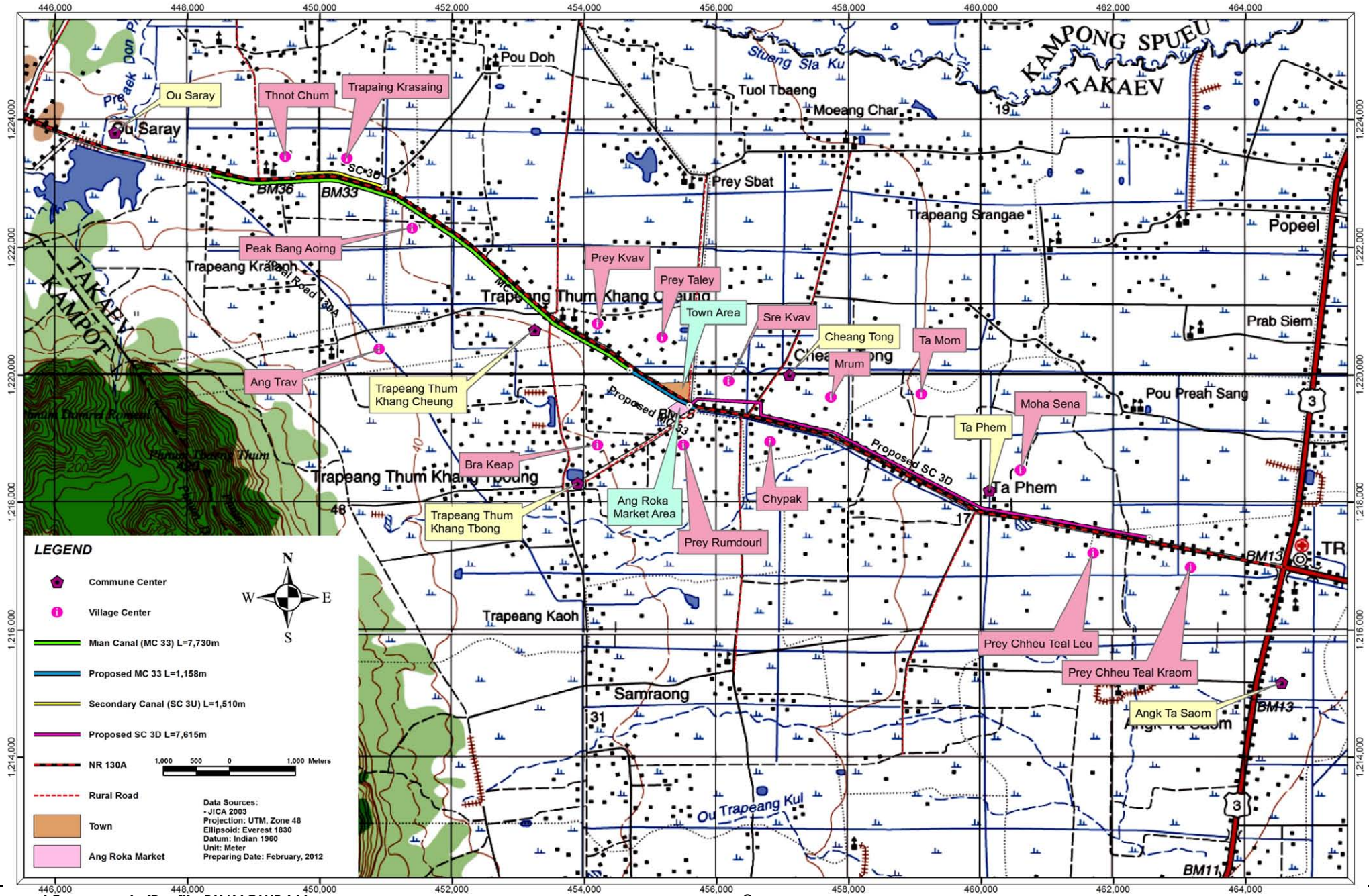
10. **Participation, Disclosure and Grievance Redress:** Consultations, public meetings and village discussions with APs and local officials will be carried out during the resettlement planning process in the DD phase of project. These activities will continue during updating and implementation and will follow the Project's participatory approach in the whole project phases. A draft Public Information Booklet (PIB) will be prepared by IRC before conducting DMS. MOWRAM will be responsible for the disclosure of the draft and final resettlement plan to the APs. A grievance mechanism has been designed to ensure that APs concerns and grievances are addressed and resolved in a timely and satisfactory manner. APs will be made fully aware of their rights verbally and in writing during consultation, survey, and time of compensation.
11. **Ethnic Minorities and Gender Strategy:** The Project does not expect to have specific impacts on ethnic minority groups and does not require preparation of an ethnic minority development plan. However, the Resettlement framework (RFW) and gender strategy do include specific actions to mitigate adverse impacts and enhance the ability of the vulnerable groups to benefit from the Project interventions. A gender strategy is included in the Draft Resettlement Plan of the DD to include enhancement of opportunities for women's participation from planning to implementation, participate in the decision-making process, and take advantage of new employment and income-generating opportunities. The project supervision consultants, independent monitoring organization, and RU-PMO/MOWRAM who will plan and implement income restoration programs will ensure that they or members of their teams have: experience in preparing and implementing gender and development programs in Cambodia; the necessary gender perspective and experience to deal with vulnerable groups; and female staff.
12. **Institutional Arrangements and Implementation Schedule:** MOWRAM, under the guidance from the Inter-ministerial Resettlement Committee-Ministry of Economy and Finance (IRC-MEF), will be responsible for updating, implementing and internal monitoring of resettlement activities. The MEF may recruit NGO for external monitoring during the implementation of the DRP.
13. The DRP will be updated on a length-by-length basis following detailed design of the project and IRC base on this will be conducted DMS. It will be disclosed to APs prior to submission to IRC for review and approval. For sections where there will be no land acquisition and resettlement, the civil works contractors will not be issued a notice of possession of sites of a particular section until the PMO, together with the RU of MOWRAM, confirm that the area for the said section will not cause any resettlement impacts and that the land is free of any encumbrances, dispute or controversy. For sections where resettlement impacts cannot be avoided, civil works contractors will not be issued a notice of possession of a particular section until (a) compensation payment, (b) agreed rehabilitation assistance is in place, and (c) and that particular section is free of all encumbrances. Land acquisition, compensation and relocation of APs cannot commence until the updated DRP has been approved by IRC.
14. To ensure that temporary impacts during construction will be avoided, if not minimized, the civil works contract will have the following requirements: (a) contractor to pay rent for any additional private land required for construction working space and include a mechanism for payment; (b) for the contractor working space, to the extent possible, only unused land will be used to avoid disruption to households, use of residential land will not require any impacts on houses and structures and will not disrupt access to households, use of land will not disturb any business establishments/shops; and (c) temporary use of land will be restored or improved in its pre-project condition. A written agreement between contractor and APs will be executed and copies and submitted to PRSC to facilitate proper monitoring.

15. Monitoring: RU/ PMO of MOWRAM will be responsible for internal monitoring of resettlement activities. Progress reports will be submitted to IRC and JICA Project Team on a quarterly basis.

Map No.1: Location Map of Upper Slakou Irrigation Rehabilitation and Tumnu Lok Reservoir



Map No.2: Location Map of Proposed New Alignment MC 33 and SC 3D of Upper Slakou Irrigation Rehabilitation Project



1. INTRODUCTION

1.1. Resettlement Plans and Resettlement Framework

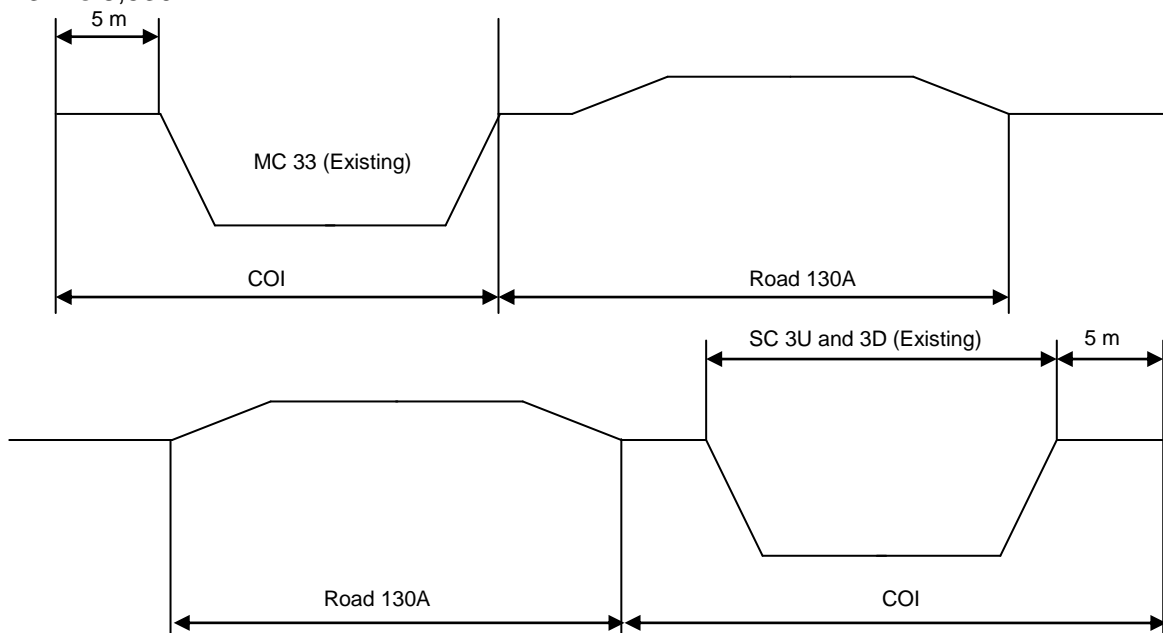
16. A Draft Resettlement Plan will be prepared during detailed design phase of the project that will be implemented during the first year and month for which there is a sufficient level of design to identify land acquisition impacts. These activities will conduct by IRC, which have RU/PMO/MOWRAM also joint with this team.
17. A Resettlement Framework has also been prepared for this phase of the project because the project for which there is insufficient level of design to be able to identify land acquisition impacts at this time and for which the selection criteria and design will entail a community participation process. The Framework is based on RGC and ADB's *Policy on Involuntary Resettlement and Handbook on Resettlement: A Guide to Good Practice* and JICA Guidelines for Environmental and Social Considerations (April 2010) and it will be applied to the projects where there will be land acquisition and resettlement. The Resettlement Framework presents the specific policies and guidelines to guide the process for land acquisition and resettlement in the DD phase. The update the draft Resettlement Plans will be prepared by the execution agencies as RU/PMO/ MOWRAM that closely works with IRC.

1.2. Description of the Project

18. The Project is consisted of 2 stages: (1) Feasibility stage and (2) Detailed design and construction stage. In this time the Project in Takeo Province is rehabilitation of irrigation systems based on:
 1. Rehabilitation and reconstruction of the existing irrigation and drainage facilities covering irrigation area of 3,500 ha.
 2. Procurement of O&M equipment including marketing assistance facilities.
 3. Institutional Development.
19. The Project is located in Tram Kok District in Takeo Province about 30 km West of Takeo Town.

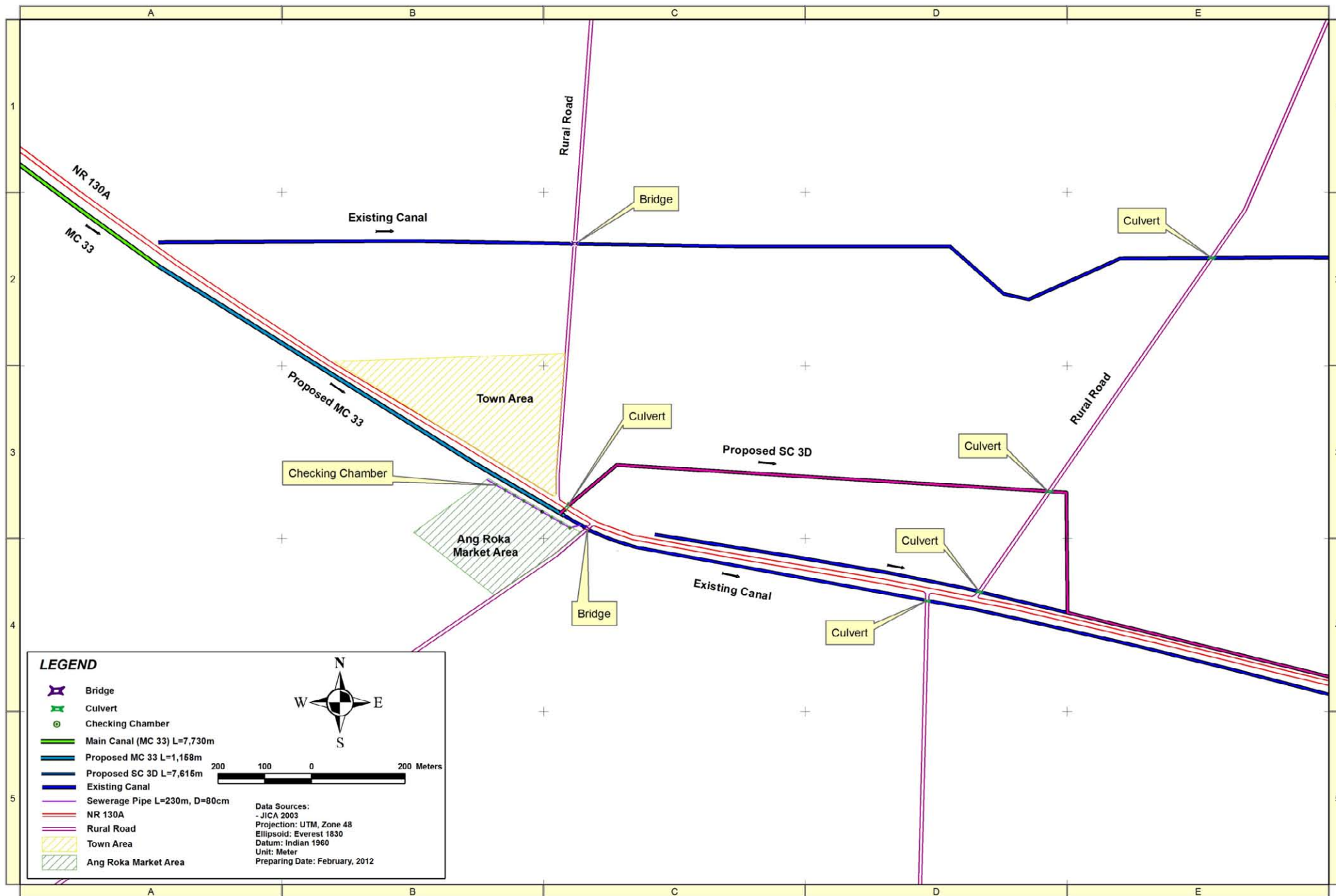
1.3. Scope of Survey

20. The RU/MOWRAM was conducted IOL for affected area in COI is 5 m from existing mouth canal to National Road 130A (Information provided by JICA Study Team) see sketch below. The RU Team have found 6 communes and 15 villages covered the MC 33, SC 3U and SC 3D. The Total length of MC 33 is 7,730 m; SC 3U is 1,510m and SC 3D is 8,530m.



Sketch of Downstream View

Map No.3: Plan View of Proposed MC 33, SC 3D and Sewerage Pipe Line of Upper Slakou Irrigation Rehabilitation Project



21. After IOL was conducted by the RU Team, socio-economic survey was conducted base on results of total affected households (HH). The total IOL surveys of affected HH (Original plan) are 412, so 21 % of the HH equivalent of 89 HHs was selected for interviewed (see Table 1 below). The living condition of the HH referring type of houses as well of HH is House Type 4*, medium HH is House Type 3*, fair HH is House Type 2*, and Poor HH is House Type 1*. (see socio-economic survey questionnaire in appendix 1)

Table 1: Selected APs for Socio-Economic Survey (21%) by the Affected Villages

Affected Commune name	Village name	Total APs (HH)	Socio-economic Survey (21%)	House Type 1	House Type 2	House Type 3
O Saray	Thnot Chum	47	9	3	3	3
	Trapaing Krasaing	55	11	4	4	3
Trapaing Thum Khangtbong	Bra Keap	12	2	1	1	0
	Prey Rumdourl	0	3	1	1	1
Trapaing Thum Khangcheung	Ang Trav	14	3	1	1	1
	Peak Bang Aorng	33	7	3	2	2
	Prey Kvav	15	3	1	1	1
	Pey Taley	33	8	3	3	2
Ang Ta Saom	Prey Chheuteal Leu	19	4	2	1	1
	Prey Chheuteal Kraom	9	2	1	1	0
Cheang Torng	Chypak	15	3	1	1	1
	Sre Kvav	78	16	6	5	5
Ta Phem	Mohasena	28	6	2	2	2
	Mrum	25	6	2	2	2
	Ta Mom	29	6	2	2	2
Total		412	89	33	30	26

* **Note:** House Types see Table 13 Below

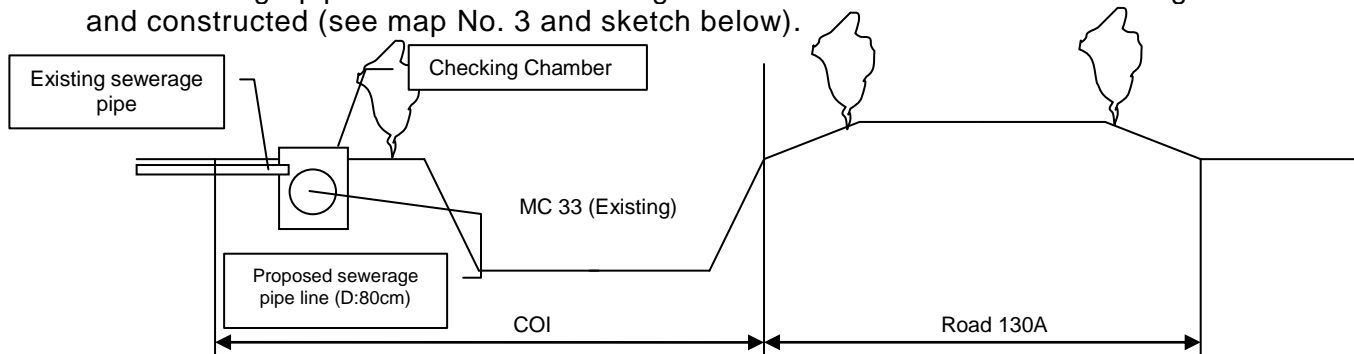
2. SCOPE OF LAND ACQUISITION AND RESETTLEMENT

2.1. Summary of Adverse Social Impacts

22. In this chapter, summary of adverse social impact was described proposed plan. A total of 44,545 m² of rice land, and a total of 33,563 m² residential land, 23 houses, 51 stalls/shops, 1 latrine, 6 granges, 5 dug wells, 6 hand pump wells, 2 ponds, 402 m of concrete fences, 217 of steel fences, 13 m of culvert, 36 concrete bridges (823m), 6 wooden bridges (79m), 31 places of concrete slab (1,800 m²), 2 cemeteries, 4 wooden stairs, 2 concrete stairs, 11 balconies (573 m²), and 5,410 of economic trees belonging to 368 AP households with 1,951 persons, will be affected by the project construction. The results of the IOL survey also has identified 63 AP households as falling under one or more of the following vulnerable groups-woman-headed, aged household head, disabled household head, and/or with a monthly household income below the national poverty line.
23. Additionally, briefly impact survey in Tumnap Lok Reservoir were found a total of 1,470,314 m² agriculture land, a total of 27,025 m² residential land and a total of 338 fruit trees belong to 193 HHs will affect by the reservoir filling. The further impact resulting changing dam dimensions or alignments and from unforeseen flooding from the Tumnap Lok reservoir, a further DMS will be conducted before construction of the dam and reservoir in the detailed design phase of the project. The extent of impact is cleared, and this additional impact will be a subject of further funding from the government to cover the costs of compensation for land losses and other APs entitlements. In the 193 APs there are 46 HHs falling under one and more vulnerability incidences (widower, elder, and disable, and monthly household income below the national poverty line household heads).

2.2. Measures to Mitigate the Adverse Social Impacts

25. In order to minimize impact on residential land and other fixed assets in the COI of SC 3D of the Project and to reduce the resettlement impact to be provided in the DRP the alignment of MC 33 and SC 3D have to be designed options to compare the proposed MC 33, SC 3D. So to minimize these impact the RU/MOWRAM team have recommended to JICA study team to continue MC 33 alignment until the Ang Roka Market area and to change alignment SC 3D also (see map No. 2 and 3). Truly, in the market area have some sewerage pipe that drain to the existing canal, but a new sewerage pipeline with 230m of length and check chamber shall be designed and constructed (see map No. 3 and sketch below).



Sketch of proposed new alignment MC 33 and new sewerage pipe line in the Ang Roka Market

26. There are 7 public concrete bridges, 27 private wooden bridges and 18 private concrete bridges constructed cross the existing of MC 33. The rehabilitation of proposed plan shall keep 4 public concrete bridges (see table 2 below), and on the right bank of MC 33 shall construct laterite road with cress wide of 5 m for people access and connect to the road 130A.

Table 2: Proposed Keeping Bridges on MC 33

#	CH	Ownership	Condition	X	Y
1	0+960	Private	B	449265	1223069
2	1+030	Public	B	449407	1223077
3	6+200	Public	B	453494	1220918
4	6+40	Public	B	453682	1220774

Note: Datum Indian Thailand, Condition B: Partly deteriorate but functioning need to be repaired

27. The same as MC 33, there are 10 public concrete bridges, 36 private concrete bridges, and 6 private wooden bridge cross the existing SC 3D. In other to improve traffic for rehabilitation of the SC 3D shall construct new laterite road on left bank of the canal with cress wide of 5 m. Where, the rural road cross the canal shall construct bridge or box culvert for the people easily access to Road 130A.
28. For Tumnu Lok reservoir, the choice of crest height, length and capacity of the spillway and dimension of regulators was made in order to reduce the risk of high levels in the reservoir which would cause flooding upstream of the reservoirs
29. APs will be compensated at replacement costs for their losses and will be provided assistance, as necessary, to help them rehabilitate themselves, consistent with the Cambodia government rule.

3. SOCIO-ECONOMIC PROFILE OF AFFECTED PEOPLE (Pre-Project)

3.1. Demography

29. During IOL survey the local authorities has interviewed and consulted by the RU/ MOWRAM Team. The table 3 (a, b, c) below show demography data in Affected Village in COI of original plan, proposed plan, and the reservoir area respectively.

Table 3a: Population in 14 Affected Villages in 6 Communes of Tram Kok District Caused by MC 33, SC 3U and SC 3D rehabilitation (IOL in Dec 2011-Feb 2012) for Original plan

#	Affected Commune name	Village name	Total family (HH)	Population (person)	Female (person)	Over 18 year old (pers.)	Female (person)	Family size (person)	Total APs (HH)	% APs in Village (HH)	Remarks
1	O Saray	Thnot Chum	251	1,015	516	629	329	4.04	47	18.7%	MC 33
		Trapaing Krasaing	223	935	479	596	303	4.19	55	24.7%	MC 33
2	Trapaing Thum Khangtbong	Bra Keap	174	834	443	545	290	4.79	12	6.9%	MC 33
3	Trapaing Thum Khangcheung	Ang Trav	329	1,366	700	847	405	4.15	14	4.3%	MC 33
		Peak Bang Aorng	295	1,300	653	898	452	4.41	33	11.2%	MC 33
		Prey Kvav	95	453	241	320	167	4.77	15	15.8%	MC 33
		Pey Taley	73	357	174	251	129	4.89	40	45.2%	SC 3D
4	Ang Ta Saom	Prey Chheuteal Leu	72	361	185	262	144	5.01	19	26.4%	SC 3D
		Prey Chheuteal Kraom	141	744	380	439	246	5.28	9	6.4%	SC 3D
5	Cheang Torng	Chypak	216	527	284	252	146	2.44	16	6.9%	SC 3D
		Sre Kvav	219	925	480	695	356	4.22	80	35.6%	SC 3D
6	Ta Phem	Mohasena	241	1,225	645	762	398	5.08	29	11.6%	SC 3D
		Mrum	155	769	408	387	205	4.96	28	16.1%	SC 3D
		Ta Mom	152	732	369	436	233	4.82	29	19.1%	SC 3D
Total			2,636	11,543	5,957	7,319	3,803	63	412	15.6%	

Note: In the affected villages some HHs is not affected.

30. There are 412 HHs (15,6% of total 14 village's population) in 6 communes of Tram Kok district of Takeo Province will be affected by the project construction for original plan (Detailed see Table 3 a above).

31. For proposed plan of MC 33 and SC 3D included SC 3U the APs was minimized to 368 HHs (13% of total 15 affected village's population) in 6 communes for proposed plan (see Table 3b below).

Table 3b: Number of Affected Household in 14 Villages of 6 Communes (IOL in Dec 2011-Feb 2012) for Proposed Plan

#	Affected Commune name	Village name	Total family (HH)	Total Population (person)	Total APs (HH)	% APs in Village (HH)
1	O Saray	Thnot Chum	251	1,015	47	18.7%
		Trapaing Krasaing	223	935	55	24.7%
2	Trapaing Thum Khangtbong	Bra Keap	174	834	12	6.9%
		Prey Rumdourl	184	336	18	9.8%
3	Trapaing Thum Khangcheung	Ang Trav	329	1,366	14	4.3%
		Peak Bang Aorng	295	1,300	33	11.2%
		Prey Kvav	95	453	15	15.8%
		Pey Taley	0	0	0	0.0%
4	Ang Ta Saom	Prey Chheuteal Leu	72	361	19	26.4%
		Prey Chheuteal Kraom	141	744	9	6.4%

#	Affected Commune name	Village name	Total family (HH)	Total Population (person)	Total APs (HH)	% APs in Village (HH)
5	Cheang Torng	Chypak	216	527	16	7.4%
		Sre Kvav	219	925	44	20.1%
6	Ta Phem	Mohasena	241	1,225	29	12.0%
		Mrum	155	769	28	18.1%
		Ta Mom	152	732	29	19.1%
Total			2,747	11,522	368	13.4%

32. For Tumnu Lok reservoir, there are 193 HHs (38.4% of total 2 affected village's population) in 2 communes for proposed plan (see Table 3c below) will be affected by the reservoir rehabilitation.

Table 3c: Number of Affected Household in 2 Villages of 2 Communes in Takeo and Kampong Speu Provinces (IOL in Dec 2011-Feb 2012) for Tumnu Lok Reservoir

#	Commune Name	Village Name	Total family (HH)	Population (person)	Female (person)	Over 18 year old (pers.)	Female (person)	Family size (person)	Total APs (HH)	% APs in Village (HH)	Remarks
1	Trapaing Kranhoung	Phlov Lok	194	866	412	507	272	4.5	58	29.9%	Reservoir
2	Phong	Dambok Khpours	309	1255	608	769	410	4.1	135	43.7%	Reservoir
Grand Total			503	2121	1020	1276	682	4.2	193	38.4%	

3.2. Status of the APs

33. From the total 412 household surveyed in COI of original plan there are 67 HHs fall in 1 one more vulnerable incidence cases. In other hand, there are 77% men HH head and 23% women household head, in which 39% are widower. The vulnerable group is showing in table 4a below:

Table 4a: Vulnerable Groups of Affected Household in the COI of Original Plan

Vulnerability	Female (Widow) Household Head	Disable Household head	Income below the national poverty line	Elderly Household Head	Total
No. of incidences	38	1	4	30	73

Note: Total of the vulnerable incidences are 73 cases in which 6 are affected households having multiple of vulnerability.

34. For proposed plan, there are 63 HHs fall in one or more vulnerable incidence cases. The vulnerability is showing in Table 4b below:

Table 4b: Vulnerable Groups of Affected Household in the COI of Proposed Plan

Vulnerability	Female (Widow) Household Head	Disable Household head	Income below the national poverty line	Elderly Household Head	Total
No. of incidences	38	1	6	25	70

Note: Total of the vulnerable incidences are 70 cases in which 7 are affected households having multiple of vulnerability.

35. The IOL briefly survey was indicated 46 HHs fall in one or more vulnerable incidence cases. The vulnerability is showing in Table 4c below:

Table 4c: Vulnerable Groups of Affected Household in the COI of Tumnup Lok reservoir

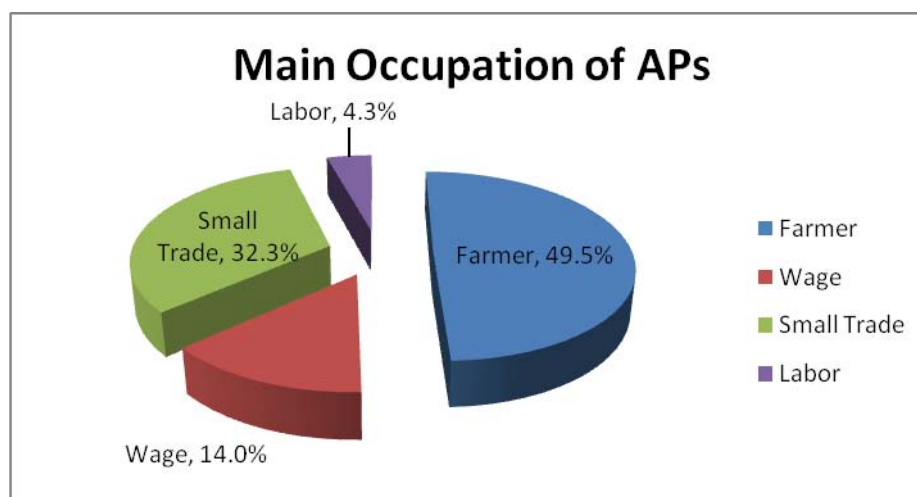
Vulnerability	Female (Widow) Household Head	Disable Household head	Income below the national poverty line	Elderly Household Head	Total
No. of incidences	30	1	5	22	58

Note: Total of the vulnerable incidences are 58 cases in which 12 are affected households having multiple of vulnerability.

36. **Literacy of the affected household:** There are 91% head of HHs can read and write Khmer and 9% head of HHs cannot read and write Khmer. The female household head is 23% in which 19% are can read and write of total APs.

3.3. Main Occupation of the APs

37. The results from socio-economic survey gartering from 21% of total affected household heads were shown that 49.5 % of APs are famer, 32.3% small trade (business), 14 % wage (government or company staff), and 4.3% labor (worker). **Note:** the socio-economic survey conducted on canal MC 33, SC 3U and SC 3D.



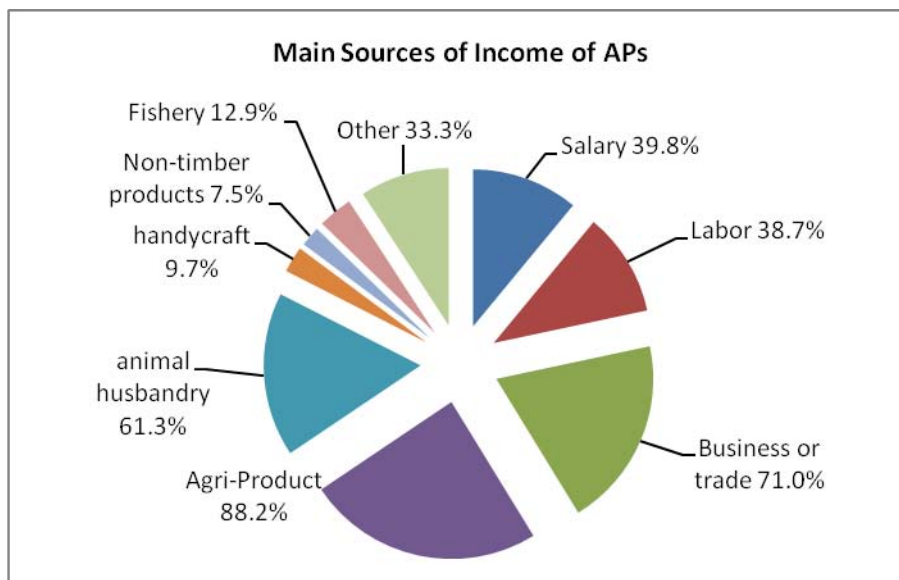
3.4. Income of the APs (Gross Income)

38. Respondents were asked about their monthly and yearly income by the RU's interview Team was shown that 88.2% of the affected household head incomes are from agricultural product (rice), 71,0% incomes from small trade (business), 61,3% from animal husbandry, 39,8% from wage/salary (government or company staff), 38,7% from labor, 32,3% from other (credit from micro finance institution, allowance his/her from relationship, house or land renting etc..). Additionally, incomes of the affected people earn from fishing (12.9%), forest non-timber product (7,5%) and small scale of handicraft (9,7%). The income of the HHs rank from about \$753 to \$12,050/year. Average monthly income of the affected households is about \$224/month. There is not HHs having income below the national poverty line. A total gross income of the socio-economic (89) APs surveyed is \$238,777/ year and have average \$2,683/ year. The table 5 show the source of income of the affected households head in the project area:

Table 5: Source of income of the Affected Household in the Project Area (survey form Dec 2011-Feb 2012)

Salary		Labor		Business or trade		Agri-Product		Animal Husbandry		Handicraft		Non-timber products		Fishery		Other	
HH	%	HH	%	HH	%	HH	%	HH	%	HH	%	HH	%	HH	%	HH	%
37	39.8%	36	38.7%	66	71.0%	82	88.2%	57	61.3%	9	9.7%	7	7.5%	12	12.9%	31	33.3%

Note: one of Affected HHs have many income sources

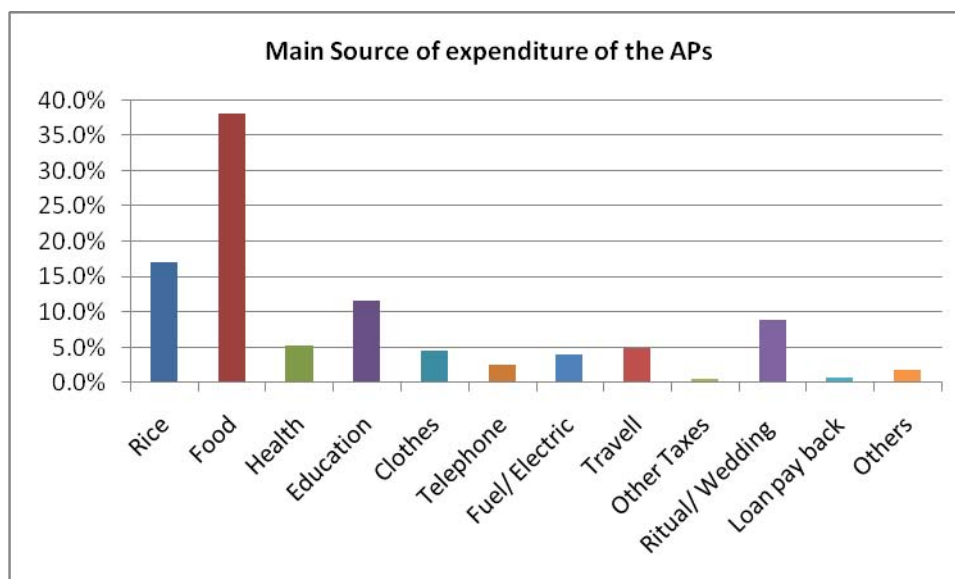


3.5. Expenditure of the APs

39. Respondents were also asked about their yearly expenditure by the RU’s interview Team and the results was shown that , the most of expenditure of the APs is food (38.0%), secondly, the APs expend for rice of 17.1%, and thirdly is education (detailed see table 6 below). the total expenditure of socio economic surveyed APs is \$79,153/year for 89 HHs interviewed.

Table 6: Expenditure of the Affected Household in the Project Area (survey form Dec 2011-Feb 2012)

Food (1 st)	Rice (2 nd)	Education (3 th)	Ritual/ Wedding (4 th)	Health (5 th)	Travel (6 th)	Clothes (7 th)	Fuel/ Electric (8 th)	Telephone (9 th)	Others (10 th)	Loan pay back (11 th)	Other Taxes (12 th)
38.0%	17.1%	11.6%	8.9%	5.3%	4.9%	4.6%	3.9%	2.6%	1.8%	0.7%	0.5%



3.6. Net Income of the Aps

40. Base of calculation of average net income for the Aps is about \$838 per year. The net income of the HHs rank from about \$3 (min) to \$3,933 (max) per year.

3.7. Basic Facilities

41. Solid waste. Similar to sanitation problem, there is not solid waste service in the affected village. The people were dump own solid waste in own land plot and burn it after the open dig was filled.
42. Source of Drinking Water: Households surveyed in project area have varied sources of drinking water and majority of them appear to obtain drinking water from unsafe sources. Of the 89 respondents, 3% get drinking water from hand dug wells water source, 6% get water for hand pump wells, 89 % obtain drinking water from rain water , 79% from reservoir / pond, and 13% from untreated water distribution pipe line, (water supply source per HH using more than one source).
43. Power/ Lighting Source: there are a power supplies system available only in the Ang Rokar Market Area about 35% of the APs have the service. result from the socio-economic survey has shown about 2 % have own engine generator, about 54% lighting source from batteries, approximately 65% night lighting is petrol lamps and candles.

3.8. Gender Labor Division

44. The study of labor distribution showed that women work longer hours more continuously, on more diverse tasks, and have more diverse sources of income and livelihood in the rural economy than men. In addition, women are an important takes care for families in most of the impacted village, mainly of carrying baskets used in agricultural and construction works, and is undertaken throughout the year. Women provide more agricultural labor, especially in rice planting and harvesting, than men. They have a substantially greater capacity for group work in these tasks, as many as twelve or fifteen women working together in each others' fields. When the RU/MOWRAM team were asked for women participation for household's income and found about 54% women and men 46%.
45. The main factor in this differential work load is that of child care and food preparation and house cleaning, none of which is done by men, except for child minding during the wife's absence.
46. As mentioned above, women, despite a lower educational and literacy level (19% women households head can read and write), control most of the household money and expenditure, and decisions about major purchases and credit.

4. LEGAL FRAMEWORK AND POLICY ON INVOLUNTARY RESETTLEMENT

4.1 Cambodian Government's Legal Framework

47. The Land Law of August 2001 is the current legislation governing land and property rights. The law states the ownership for non-movable properties in Cambodia, which includes land, trees and structures. It is based on the provisions of the Constitution of 1993.
48. There is no specific legislation regarding involuntary resettlement but the law regarding land or property acquisition for that resettlement by the State or other entities is indicated in Article 5 of the Land Law:
- "No person may be deprived of his ownership unless it is in the public interest. An ownership deprivation shall be carried out in accordance with the forms and procedures provided by law 3rd regulations and after the payment of fair and just compensation in advance."
 - Specific laws, decrees or directives setting out regulations on land or other property acquisition in the context of involuntary resettlement will be based on Article 5 and Article 11 that states;
 - "The legal regime for ownership of immovable property varies in accordance with the requirements of Cambodian society, such as agricultural land, forests, waterways, lakes, reservoirs or expanses of water, seashores, riverbanks, urban immovable property, and land for construction of industrial development zones."
 - "Specific laws shall supplement the provisions of this law or shall derogate this law in order to meet socio-economic, land management, and urban planning exigencies."
 - "Regulations may, in compliance with legislative provisions, stipulate the details of these various property regimes."
49. Article 6 of the Land Law also defines the legal basis on which transfers of ownership are based:
- "Only legal possession can lead to ownership".
 - "The State may also provide to natural persons or legal entities of Khmer nationality ownership over immovable property belonging to the State within the strict limits set forth in this law".
 - "All transfers or changes of the rights of ownership shall be carried out in accordance with the required general rules for sales, succession, exchange, gift or by court decision".
50. In Article 7, it states: "Any regime of ownership of immovable property prior to 1979 shall not be recognized."
51. On policies concerning land acquisition, Article 44 of the Cambodian Constitution of 1993 states the government's right to confiscate properties from any person shall be exercised only in the public interest as provided by law and shall require fair and just compensation in advance."
52. Article 44 of the Constitution also states that "nobody shall be forced to transfer his or her ownership, if forcing is not necessary in the public interest and (if) no proper and just indemnity has been paid to the owner".

53. Article 19: "Any person having titles or real situation under the influence of Article 19 of this law cannot claim any compensation or cost for maintenance or development made under immovable property which is illegally possessed. Any illegal and intentional or deceitful acquisition of the public domain of the State or public legal entity shall be punished as provided in Article 259 of this law. For possession of public domain that damages or delays work in favor of the common interest, especially the possession of land necessarily reserved for maintaining roads, the penalty shall be double. In all cases where the offender does not cease possession within the period of time determined by the competent authority, the authority can proceed to evict that offender."
54. Article 259: "infringement upon the public domain shall be punished with a fine from 5,000,000 Riel (five million Riels) to 50,000,000 Riels (fifty million Riels) [between US\$1,250 and US\$12,500] and/or imprisonment from one (a) to five (5) years. The perpetrator has an obligation to immediately vacate such a public domain. The perpetrator has no right to any indemnity for works or improvement made on such public property. In the event that the current occupant of public property prior to this law taking effect has documents as proof and a certificate that states she/he purchased it from a person, [the occupant] may report to competent authority to enforce legal measures on such a person who sold public property illegally and for his/her own interest [and the occupant is] injured by such an act. In any event, such injured party has no right to possess the public property."
55. Royal Government of Cambodia's Proclamation No. 6 (September 27, 1999): an Order by RGC entitled "Measures to Crack Down on Anarchic Land Grabbing and Encroachment" prohibits private ownership on state lands. In particular, it required a cessation to encroachment on public and private properties as well as State lands, including public gardens, reserved lands for roads and rail sites. This order directs the municipal provincial authority, and the Royal Cambodian Armed Forces, National Police and Military Policy, and all relevant ministries and institutions, to participate in solving problem of anarchic land grabbing and encroachments.

4.1.1. Land Registration

56. The right to private occupation of land was re-established in 1989 before the passing of the 1992 and 2001 Land Laws, which ratified Cambodia government policy and common usage. This position has been reinforced by the system of land use and possession.

4.1.2. Resettlement Policy in Cambodia

57. Sub-Decree No. 19 ANK/BK dated 19 March 2003, for instance, provides the condition within which landless families displaced by public development projects may acquire land on which to shift (Article 3).
58. There is, however, no formally established national policy for resettlement in Cambodia, and a policy to that effect was reviewed by the Inter-Ministerial Resettlement Committee (IRC) chaired by the Ministry of Economy and Finance (MEF). A consultative report setting out the proposed Policy on Involuntary Resettlement has the following main provisions being reviewed:
- Displacement will be reduced or avoided as much as possible by sensitive design of the project infrastructure and civil engineering works;
 - The area to be cleared will be limited to the width required for the construction itself and for construction to proceed;
 - Land replacement for land is the preferred option and any replacement will be based on present market value plus a margin for loss of future earnings;
 - Compensation for affected persons will not be reduced to reflect depreciation; and

- Affected persons and host communities shall be encouraged to participate in the design and implementation of the DRP.
59. Observance of ADB's Policy on Involuntary Resettlement and Cambodian Policy is that the adverse impacts in a project are avoided or minimized, and that resettlement measures are conceived and executed as development programs and that affected persons (APs) are given the opportunity to share in project benefits. The objective is to assist displaced persons in their efforts to restore or improve their former production levels, income earning capacity, and living standards.
 60. The Policy further stipulates that customary and formal rights are recognized equally in providing assistance and in devising criteria for entitlements and procedures for compensation and other resettlement assistance. The policy further states that the absence of formal legal title to land by some affected groups should not be a bar to compensation and that particular attention should be paid to the needs of the poorest affected persons including those without legal title to assets, female-headed households, the landless, aged households and other vulnerable groups, such as indigenous peoples, and appropriate assistance provided to help them improve their status.
 61. The preferred compensation option for affected productive land is land-for-land. However, consultations with the APs indicate that majority of them prefer to receive full cash compensation. Consistent with the policy of ADB and the Cambodian Government, compensation for lost assets will be at replacement cost.

4.2. Principles of Resettlement

62. The following principles of resettlement and compensation apply in the Project:
 - a. Acquisition of land and other assets, and resettlement of people will be minimized as much as possible.
 - b. All APs residing in, working, doing business, or cultivating land, or having rights over resources within the COI of the project infrastructures and reservoirs as of the date of the DMS survey in the project area (i.e., the **Cut-off Date**) are entitled to compensation for their lost assets, incomes, jobs and businesses at replacement cost. Those displaced by the project will be provided additional relocation assistance and offered support during the transition period. Displaced persons will also be provided with appropriate development assistance in order to improve or at least restore their incomes and living standards to pre-project levels. Lack of legal rights will not bar the AP from entitlement to such compensation for his/her lost assets (improvements including structures, houses, crops, trees, etc.), businesses and incomes, and rehabilitation measures.
 - c. APs will be entitled to full compensation for the entire affected assets at replacement cost, and in the case of loss of productive assets, incomes, jobs and employment, to additional development assistance that allows them to enhance or at least maintain their standard of living.
 - d. APs affected by partial impact on their assets i.e. partial loss of land or structures and the remaining assets remain viable for continued use, where the livelihood is not land-based, the compensation for the affected assets will be paid in cash.
 - e. The compensation and rehabilitation measures to be provided are: (i) compensation at replacement cost for houses and other structures without depreciation or deductions for salvaged material; (ii) compensation at

- replacement cost for the loss of other fixed assets; (iii) compensation at the replacement cost of the affected land or the provision of replacement land of equal agricultural productivity, residential quality and business potential, as the case may be, at a location acceptable to the APs; (iv) cash compensation at replacement cost for affected businesses, means of livelihood and incomes; (v) rent allowance and assistance in finding alternate rental accommodation to tenant APs; (vi) transport allowance and dislocation assistance during transition; and (vii) income restoration program, which includes on-farm and off-farm income earning activities; (viii) special assistance and allowances for APs belonging to vulnerable groups.
- f. Replacement agricultural land or premise/business plot will be as close as possible to the land that was lost and/or acceptable to the APs. All replacement land for agriculture, residential and businesses will be provided with secure tenure status and without any additional cost, taxes, and surcharge to the APs at the time of transfer.
 - g. Plans for acquisition of land and other assets and provision of rehabilitation measures will be carried out in consultation with the APs who will receive prior information of the compensation and rehabilitation options available to them.
 - h. Where cultural minorities or indigenous peoples are affected, the social and economic benefits they receive would be in harmony with their cultural preferences and would be decided in consultation with affected communities.
 - i. Particular attention shall be paid to the needs of the poorest affected people and vulnerable groups. This may include households headed by females, the elderly, or disabled, and other vulnerable groups, particularly indigenous peoples. Appropriate assistance must be provided to help them improve their socio-economic status.
 - j. Any acquisition of, or restriction on access to resources owned or managed by APs as a common property will be mitigated by arrangements ensuring access of those APs to equivalent resources on a continuing basis.
 - k. APs whose land or assets are temporarily taken by the works under the project will be fully compensated for their net loss of income and damaged assets, the latter at replacement cost. Assets which are only temporarily affected or inoperable, will be compensated at 10% of the replacement cost of affected assets provided that such assets or properties are required by the project for a maximum of 3 months. In case the assets are required by the project for periods longer than three months, the amount of compensation should be negotiated with the owner of said property.
 - l. The previous level of community services and access to resources will be maintained or improved after resettlement.
 - m. Financial and physical resources for resettlement and rehabilitation will be made available as and when required.
 - n. The DRP will provide for a planned resettlement program and will include adequate institutional arrangements to ensure effective and timely design, planning, consultation and implementation of compensation, resettlement and rehabilitation measures. Project authorities will ensure effective coordination with relevant agencies for implementation of resettlement.
 - o. Adequate arrangements will be made for the effective supervision and monitoring of resettlement, both internally by the Government and externally by an independent organization to be hired for the purpose, to ensure compliance to the resettlement policy and help ensure that APs are able to rehabilitate themselves as planned.

4.3. The Cut-off date of the Project

63. As mentioned in chapter 4 above, all APs residing in, working, doing business, or cultivating land, or having rights over resources within the project area as of the date of the DMS survey in COI of the project infrastructures and the reservoirs are entitled to compensation for their lost assets, incomes, jobs and businesses at replacement cost. For APs in the reservoir, the DMS will be concluded by IRC, and this will identify the cut-off date for eligibility.

4.4. Eligibility

64. APs include anyone who at the cut-off date of the project was located within the project area or any of its component or sub-project or part thereof, and would have their:
- a. Standard of living adversely affected;
 - b. Right, title or interest in any house, land (including residential, commercial, agricultural and other land), water resources, or any other movable or fixed assets acquired or possessed, in full or in part, temporarily or permanently by public sector acquisition; or
 - c. Business, occupation, place of work or residence or habitat adversely affected by public sector intervention.
65. "APs" refers to households and consists of all members residing under one roof and operating as a single economic unit, who are adversely affected by the Project. For resettlement purposes, project affected persons will be considered as members of the project affected households.

5. PROJECT IMPACTS

5.1. Methodology

5.1.1 *Data Gathering Instruments and Procedures*

66. Land losses in the COI were conducted ground trusting survey by measuring from existing canal mouth 5 m (see in sketch in point 1.3 above) in order to collect affected house and other fixed assets as well as losses of economic trees and land likely to occur. The Inventory of Losses (IOL) conducted from 19 December 2011 to 17 February 2012 by MOWRAM Resettlement Unit (MOWRAM-RU) and the Provincial Resettlement Working Group (PRWG).
67. The IOL surveys followed essentially methodology: that of cadastral survey of impacted areas and structures, and that of socio-economic household survey of 21% of impacted households. However, Government treats the surveys as having different purposes and outputs. The IOL provided the EA a preliminary idea on the type, magnitude and severity of project impacts for consideration in deciding the final design of the civil works components of the Project. On the other hand, the DMS served as the validation of the results of the IOL, taking into consideration modifications in the Project detail design and the results of negotiation with APs regarding the type and amount of compensation and assistance for affected assets. Therefore, the DMS will be conducted by the IRC constitute the documentary contractual record of impacts and losses agreed with APs, bearing the signature or thumb print of the household head and the village head, and provided to the Provincial Department of Economy and Finance for the delivery of compensation. All most the same questionnaire was used for the IOL. (See Appendix 1 for a copy of the questionnaire used).
68. Social impact on communities, households and individuals was assessed both from the socio-economic profile survey and in a series of focused group discussions (FGDs) and individual interviews conducted by MOWRAM-RU and the PRWG. For the DMS will be conducted by IRC.

5.1.2 *The IOL Survey Team*

69. 6 Members of RU/ MOWRAM and 2 staffs recruited from the Provincial Department of Water Resources and Meteorology (PDOWRAM), together with 4 staff from district of Tram Kok and related commune and village in the Ta Keo province, constituted the Provincial Resettlement Working Group (PRWG) which conducted the IOL. The PRWG was appointed by the Provincial Governor for that and other tasks for the preparation of the survey. They received training in the field at commune office from the Representative of RU /MOWRAM and the national consultant and from the team leader of RU.

5.1.3 *Participation of the Public in the Survey*

70. Members of the Commune Council and village headmen took part in the IOL and will be in the DMS. All household interviews and the inventory and measurement of affected land and property were conducted with the assistance of the household head and the village headman.

5.1.4 *Processing of Data*

71. MOWRAM-RU processed the data from the IOL in Microsoft EXCEL at MOWRAM, and the IRC will be processed the DMS using Microsoft EXCEL too.

5.2. Results of the IOL Survey

72. Following sections provide details of project impacts. These impacts are also summarized in Table 7(a, b, c), 8 (a, b, c), 9(a, b), 10(a, b, c), and 11(a, b), which provides a Matrix of Entitlements in Table 16 below.

5.2.1 Impacts on Land

29. A total of 294 AP households will lose agricultural and residential lands totaling 79,043 m² in COI of original plan. In which severely affected productive land more than 10% belong to 11 Aps (3% of total 412 APs). The partially affected productive land (land which is equal and less than 10% of the total agricultural land of the APs) is belonging to 150 APs. The affected land shown in Table 7a below:

Table 7a: Type of Land Loss in COI of Original Plan (IOL in Dec 2011-Feb 2012)

#	Affected Commune name	Village name	Affected Rice Land		Affected Residential		APs loss productive land > 10%
			Total APs (HH)	Area (m ²)	Total APs (HH)	Area (m ²)	
1	O Saray	Thnot Chum	10	2540	35	5150	0
		Trapaing Krasaing	18	5065	41	3074	1
2	Trapaing Thum Khangbong	Bra Keap	11	2745	3	655	0
		Prey Rumdourl	0	0	0	0	0
3	Trapaing Thum Khangcheung	Ang Trav	9	2798	9	1720	1
		Peak Bang Aorng	27	7380	12	2080	3
		Prey Kvav	15	2975	3	755	0
		Pey Taley	11	1885	28	3013.42	1
4	Ang Ta Saom	Prey Chheuteal Leu	14	3773.5	7	1730	0
		Prey Chheuteal Kraom	8	1235	1	255	0
5	Cheang Torng	Chypak	4	1065	14	2665	1
		Sre Kvav	5	956	79	7255.89	0
6	Ta Phem	Mohasena	4	755	25	5185.5	1
		Mrum	12	2611.5	20	3450	2
		Ta Mom	13	3237.5	17	3032.5	1
Total			161	39,022	294	40,021	11

30. A total of 216 AP households will lose agricultural and residential lands totaling 78,108 m² in COI of proposed plan. Of the total severely affected land belong to 2 HHs (about 0.5% of the 368 APs) will lose more than 10% of total productive land. Of partially affected agricultural land (land which is equal and less than 10% of the total agricultural land of the AP) is belonging to 214 APs. The affected shown in Table 7b below:

Table 7b: Type of Land Loss in COI of Proposed Plan (IOL in Dec 2011-Feb 2012)

#	Affected Commune name	Village name	Total family (HH)	Affected Rice Land		Affected Residential		APs loss productive land > 10%
				Total APs (HH)	Area (m ²)	Total APs (HH)	Area (m ²)	
1	O Saray	Thnot Chum	251	10	2540	35	5150	0
		Trapaing Krasaing	223	18	5065	41	3074	0
2	Trapaing Thum Khangbong	Bra Keap	174	11	2745	3	655	0
		Prey Rumdourl	184	8	2235	11	1410	0
3	Trapaing Thum Khangcheung	Ang Trav	329	9	2798	9	1720	0
		Peak Bang Aorng	295	27	7380	12	2080	0
		Prey Kvav	95	15	2975	3	755	0
		Pey Taley	0	0	0	0	0	0
4	Ang Ta Saom	Prey Chheuteal Leu	72	14	3773.5	7	1730	0
		Prey Chheuteal Kraom	141	8	1235	1	255	0

#	Affected Commune name	Village name	Total family (HH)	Affected Rice Land		Affected Residential		APs loss productive land > 10%
				Total APs (HH)	Area (m ²)	Total APs (HH)	Area (m ²)	
5	Cheang Torng	Chypak	216	4	1065	14	2665	1
		Sre Kvav	219	30	5799	17	2106	0
6	Ta Phem	Mohasena	241	4	755	26	5480.5	1
		Mrum	155	14	2941.5	20	3450	0
		Ta Mom	152	13	3237.5	17	3032.5	0
Total			2,747	185	44,545	216	33,563	2

31. From the results of IOL in the Tumnu Lok reservoir was shown a total of 193 AP households will lose agricultural and residential lands totaling 1,497,339 m² in COI of the reservoir. Of the total severely affected land belong to 2 HHs (about 0.5% of the 368 APs) will lose more than 10% of total productive land. Of partially affected agricultural land (land which is equal and less than 10% of the total agricultural land of the AP) is belonging to 214 APs. There are 3 APs will lose 100% of their total land used. The affected land shown in Table 7c below:

Table 7c: Type of Land Loss in Tumnu Lok Reservoir (IOL in Dec 2011-Feb 2012)

#	Affected Commune name	Village name	Affected Rice Land		Affected Residential		APs loss productive land > 10%	APs loss total land = 100%
			Total APs (HH)	Area (m ²)	Total APs (HH)	Area (m ²)		
1	Trapaing Kranhoung	Phlov Lok	58	453,800	59	-	59	0
2	Phong	Dambok Khpours	135	1,016,514	48	27,025	126	3
Grand Total			193	1,470,314	107	27,025	185	3

32. There is one tenancy has been found to occur in the IOL of APs in the COI of original and proposed plans and no tenancy have been found in the reservoir. No losses of production or land use entitlement of tenants will occur.

5.2.2 Impacts on Main Structures (i.e., houses, buildings)

33. All structures impacted in the COI of the original plan are severely impacted and displaced. The number of houses that have to be displaced is 89 shown in Table 8a.

Table 8a: Number of Affected Houses in 14 Villages of 6 Communes for Original Plan (IOL in Dec 2011-Feb 2012)

#	Affected Commune name	Village name	Aff House Type 1		Aff House Type 2		Aff House Type 3	
			Area (m ²)	No. Aff. House	Area (m ²)	No. Aff. House	Area (m ²)	No. Aff. House
1	O Saray	Thnot Chum	21	1	0	0	0	0
		Trapaing Krasaing	74.5	2	399.25	8	0	0
2	Trapaing Thum Khangtbong	Bra Keap	0	0	0	0	0	0
		Prey Rumdourl	0	0	0	0	0	0
3	Trapaing Thum Khangcheung	Ang Trav	0	0	0	0	0	0
		Peak Bang Aorng	0	0	0	0	0	0
		Prey Kvav	0	0	0	0	0	0
		Pey Taley	85.9	2	616.37	6	0	0
4	Ang Ta Saom	Prey Chheuteal Leu	0	0	0	0	0	0
		Prey Chheuteal Kraom	0	0	0	0	0	0
5	Cheang Torng	Chypak	0	0	0	0	0	0
		Sre Kvav	654.06	8	2211.03	33	1675.45	20
6	Ta Phem	Mohasena	0	0	375.7	6	0	0
		Mrum	30	1	264	2	0	0
		Ta Mom	0	0	0	0	0	0
Total			865	14	3,866	55	1,675	20

34. All structures impacted in the COI of the proposed plan are severely impacted and displaced. The number of houses that have to be displaced is 23 shown in Table 8b.

Table 8b: Number of Affected Houses in 14 Villages of 6 Communes for Proposed Plan (IOL in Dec 2011-Feb 2012)

#	Affected Commune name	Village name	Aff House Type 1		Aff House Type 2		Aff House Type 3	
			Area (m ²)	No. Aff. House	Area (m ²)	No. Aff. House	Area (m ²)	No. Aff. House
1	O Saray	Thnot Chum	21	1	0	0	0	0
		Trapaing Krasaing	74.5	2	399.25	8	0	0
2	Trapaing Thum Khangbong	Bra Keap	0	0	0	0	0	0
		Prey Rumdourl	0	0	35	1	0	0
		Peak Bang Aorng	0	0	0	0	0	0
		Prey Kvav	0	0	0	0	0	0
		Pey Taley	0	0	0	0	0	0
4	Ang Ta Saom	Prey Chheuteal Leu	0	0	0	0	0	0
		Prey Chheuteal Kraom	0	0	0	0	0	0
5	Cheang Torng	Chypak	0	0	0	0	0	0
		Sre Kvav	0	0	30	1	81	1
6	Ta Phem	Mohasena	0	0	375.7	6	0	0
		Mrum	30	1	264	2	0	0
		Ta Mom	0	0	0	0	0	0
Total			126	4	1,104	18	81	1

35. All structures impacted in the reservoir are severely impacted and displaced. The number of houses that have to be displaced is 4 shown in Table 8c.

Table 8c: Number of Affected Houses in Tumrup Lok Reservoir (IOL in Dec 2011-Feb 2012)

#	Affected Commune name	Village name	Aff House Type 1		Aff House Type 2		Aff House Type 3	
			Area (m ²)	No. Aff. House	Area (m ²)	No. Aff. House	Area (m ²)	No. Aff. House
1	Trapaing Kranhoung	Phlov Lok	12	1	0	0	0	0
2	Phong	Dambok Khpours	20	1	50	2	0	0
Grand Total			32	2	50	2	0	0

5.2.3 Impacts on Other Fixed Structures

36. There are 16 aggregates of the other fixed structures located in the COI of original plan see in Table 9a below.

Table 9a: Other Fixed Structure in the COI of Original Plan (IOL in Dec 2011-Feb 2012)

#	Commune Name	Village Name	Toilet (unit)	grange (unit)	shop (unit)	Dug well (unit)	Pump well (unit)	Pond (m ²)	Conc. Fence (m)	Steel Fence (m)	no. of Culvert	Conc. bridge (m ²)	Wo. Bridge (m ²)	Cocr. Slab (m ²)	Stupa (unit)	wood stair (unit)	No. concr. stair	Balcony m ²
1	O Saray	Thnot Chum	0	3	7	0	0	0	0	30	0	102.9	49	77	0	1	0	0
2		Trapaing Krasaing	0	0	14	0	3	0	59.5	57	0	52	0	132.25	2	3	2	158.5
3	Trapaing Thom Khang Cheung	Peak Bang Orng	0	1	10	0	1	144	120	35	0	66	30	311	0	0	0	275
4		Ang Trav	1	1	2	0	0	0	30	0	0	46	0	24	0	0	0	36
5		Preykvao	0	0	0	0	0	0	0	0	0	24	0	0	0	0	0	0
6		Prey Ta Ley	0	0	9	0	0	0	312.3	0	0	0	0	48	0	0	0	100
7	Trapaing Thom Khang Tbong	Bra Keap	0	0	0	0	0	0	37	0	0	38	0	0	0	0	0	0
8	Cheang Tung	Sre Kvav	0	0	25	0	2	0	193.9	20.8	31	0	0	1084	0	0	0	98.1
9		Chipak	0	0	2	0	0	0	0	0	0	0	0	15	0	0	0	0
10	Ta Phem	Ta Mom	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0

UPPER SLAKOU IRRIGATION SYSTEM REHABILITATION SUB-PROJECT IN TAKEO PROVINCE OF CAMBODIA

#	Commune Name	Village Name	Toilet (unit)	grange (unit)	shop (unit)	Dug well (unit)	Pump well (unit)	Pond (m ²)	Conc. Fence (m)	Steel Fence (m)	no. of Culvert	Conc. bridge (m ²)	Wo. Bridge (m ²)	Cocr. Slab (m ²)	Stupa (unit)	wood stair (unit)	No. concr. stair	Balcony m ²
11		Mrum	0	0	4	1	1	0	6.5	22	1	12	0	96	0	0	0	0
12		Mohasena	0	0	13	1	0	0	102.5	0	0	36	0	0	0	0	0	0
13	Ang Ta Saom	Prey Chhuteal Leu	0	0	1	1	0	0	4	0	0	42	0	0	0	0	0	0
14		Prey Chhuteal Kraom	0	0	0	0	0	0	0	0	0	22.75	0	0	0	0	0	0
TOTAL			1	5	87	4	8	144	866	238	44	442	79	2402	2	4	2	696

37. There are 11 aggregates of the other fixed structures located in the COI of proposed plan see in Table 9b below.

Table 9b: Other Fixed Structure in the COI of Proposed Plan (IOL in Dec 2011-Feb 2012)

#	Commune Name	Village Name	Toilet (unit)	grange (unit)	shop (unit)	Dug well (unit)	Pump well (unit)	Pond (m ²)	Conc. Fence (m)	Steel Fence (m)	no. of Culvert	Conc. bridge (m ²)	Wo. Bridge (m ²)	Cocr. Slab (m ²)	Stupa (unit)	wood stair (unit)	No. concr. stair	Balcony m ²
1	O Saray	Thnot Chum	0	3	7	0	0	0	0	30	0	102.9	49	77	0	1	0	0
2		Trapaing Krasaing	0	0	14	0	3	0	59.5	57	0	52	0	132.25	2	3	2	158.5
3	Trapaing Thom Khang Cheung	Peak Bang Aomg	0	1	10	0	1	144	120	35	0	66	30	311	0	0	0	275
4		Ang Trav	1	1	2	0	0	0	30	0	0	46	0	24	0	0	0	36
5		Prey Kvao	0	0	0	0	0	0	0	0	0	24	0	0	0	0	0	0
6	Trapaing Thom Khang Tbong	Bra Keap	0	0	0	0	0	0	37	0	0	38	0	0	0	0	0	0
7		Prey Rumduol	0	2	6	0	0	0	42	0	0	381	0	530	0	0	0	75
8	Cheang Tung	Sre Kvav	0	0	0	1	0	280	0	0	0	0	0	0	0	0	0	0
9	Cheang Tung	Chipak	0	0	2	0	0	0	0	0	0	0	0	15	0	0	0	0
10	Ta Phem	Ta Mom	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0
11		Mrum	0	0	4	1	1	0	6.5	22	1	12	0	96	0	0	0	0
12		Mohasena	0	0	13	1	0	0	102.5	73	12	36	0	615.1	0	0	0	28
13	Ang Ta Som	Prey Chhuteal Leu	0	0	1	1	0	0	4	0	0	42	0	0	0	0	0	0
14		Prey Chhuteal Leu	0	0	0	0	0	0	0	0	0	22.75	0	0	0	0	0	0
TOTAL			1	7	59	5	6	424	402	217	13	823	79	1800	2	4	2	573

38. There are no other fixed structures located in the reservoir.

5.2.4 Impacts on Seasonal/ Annual Crops

39. The seasonal crops, such as rice, corn, sesame, soybean, are expected to be destroyed by rehabilitation and water filling the reservoir during construction and operation phases of the project. The affected people will be informed and made booklet to provide information on the construction of the project before construction phase start. In case, the crops have not being collected during construction, the seasonal crops product will be compensated base one unit price of rice in US dollar per ha. However, all standing crops will be allowed to be harvested prior to the start of construction works.

5.2.5 Impacts on Perennial Crops and Trees

40. A total of 5,717 trees of various species will be impacted by the original plan show in Table 10a below.

Table 10a: Inventory of Affected Trees for Original Plan (IOL in Dec 2011-Feb 2012)

Tree	Number	Tree	Number
Mango	725	Milk Fruit Tree	36
Cashew	233	Coconut	418
Tamarind	329	Bamboo	295
Jack Fruit	34	Other Tree	3034
Palm	360	Orange	43
Bana	180	Logan	30
Total	1861	Total	3856

41. A total of 5,410 trees of various species will be impacted by the proposed plan show in Table 10b below.

Table 10b: Inventory of Affected Trees for Proposed Plan (IOL in Dec 2011-Feb 2012)

Tree	Number	Tree	Number
Mango	675	Milk Fruit Tree	27
Cashew	226	Coconut	394
Tamarind	357	Bamboo	307
Jack Fruit	30	Other Tree	2835
Palm	352	Orange	39
Banana	152	Logan	16
Total	1792	Total	3618

42. A total of 338 trees of various species will be impacted by the reservoir show in Table 10c below.

Table 10c: Inventory of Affected Trees for the Reservoir (IOL in Dec 2011-Feb 2012)

Tree	Number	Tree	Number
Mango	118	Milk Fruit Tree	0
Cashew	0	Coconut	57
Tamarind	32	Bamboo	0
Jack Fruit	6	Other Tree	0
Palm	111	Orange	0
Banana	14	Logan	0
Total	281	Total	57

5.2.6 Impact on Vulnerable Groups

43. The IOL has identified a total of 67 households for original plan, a total of 63 HHs for proposed plan, and a total of 46 HHs for the reservoir, which are vulnerable in one or more ways having a widowed woman household head, having an aged and disabled household head, or as having a total income below the national poverty line. Altogether 73 (original plan), 70 (proposed plan), and 58 (the reservoir) incidences of vulnerability have been identified, set out in Table 4 (a, b, c) above, some of these households having multiple aspects of vulnerability.

5.2.7 Impact on Public Assets

44. The IOL has identified the public assets for original plan show in Table 11a below:

Table 11a: List of Affected Public Assets for Original Plan (IOL in Dec 2011-Feb 2012)

#	Description	Unit	No. of Affected Structure	Remarks
1	Building and Land of Commune Health Center	LS	1	1704 m ² of building type 3, 445 m ² of compound land, and 89 m of concrete fence
2	CPP Commune Office Compound Land	LS	1	295 m ² of compound land, 25 economic trees, 59 m steel fence, 1 entrance culvert, and 4 m ² of concrete slab.
3	Commune Commercial Office Compound Land	LS	1	190 m ² of the compound land
4	Commune Police Office Compound Land	LS	1	140 m ² of the compound land and 4 economic trees
5	Concrete Bridge	Unit	18	7 on MC 33, 10 on SC 3D, and 1 on SC 3U

45. The IOL has identified the public assets for proposed plan show in Table 11b below:

Table 11b: List of Affected Public Assets for Proposed Plan (IOL in Dec 2011-Feb 2012)

#	Description	Unit	No. of Affected Structure	Remarks
1	CPP Commune Office Compound Land	LS	1	295 m ² of compound land, 25 economic trees, 59 m steel fence, 1 entrance culvert, and 4 m ² of concrete slab.
2	Commune Commercial Office Compound Land	LS	1	190 m ² of the compound land
3	Commune Police Office Compound Land	LS	1	140 m ² of the compound land and 4 economic trees
4	Concrete Bridge	Unit	18	7 on MC 33, 10 on SC 3D, and 1 on SC 3U



2 Pagoda Entrance Gates in COI of SC 3U



Ang Roka Commune Health Center in COI of SC 3D of Original Plan



Steel fence and entrance gate of Ta Phem Commune Health Center in COI of SC 3D of Original and Proposed Plan



Steel Fence and Compound Land of Commune Commercial Office in COI of Original and Proposed Plan



Steel Fence and Compound Land of Commune Police Office in COI of Original and Proposed Plan

46. There no public assets located in the reservoir.

5.3. Bases of Unit Costs Used in Calculating Compensation

47. The RU follows MEF Guidelines in establishing the rates from compensation of land, structures and trees at replacement cost based on differing regional and local markets. It does not apply standard rates throughout the country. There are, for example, substantially higher prices for house, building costs and for trees in the seaside resort and industrial areas of MEF, reflected in unit prices arrived at in a land replacement cost study for project. The land cost for estimation of resettlement cost in the RFW is collected from district, commune, village level, and interviewed some local people. The unit cost of land was taken in average cost by types of land. However, in DMS the replacement cost study shall be conducted. In this case, for rehabilitation of MC 33, SC 3U and SC 3D are located in ROW of road 130A (25m from road centerline both side) and existing the canals.

5.3.1 Land

48. The rates for land loss by land use type and value of land, based on market prices established in the IOL survey for this RFW that was conducted in December 2011 to February 2012 by MOWRAM-RU and the PRWG assisted by a national consultant. This replacement cost will be updated and conducted by the IRC during DMS in DD phase of the Project. The results of the land cost are summarized in Table 12 (a, b, c) below.

Table 12a: Cost Rates for Land Type in COI of Proposed Plan

#	Land Use Type	Compensation Rate (US\$/m ²)
1	Agricultural rice low land have value different according to location of the land for estimation unit cost of the agriculture land is considerate average cost for rice land along Road 130 A	0.9
2	Residential land	9

49. The affected land owner will compensate at 1/3 of rate land type cost above, because of the project area located in ROW of road 130A. compensation rate for land loss type see in Table 12b below:

Table 12b: Compensation Rates for Loss Land Use Type in COI of Proposed Plan

#	Land Use Type	Compensation Rate (US\$/m ²)
1	Compensation Agricultural rice low land in COI of MC33, SC 3U and SC 3D	0.3
2	Residential land	3

50. For the reservoir the affected land owner will compensate at full rate land loss type cost without deduction. compensation rate for land loss type see in Table 12c below:

Table 12c: Compensation Rates for Land Loss Type in Reservoir Area

#	Land Use Type	Compensation Rate (US\$/m ²)
1	Compensation Agricultural rice low land in the reservoir area	0.15
2	Residential land	0.5

5.3.2 Structures

51. The households in COI of MC 33, SC 3U and SC 3D will be moved. Those affected houses fall into category one or two or three, which cost derived from MEF Table 13.

Table 13: Compensation Rates for Structures

House/ Building Type	Description	Compensation Rate (US\$/m ²)
1	Thatch or wooden walls with bamboo or earth floor and thatch or metal roof on wooden stilts or on the ground	22.00
2	Wooden walls and wood or cement floor with metal, tile or plastic sheet roof on wooden stilts or on the ground	45.00
3	Brick or mortar walls with concrete or wooden floor and metal or tiled roof on concrete stilts or on the ground - single storey.	160.00
4	Fuel Station (lump sum base)	20000

5.3.3 Annual Crops

52. APs will be given two months' notice that the land on which their crops are planted will be used by the project and that they must harvest their crops in time. If standing crops cannot be harvested, or if APs are prevented from planting a crop and are unable to do so on replacement land, they will be compensated for the loss of the un-harvested or unplanted crops at the value as indicated below.

Table 14: Value of Annual Crops

Crop Type	Average Value	Amount per ha
Rice (1.5 t/ha)	1100 Riel /Kg	1,650,000 Riel

5.3.4 Compensation Rates for Perennial Crops and Trees

53. APs will be compensated for the loss of fruit trees, and timber trees hereafter economic trees that located within the COI and reservoir. The values set out in Table 15 have been calculated as the annual produce value multiplied by a five year factor plus the cost of planting of seedlings.
54. APs will be awarded the full value of any lost tree crops where the plants are near or ready to harvest.

Table 15 : Value of Trees

Code	English Name	Khmer Name	Unit	Unit cost (\$US)
1	Mango	ស្វាយ	tree	30
2	Coconut	ដូង	tree	20
3	Tamarind	អំពិល	tree	15
4	Jack Fruit	ខ្នុរ	tree	22
5	Palm	ត្នោត	tree	45
6	Longan	មៀន	tree	30
7	Citrus	ក្រូចពោធិសាត់, ក្រូចផ្លែ	tree	15
8	Milk fruit Tree	ដើមទឹកដោះគោ	tree	30
9	Banana	មេក	clump	3
10	Cashew	ស្វាយចន្ទី	tree	13
11	Bamboo	ប្លូស៊ី	thicket	15

6. DETAILED COMPENSATION AND OTHER ENTITLEMENTS

55. The project impact by comparing with 2 options of alignment for original plan and proposed plan were shown that the proposed plan by RU/MOWRAM has less negative impact than the original plan by the JICA study Team. Therefore, the proposed plan will need less in the acquisition of land, structures and trees. APs will be compensated according to the resettlement policy and principles set out in Chapter 4 of this DRF. This section outlines the compensation and entitlements for each category of APs. The compensation and other entitlements are summarized for the proposed plan in Table 16 below.

6.1. Loss of Productive (Agricultural) Land

56. For the proposed plan, marginally affected AP households, i.e., those losing 10% or less of their total productive (agricultural) land, 183 AP households fall under this category. The 183 marginally affected AP households will be compensated at land use cost not for land cost. The land use cost is equivalent to 1/3 of land cost prevailing market rates for transaction costs for agricultural lands of the same productive capacity within the locality. Because, its COI is located in the ROW of road 130 A.
57. Severely affected AP households, i.e., those losing more than 10% of their total productive (agricultural) land, 2 AP households fall under this category.
58. The 2 severely affected AP households will be compensated at replacement land use cost that is equivalent to 1/3 of land cost at prevailing market rates for transaction costs for agricultural lands of the same productive capacity within the locality. Any improvements, such as structures and trees, found thereat will be paid at replacement costs on top of the compensation for the land.
59. The 2 severely affected AP households are each entitled to participate in income restoration measures set out in Section 4.2 of this DRF. They will likewise be assisted in finding replacement agricultural land to buy.
60. All APs included those who have to relocate as a result of the acquisition of the land they occupy; they will be provided a one-time disruption allowance of \$40.

6.2. Loss of Residential Land

61. Severely affected residential land of 216 AP households who own a total of 33,563 m² of the land. The affected APs will be compensated at replacement cost for land use that is equivalent to 1/3 of the land cost at prevailing market rates for transaction costs for residential lands of the same characteristics within the locality. Any improvements, such as structures and trees, found thereat will be paid at replacement costs on top of the compensation for the land. Additionally, they will be compensated one-time disruption allowance of \$40. For tenancy of the APs, they will be received will additional compensation one-time disruption allowance of \$40, but land compensation is cash will not be provided. However, in DMS replacement cost study will be conducted by IRC in the DD phase of the Project.

6.3. Loss of Main Structures

62. Severely affected structure (i.e., the whole structure is impacted or the remaining unaffected structure is no longer viable for continued use). This category covers APs who will either reorganize their structures on adjacent or nearby lots or those who will have to shift elsewhere. 23 AP households and one tenancy APs fall in this category.

63. The 23 AP households will each be entitled to cash compensation at replacement cost (i.e., the cost of construction materials and labor at current market prices without depreciation or deduction for salvage materials), including the cost to restore service facilities. Additionally, a one-time disruption allowance of \$40 will be provided to each household and transportation allowance of \$40 provides to 1 tenancy affected households.

6.4. Loss of Other Fixed Structures

64. The owners of one latrine, 59 shops/stalls, 5 dug wells, 6 pump wells, 524m² of pond, 402 m of concrete fence, 217m of steel fence, 1800 m² of concrete slabs, 2 stupa, 2 concrete stairs, 4 wooden stairs, and 573 m² of balcony, will be impacted by the project construction are entitled to cash compensation at replacement cost for said structures.
65. The affected culverts and bridges on the MC 33, SC 3U and SC 3D, the Project will construct new bridges or culverts where the canals cross rural road and new laterite road with top cress of 5 m on right embankment of MC 33 and the same laterite road will construct on left embankment of SC 3U and SC 3D for access to the road 130A. The wooden bridges on the canals, the owners can retain the wood for their use.
66. The affected sewerage drainage in the Ang Rokar Market area, the project will new constructed a sewerage pipe line with diameter of 80 cm and 230 m of lengths (see paragraph 25 and map no. 3 above).

6.5. Loss of Standing Crops and Trees

67. Standing crops that cannot be harvested prior to land clearing and to the inundation of the reservoir or the loss of expected crops which the APs is prevented from planting will be compensated at prevailing market rates. Loss of standing crops or of expected crops which the farmer is unable to plant will be avoided as far as possible and will be known only early during implementation, but provision is made for their compensation in the contingency budget. Likewise, the 5,410 trees identified in the IOL will be compensated at current market rates. Owners of the cut trees will retain the wood for their use.

6.6. Loss of Public Assets

68. The affected public properties as mentioned in table 11 (a, b) will be compensated at current market rates and calculated as lamp sum base.

6.7. Income Restoration Measures and Relocation Assistance

6.7.1 Income Restoration Measures

69. For 2 AP households losing more than 10% of their total productive lands, each is entitled to the following income restoration measures:
70. Short-term employment in the clearing of trees and related activities at the construction phase of the project, to be facilitated by the Ministry of Water Resources and Meteorology (MOWRAM), the Executing Agency (EA). The EA will request the civil works contractor to hire the APs as labors for construction process.
71. Transitional allowance of \$412 per hectare of land lost in the reservoirs and other project infrastructures (all affected agricultural land compensate base of rice field with the average yield of rice productivity per year of 1.5 tons per hectare at a current market value of 1100 Riel per kilogram). This transitional allowance covers for their loss of rice production, which was not able to be grown in a year COI of the canal and reservoir filling and it will be provided for the other specific transitional period in case it is needed. The

- transitional allowance will clear identify in RP of the DD phase of the project following discussion with the APs and relating local authorities.
72. MOWRAM will provide advice to APs to help them in finding and purchasing replacement productive land. The majority of APs will obtain land by purchase on the basis of cash compensation for their land losses. MOWRAM RU and the PRWG and the EMA will monitor their success and any constraints in doing so.
 73. Indirect impact APs that will loses public facility the project will be construction new for replacement losing the public facilities as set out in point 6.4. and point 6.6 above.
 74. An NGO, the Envisioning, may have been contracted by the Government to assist in the planning and monitoring of the above income restoration program.

Table 16: Entitlement Matrix

#	Type of Impact	Application	Entitled Person	Entitlements
1.	All AP HHs	All effected household of 368 APs of MC 33, SC 3U, SC 3D and the reservoir of 193 APs	Owners with acceptable (recognized) proof or without acceptable of ownership	For the portion or severe impact all kind of land or structure will provide one-time disruption allowance of \$ 40
2.	All Indirect Impact people	All people that living in the surrounding project area	All people in the area	Replacement public facilities that lose by the project construction: (new construction of) - Access roads, culvert and bridges, - Sewerage pipe line in Ang Rokar Market area
3.	Agriculture Land	Marginal impact 183 APs of MC 33, SC 3U, SC 3D and the reservoir of 8 APs	Owners with acceptable (recognized) proof or without acceptable of ownership	For the portion of the land needed: - Cash compensation at replacement land use cost - Cash compensation for affected structures, perennials, and crop at replacement cost - AP will be given sufficient time to harvest crops on the subject property. - If falling in one or more of the categories of vulnerability, one-time cash assistance of \$240 for the categories the AP belongs.
		Severe impact 2 APs of MC 33, SC 3U, SC 3D and the reservoir of 185 APs	Owners with acceptable proof or without acceptable of ownership	- Cash compensation at replacement land use cost for the entire land, or land-for-land with secure tenure - AP will be given sufficient time to harvest crops - Cash compensation for affected structures, perennials, and crop at replacement cost - Eligible to avail of the income restoration measures to be provided by the Project - To be advises by Project authorities in looking for replacement land. - If falling in one or more of the categories of vulnerability, one-time cash assistance of \$240 for the categories the APs belongs.
4.	Residential Land	Marginal impact 216 APs of MC 33, SC 3U, SC 3D and the reservoir of 10 APs	Owners with acceptable (recognized) proof or without acceptable of ownership	For the portion of the land needed: - Cash compensation at replacement land use cost - Cash compensation for affected structures, perennials, and crop at replacement cost - AP will be given sufficient time to harvest crops on the subject property. - If falling in one or more of the categories of vulnerability, one-time cash assistance of \$240 for the categories the AP belongs.
5.	Residential Land	Severe impact 0 APs of MC 33, SC 3U, SC 3D and the reservoir of 3 APs	Owners with acceptable (recognized) proof or without acceptable of ownership	- Cash compensation at replacement land use cost for the entire land, or land-for-land with secure tenure - AP will be given sufficient time to harvest crops - Cash compensation for affected structures, perennials, and crop at replacement cost

				<ul style="list-style-type: none"> - One time transport allowance - To be advises by Project authorities in looking for replacement land. - If falling in one or more of the categories of vulnerability, one-time cash assistance of \$240 for the categories the APs belongs.
6.	Main Structures	Severe impact see 23 APs of MC 33, SC 3U, SC 3D and the reservoir of 4 APs	Owners of the structures with or without acceptable proof of ownership over the land; with or without building permit	<ul style="list-style-type: none"> - Cash compensation at replacement cost (i.e., no depreciation and no deduction for salvage materials) for the entire structure. - If the affected APs have all kind land will additionally impact , they will entire and point 2, 3 and 4. - If falling in one or more of the categories of vulnerability, one-time cash assistance of \$240 for the categories the AP belongs.
7.	Other Structures	Loss of, or damage to, affected assets, partially or entirely	All APs	<ul style="list-style-type: none"> - Cash compensation at replacement cost for the affected assets.

7. PUBLIC PARTICIPATION AND CONSULTATION

7.1. Informing APs

75. The Provincial Resettlement Working Group (PRWG), assisted by PDWRAM, carried out an information campaign including a series of public meetings at each of the effected villages before conducting (IOL) the registration of APs.
76. However, a Public Information Booklet (PIB) will disseminate during DMS Survey by IRC. The PIB contained information on the Project compensation policy, compensation payment procedures, and construction schedule aimed at social preparation for relocation and resettlement of the affected persons. The public meetings and consultation with the APs revolved around the following concerns:
- a. Explain the relevant details of the Project scope and schedule,
 - b. Explain the DRP and the various degrees of project impact,
 - c. Provide details of the entitlements under the DRP and what is required of APs in order to claim their entitlement,
 - d. Explain the relocation and resettlement operations and options and enlist the agreement and support of affected people in participating in these operations,
 - e. Explain the Implementation Schedule with a timetable for the delivery of entitlements,
 - f. Explain the compensation process and set out compensation rates,
 - g. Provide a detailed explanation of the grievance process, and
 - h. Enlist the help of village leaders and other influential community officials in encouraging the participation of the APs in DRP implementation.

7.2. Consultation with APs

7.2.1 Consultation with APs in Tropaing Thom Khang Cheung Commune

Date: 19 December, 2011

ON 19th December 2011 at 10:00 AM a meeting were hold in Provincial Department of Water Resources and Meteorology (PDOWRAM) of Takeo province participated by Director of PDOWRAM, MOWRAM/RU staff and Governor of Traimkok district. The member of the meeting were 9 person.

Meeting Agenda:

- 1-PDOWRAM DIRECTOR confirm about project background
- 2-MOWRAM/RU confirm the resettlement guideline and IOL survey, and the compensation procedure before starting of project construction.

PDOWRAM Director had told that this project is for course on the rehabilitation and improvement the Upper Slakou scheme. Therefore the project impact is smaller because the construction is in the existing area and for rehabilitation of Tumnap Lok reservoir, the APs had agreement with the authority to provide the reservoir area whenever the dam require for rehabilitation.

MOWRAM/RU Team Leader told the schedule of Inventory of Losses (IOL) and resettlement procedure when the project needed any land acquisition for construction. All Affected People (APs) will be recorded of the property losses or business activities. The Owner of the land will spend time with RU staff to interview on property losses and socio economy activities. When the IOL survey finished as schedule the Resettlement Action Plan (RAP) will be preparing and the submit to JICA. The resettlement procedure has 2 steps: Step 1 is IOL survey to find out the APs signification and Step 2 is Detailed Measurement Survey (DMS) which will be conducted by Inter-Ministerial Resettlement Committee (IRC) working group before the starting project construction.

The same date on 2:30 PM hold a meeting in Tropaing Thom Khang Cheung commune office on starting the IOL survey for Upper Slakou Project. Six Affected commune heads joint the meeting. Each commune head showed their good feeling to the project because the farmer have been waiting for long time for the project rehabilitation. For the ROW of national road is keeping 20-25 meters from axle of the national road. With the new proposed secondary canal SC 3D alignment where across in front of commercial area, the Cheang Torng commune head told that the beginning channel of new alignment of SC 3D never had the existing canal since the Pol Pot Period and the people who living north of National Road No. 130A did not filling the existing canal. Truly existing canal is crossed the road and go through backside of the village and continue to Ta Phem and Ang Tasom commune along side the national road.

The new alignment of SC 3D, the value property will impacted by project such as Health Centre, Gasoline Station, Ice manufacturing, and building as concrete flat or shopping. He is happy with the project but if the new alignment will be change to the existing canal it can reduce the impact and most people who running the business and farmer are very happy with the project.

The meeting was finished at 4:00PM with understanding each other and friendly.

Seen and Approved:

Note taker

Than Phalleap

Tauch Ang



Photos Of Meeting With 6 Commune Leaders In *Tropaing Thom Khang Cheung Commune Office, Takeo Province* On 19.12.2011

7.2.2 Consultation with APs in O Saray Commune

Date: 22 December, 2011

ON 22nd December 2011 at 9:00 AM a meeting were hold in Tropaing Krosaing public meeting house participated by Osaray commune head, MOWRAM/RU and 48 people from Tropaing Krosaing and Thnot Chum village. The member of the meeting were 59 person.

Meeting Agenda:

- 1-Opening the meeting by commune head
- 2-MOWRAM/RU confirm the resettlement guideline for Upper Slakou Project
- 3-Other discussion

O Saray commune head had explained to farmers the beneficiary of the project such as the development of social infrastructure as rehabilitation of irrigation scheme and road construction. This project is very important to our commune in order to have a poverty reduction and increase the agriculture productivity.

MOWRAM/RU Team Leader told that all affected people have to spend time for interviewing with RU staff of any losses such as affected tree, house, shop and all property in the corridor of impact. This is the opportunity for farmer which the irrigation scheme will be rehabilitated by JICA. So do not worry any losses with the project because the government will be responsible for the resettlement.

3 representatives of affected peoples raised some issues such as what will do with houses, tree or other property which impacted by the project? and how to settle with landless who only have house in the corridor of impact?

For this matter the IRC team will measure the property during conducting the DMS before project start constructing and government will be responsible for all APs who losses the property by project.

The meeting was finished at 11:00AM with understanding each other and friendly.

Seen and Approved:

Note taker

Than Phalleap

Tauch Ang



Photos Of Affected People Joint The Meeting In *Tropaing Krosaing Village, O saray Commune, Takeo Province ON 22.12.2011*

7.2.3 Consultation with APs in O Saray Commune

Date: 27 December, 2011

ON 27th December 2011 at 9:15 AM a meeting were hold in Thnot Chum temple on Land Losses and affected property by construction of Main Canal MC 33 participated by O saray commune head, MOWRAM/RU and 46 people from Thnot Chum village. The member of the meeting were 46 person.

Meeting Agenda:

- 1-Opening the meeting by commune head
- 2-MOWRAM/RU confirm the resettlement guideline for Upper Slakou Project
- 3-Other discussion

O saray commune head had explained to farmers the history of this commune, in Pol Pot period all infrastructure as Road, Bridge, manufactory, were destroyed but after the 7 January 1979 whole country were liberated, social infrastructure were rehabilitate one day to one day. Up to now the government lead by Samdech Akaksenabodey Techo Hun Sen are developing all infrastructure as the result this national road no.130A were constructed a few years. Further more now the government have a good cooperation with Japan through JICA have proposed plan for rehabilitation and improvement of irrigation for Upper Slakou Project. All property losses by this construction the RU staff will interview with household's owner to find out what kind of impact.

MOWRAM/RU Team Leader told that all development project the donor always ask the government to prepare the resettlement plan if project will impact some property and land lose. In the first stage is the estimation how much the cost for resettlement and procedure for compensation. Second stage is DMS survey by IRC working group to find out how large the impact and then ask budget guideline from leader for compensation. Now this is the time for estimation the cost. So RU staff will conduct the IOL and all affected people have to spend time for interviewing of any losses such as affected tree, house, shop and all property in the corridor of impact. This is the opportunity for farmer which the irrigation scheme will be rehabilitated by JICA and this project will increase the agricultural production through irrigation improvement and this is the government strategy to have poverty reduction.

The meeting was finished at 11:00AM with understanding each other and friendly.

Seen and Approved:

Note taker

Than Phalleap

Sarn Mengsong



Photos Of Affected People Joint The Meeting In *Thnot Chum Temple*
O Saray Commune, Takeo Province On 27.12.2011

7.2.4 Consultation with APs in Tropaing Thom Khang Cheung Commune

Date: 04 January, 2012

ON 4th January 2012 at 8:30 AM a meeting were hold in Tropaing Thom Khang Cheung commune office on Land Losses and affected property by construction of Main Canal MC 33

participated by commune head, MOWRAM/RU and 36 people from Peakbang Orng, Ang Trav , and Prey Kvav village. The member of the meeting were 47 person.

Meeting Agenda:

- 1-Opening the meeting by commune head
- 2-MOWRAM/RU confirm the resettlement guideline for Upper Slakou Project
- 3-Other discussion

Tropaing Thom Khang cheung commune head had explained that all farmers who living or have the land along Main Canal MC 33 will impact by the project. All affected people have living this area for long time ago some people had constructed house and planting fruit tree along this canal. In 2000 one Japan Team surveyed this area and farmer waiting for long time but no action on irrigation rehabilitation. The people in this village are very glade if this project will take place soon though their property will be loss by the project

MOWRAM/RU Team Leader told that the government have proposed plan to rehabilitate and improvement irrigation scheme for Upper Slakou Project through JICA assistant. Those proposed infrastructure are Main Canal MC 33, Secondary Canal SC 3U and Secondary Canal SC 3D. All development project the donor always ask the government to prepare the resettlement plan if project will impact some property and land lose. So in order to prepare a resettlement plan RU staff have to conduct IOL survey so the land owner have to spend time for interview all losses as House, Shop, value tree, gate, fence and other property.

In the first stage is the estimation how much the cost for resettlement and procedure for compensation. Second stage is DMS survey by IRC working group to find out how large the impact and then ask budget guideline from leader for compensation. This is the good opportunity for farmer which the irrigation scheme will be rehabilitated by JICA and this project will increase the agricultural production through irrigation improvement and also the government strategy for poverty reduction.

The meeting was finished at 10:05AM with understanding each other and friendly.

Seen and Approved:

Note taker

Than Phalleap

Sarn Mengsong



Photos Of Affected People Joint The Meeting In Tropaing Thom Khang Cheung Commune, Takeo Province On 04.01.2012

7.2.5 Consultation with APs in Ta Phem Commune

Date: 17 January, 2012

ON 17th January 2012 at 9:30 AM a meeting were hold in Cambodian People Party meeting room in Ta Phem Commune participated by Ta Phem commune head, MOWRAM/RU and 56 people from Cheang Tung commune and 124 people from Ta Phem commune. The member of the meeting were 189 person.

Meeting Agenda:

- 1-Opening the meeting by commune head
- 2-MOWRAM/RU confirm the resettlement guideline for Upper Slakou Project
- 3-Other discussion

Ta Phem commune head had explained to farmers that the construction of secondary canal SC 3D is very beneficiary to all farmer in Ta Phem and Ang Tasom commune because when the construction finished the farmer will get enough water for irrigation and for other crop plantation. Though some people will their property will affected by the project but they we are very happy for this irrigation rehabilitation. This project is very important to our commune in order to have a poverty reduction and increase the agriculture productivity.

MOWRAM/RU Team Leader told that the proposal for irrigation construction of MC 33, SC 3U, and SC 3D assisted by the Japan government through JICA resident in Cambodia. JICA has proposed to MOWRAM to prepare the resettlement plan for this project because all JICA project have to follow the JICA guide line of Involuntary Resettlement. According to the background this canal were built in Pol Pot regime and now some area were filed for shopping or running business along national road. All land owner have to spend time for interviewing with RU staff for any losses such as affected tree, house, shop and all property in the corridor of impact. This is the opportunity for farmer which the irrigation scheme will be rehabilitated by JICA. So do not worry any losses with the project because the government will be responsible for the resettlement.

4 representative of affected peoples raised some issues why the project have to do the construction in front of business and market area and why not fallow to existing canal where back side of business area? For this 3D construction we suggest to project owner or JICA please do the construction in the existing canal.

For this matter the RU will discuss with JICA team for their affected people proposal of changing canal alignment and will let them know when Detailed Design Stage

The meeting was finished at 11:30AM with understanding each other and friendly.

Seen and Approved:

Note taker

Than Phalleap

Sarn Mengsong



Photos Of Affected People Joint The Meeting In Cambodian People Party Meeting Room, Ta Phem Commune, Takeo Province On 17.01.2012

7.2.6 Consultation with APs in Tropaing Kronhoung and Phong Commune

Date: 31 January, 2012

ON 31th January 2012 at 9:00 AM a meeting were hold in Tropaing Kok village of Tropaing Kronhoung commune participated by Tropaing Kronhoung commune head of Takeo province and Phong commune head of Kampong Speu province, MOWRAM/RU and 31 people from Tropaing Kronhoung commune of Takeo and 71 people from Phong commune of Kampong Speu. The member of the meeting were 116 person.

Meeting Agenda:

- 1-Opening the meeting by commune head
- 2-MOWRAM/RU confirm the resettlement guideline for Upper Slakou Project
- 3-Other discussion

Tropaing Kronhoung commune council had explained to farmers that now the government is proposing to rehabilitate Tumnupek reservoir. So the commune informs to all farmers who are using land in the reservoir please keep this land frees for any construction.

Phong commune head of Kampong Speu province had informed to all land user in reservoir that now the time for reconstruction this reservoir. Land in the reservoir is public land or government property so the government has the right to rehabilitate this reservoir for the public services. All people who using this land in the reservoir the authority never provide any land title therefore all user have to provide this area for government use as improvement of Agricultural Productivity. When this reservoir will be finished as construction schedule all people in two provinces will get more income and good communication as Dam road is link road connecting people from Takeo and Kampong Speu and the water in the reservoir will provide for dry recession rice and other vegetable and crop.

MOWRAM/RU Team Leader told that this project was proposed by the Royal Government of Cambodia to Royal Japan Government to rehabilitate and improvement the irrigation scheme of Upper Slakou Project. In order to proceed this project JICA has proposed to MOWRAM to prepare the resettlement plan for this project because all JICA project have to follow the JICA guide line of Involuntary Resettlement.

All land owners have to spend time for interviewing with RU staff for any losses such as affected tree, house, shop and all property in the corridor of impact. This is the time for estimating the resettlement cost. If this project is decided for construction all affected people will be announced by IRC Working group before construction how the government will assist.

5 representatives of affected peoples raised some issues that they bought this land from someone over ten or nearly twenty years ago so the affected people ask to the government for providing the budget policy or rice support as government can especially assistant for landless household. And other people ask the project do not keep the water in the reservoir higher than the past. But as the result all farmer who use land in the reservoir showed their feeling happy with reservoir rehabilitation and they expected that they will get enough water for other crop planning and get income from fishery.

For this matter the RU will record their proposal in the resettlement action plan.

The meeting was finished at 11:15AM with understanding each other and friendly.

Seen and Approved:

Note taker

Than Phalleap

Sarn Mengson



Photoes Of Affected People Joint The Meeting In *Tumnuplok Reservoir*
In *Tropaing Kok Village, Tropaing Kronhoung Commune, Takeo Province* On 31.01.2012



Photos Of Affected People Joint The Meeting In *Tumnuplok Reservoir*
In *Tropaing Kok Village, Tropaing Kronhoung Commune, Takeo Province* On 31.01.2012

8. GRIEVANCE REDRESS

8.1. Grievance Rights

77. All APs have the right of appeal against any aspect of decisions made not in accordance with the DRP or with commitments given to them, or on which they disagree with the level or manner of compensation, including that for land losses. The main objectives of the grievance procedure are to provide a mechanism to ensure that the compensation and resettlement program have been implemented accurately and fairly, alleviating any adverse effects on APs, to mediate conflict and to avoid lengthy litigation that is unfair to APs and can delay the Project. It also provides people who have objections or concerns about their compensation or other assistance with an accessible and known procedure through which to raise their objections and have them resolved.

8.2. Function

78. The functions of the grievance process will be:
- a. To provide support for the APs being relocated on problems arising out of their adjustment to their new environments;
 - b. To record grievances of the APs and categorize and prioritize those grievances needing to be resolved by the Grievance Committee;
 - c. To record grievances of the APs and categorize and prioritize those grievances needing to be resolved by the Grievance Committee;

- d. To assist the APs in dealing with the decisions of the Grievance Committee (the Grievance Committee should be given the power to resolve all but the most serious of grievances);
- e. To report new developments to the aggrieved parties regarding the hearing of their grievances. The decisions of the Grievance Committee will not be contested in any other forum, except in the courts of law.

8.3. Steps Involved

79. The grievance process must be explained to every AP at the time of during the public meetings and consultations and during the delivery of compensation and other entitlements. The process should be as follows:
80. As the first stage, APs will present their complaints and grievances to the Village or Commune Resettlement Sub-Committee. The Sub-Committee will be obliged to provide immediate written confirmation of receiving the complaint. At the same time, the complaint will be forwarded to the Provincial Resettlement Sub-Committee and the Provincial Grievance Committee. If the Village or Commune resettlement Sub-Committee is unable to resolve the grievance, it will refer the grievance with any relevant information or documents to the Provincial Resettlement Sub-Committee through the PIU at PDWRAM, which will advise the Provincial Grievance Committee.
81. At this or any subsequent stage the Village or Commune Resettlement Sub-committee may be asked by the AP or the PIU and RU to carry out a survey and valuation of structures or land which is the subject of dispute and to provide this or otherwise assist in further review or arbitration.
82. The Provincial Grievance Committee meets with the aggrieved party and tries to resolve the situation. The Committee may ask for a review of the DMS by the external monitor. Within 21 days of the submission of the grievance the Committee must make a written decision and submit copies to PDOWRAM, the monitoring agency, and the AP
83. A judgment on the complaint will be made by the Provincial Grievance Committee with the participation of the village head, Commune Chairman within 21 days of the written acknowledgement being issued. The Provincial Grievance Committee will provide the AP with its decision within 21 days of the complaint being lodged.
84. If the AP is not satisfied with the solution of the Provincial Grievance Committee, the case may be submitted for consideration by the legal system, however, every effort shall be made to avoid this by resolving grievances within the framework of the Provincial administration and the Project.
85. If the decision is in favor of the aggrieved party, corrective actions must be prescribed in the letter and implemented within 14 days of the decision with interest added for any back payment of compensation.
86. If no decision can be agreed to and the settlement of the grievance is essential to the successful implementation of the Project, MOWRAM may ask for arbitration to be undertaken by an independent agency, assisted by any survey or valuation by the EMA and with the presence of the EMA.
87. In the event that this procedure does not achieve an agreed resolution of the grievance, MOWRAM may take the matter to court, with the plea that an order for eviction be granted, but must advise the Project of its intention to take this step one month in advance, and must in any case make payment of the full compensation costs and allowances to which the AP is entitled.
88. The grievance procedures do not take away the constitutional rights of any AP him or herself to lodge a complaint with the court at the municipal level. This may be followed by subsequent appeals to the court at the provincial level and national level, but the purpose of the grievance procedure is that citizens, particularly people in the municipal and Commune/village level, will not need to take their complaints to

the formal legal institutions and that most complaints will be settled at the lowest level. APs will be exempted from all administrative, transfer and legal fees.

89. It is recognized that, in many cases, APs do not have writing skills and the possibility of being able to express grievances verbally has been considered, however, APs are encouraged to seek assistance from other local NGOs or other family members, village heads or community chiefs to have their grievances recorded in writing and to have access to the DMS or other documentation, and to any survey or valuation by the committee, to ensure that where disputes do occur all the details have been recorded accurately enabling all parties to be treated fairly.

8.4. Make Up of the Grievance Committee

90. Ta Keo Province has a Grievance Committee under the Provincial Resettlement Sub-Committee comprising four permanent members and two local members. The Committee is chaired by the Provincial Governor or his representative and has as members the Provincial Head of the Department of Water Resources, the Provincial Head of the Department of Economy and Finance, and Justice Department, on a co-opted basis, one or more local leaders (such as the Village Head or Commune Chairman) familiar with the area and the circumstances of the complaint, one of whom at least should have been nominated by the AP and briefed to represent him or her. Co-opted members may include any local NGO nominated by the AP and the External Monitor contracted by the IRC. The External Monitor and any local NGO representing the AP may offer advocacy, advice or expert support, but may not vote.

9. ORGANIZATIONAL FRAMEWORK

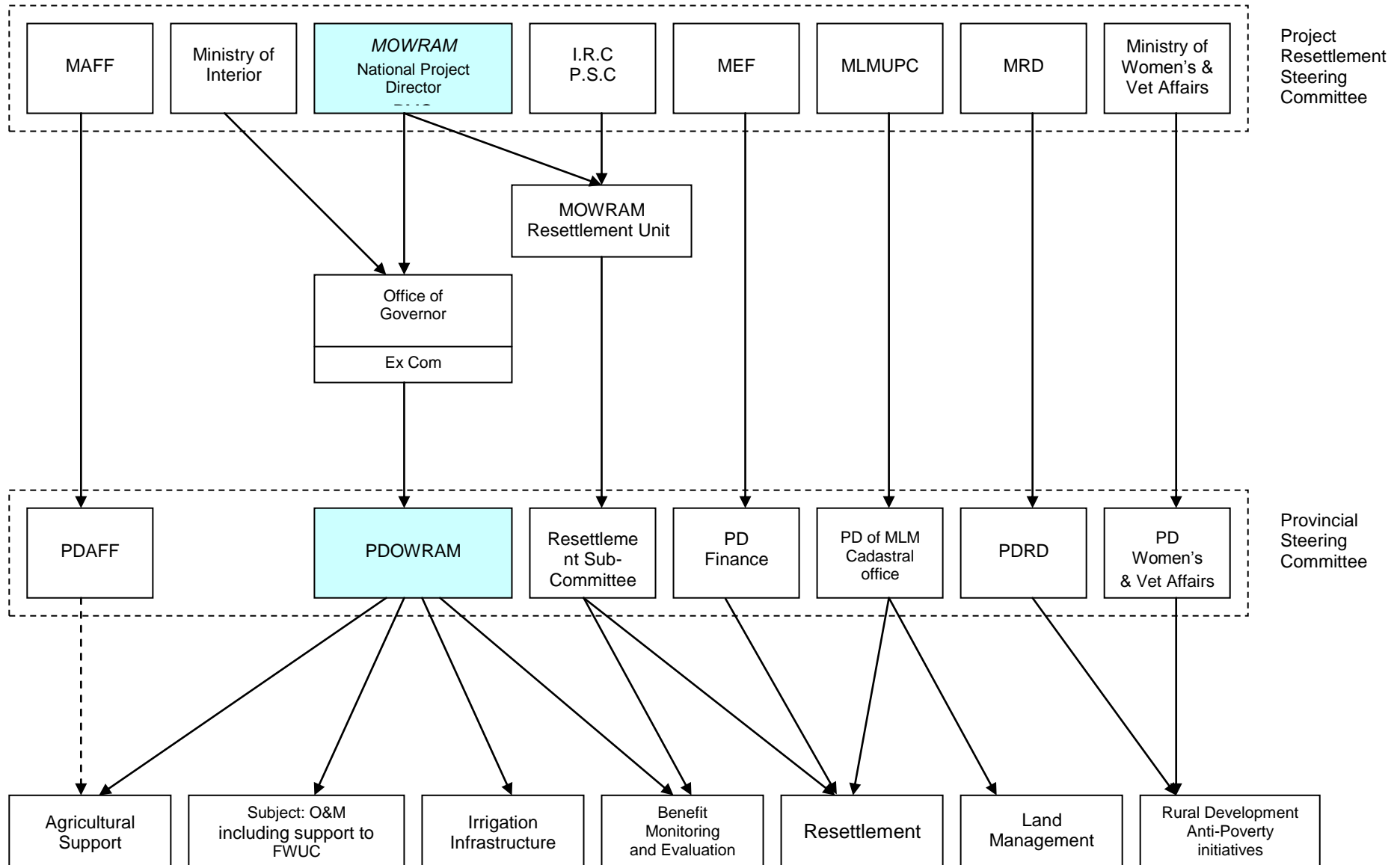
91. A Project Management Unit (PMU) at MOWRAM headed by the Project Coordinator is responsible for all aspects of the irrigation development and engineering operations and MOWRAM is the Executive Agency assigned by the Government. MOWRAM has appointed a PIU at the provincial level, headed by the Director of PDOWRAM, and is in charge of supervision and coordination of Project implementation.
92. For purposes of resettlement planning and implementation, including the conduct of surveys, consultation with and information to APs, the Inter-ministerial Resettlement Committee (IRC) chaired by MEF has convened a Project Resettlement Subcommittee (PRSC).
93. A Resettlement Unit in MOWRAM PMU (MOWRAM-RU) and Resettlement Unit in MEF have the main responsibility for coordinating and managing all aspects of resettlement. MOWRAM-RU is responsible for supporting the PRWG and provincial authorities in the conduct of surveys and planning for resettlement and relocation in liaison with the IRC, Ministry of Agriculture Forestry and Fishery (MAFF), and MLMUPC. MOWRAM-RU will be responsible for supervising the detailed implementation of the DRP on behalf of the Executing Agency.
94. The following specific organizational and management arrangements will be applicable to the resettlement activities in the project.

9.1. Institutions for Resettlement

9.1.1 Steering Committee

95. The Steering Committee comprising representatives of MEF, MOWRAM, MRD, MAFF, MLMUPC and IRC will oversee all aspects of the Project including resettlement (see organizational structure for project implementation in Figure below).

Organizational Structure for Project Implementation



9.1.2 MOWRAM

96. MOWRAM is responsible for implementing the irrigation and agriculture components of the Project on behalf of the Government of Cambodia. Apart from a small national Project Management Unit (PMU), MOWRAM will establish PIU in Ta Keo Province and headed by the Director of PDOWRAM, to implement the irrigation components.
97. PIU personnel have been appointed to the PRWG, which currently operates under the direction of MOWRAM RU. Additionally, MOWRAM will create a Social and Environmental Unit (SEU) based on the existing RU to work with the IRC, PRSC and provincial authorities on implementation of the Resettlement Plan, and specifically to coordinate civil works with resettlement activities to minimize hardship of APs.
98. Specifically, MOWRAM RU will have the following tasks:
 - a. consultation with the concerned AP together with the village headman and village development committee to identify and register land, agricultural development requirements and options of individual APs;
 - b. setting of a timetable for land acquisition and resumption of production of the APs;
 - c. reporting to IRC and National Project Director (NPD), identities and needs of APs registered for assistance;
 - d. liaising with IRC and PDEF to ensure timely provision of any outstanding compensation to facilitate land acquisition and agricultural production support, including payment of compensation for any loss of crop during the transition;
 - e. review of options for inclusion in a MOWRAM and PRWG managed agricultural relocation program in areas identified and surveyed by MOWRAM RU for that purpose;
 - f. monitoring of these actions by the RU and reporting on them to the IRC and NPD.

9.1.3 Resettlement Subcommittee

99. A Resettlement Sub-committee is convened by the IRC. The PRSC will be responsible for the following resettlement activities:
 - a. Liaising with the RU/MOWRAM to carry out the overall implementation of resettlement activities in accordance with the resettlement policies specified in the DRP;
 - b. Amending or complementing the DRP in coordination with concerning government agencies in case of any problems identified by internal and/or external monitoring of DRP implementation to ensure that the objectives of the DRP are met;
 - c. Overall planning of the resettlement programs;
 - d. Guiding and supervising the field staff to carry out the verification of inventory, finalization of entitlements, and assessment of final compensation;
 - e. Submitting compensation / assistance costs for approval by the IRC, and allocation of needed resources;
 - f. Informing APs of the resettlement program and of their entitlements; in coordination with the local authorities;
 - g. Supervising the compensation payment process and the implementation of the DRP in all the communes;
 - h. Providing support to the Provincial Grievance Committee to redress grievances concerning about resettlement; activities in collaboration with the local authorities and GRC;
 - i. Providing training to the commune staff on planning and implementation of resettlement activities and on the principles of resettlement in accordance with the DRP;

- j. Preparing periodic supervision and monitoring reports liaising with the MOWRAM resettlement unit on DRP implementation then MOWRAM/RU will officially submit to the IRC.

9.1.5 Provincial Agencies

- 100. The office of the provincial and district Governors, provincial agencies of MRD, MAFF and MLMUPC and Department of Finance will assist the PRSC in the following:
 - a. DMS surveys;
 - b. Establishing compensation prices for land, structures, crops and other fixed assets;
 - c. Validating tenure status of land and structure; and
 - d. Land recovery and allocation.

- 101. Moreover, local authorities may be called on to assist the PRSC in:
 - a. Public information campaign, public participation and consultation;
 - b. Finalizing compensation and entitlement forms for each PAP;
 - c. Payment of compensation and allowances;
 - d. Planning and implementing all resettlement and rehabilitation activities in the district and commune level;
 - e. Addressing all grievances in the commune in accordance with the established procedures; and
 - f. Maintain record of all public meetings, grievances, and actions taken to address complaints and grievances.

9.2. Monitoring and Evaluation

- 102. The MOWRAM will conduct regular monitoring and evaluation of all efforts connected with addressing involuntary resettlement. Said monitoring and evaluation are intended to help ensure that the DRP is implemented as planned and that the mitigating measures carried out are adequate and effective in addressing the adverse social impacts of the Project. The MOWRAM-RU, particularly the SEU, will insure the total cost of resettlement for the original plan is US\$ 1,500,462, for proposed plan is US\$ 441,803, and for Tumnup Lok Reservoir is US\$ 472,571 serve as the in-house monitoring body for the Project.

9.2.1 Indicators for In-house Monitoring

- 103. The following indicators will be monitored periodically by the SEU:
 - a. Compensation and entitlements are computed at rates and procedures provided in the DRP;
 - b. APs are paid as per agreement with Project authorities;
 - c. Public information, public consultation and grievance redress procedures are followed as described in the DRP;
 - d. The implementation of the Income Restoration Program (IRP) carried out by the NGO (proposed Envisioning);
 - e. Public facilities and infrastructure affected by the Project are restored promptly; and,

10. COSTS AND BUDGET

104. Funds for the implementation of the DRP are part of the Project budget. Costs are estimated based on the prevailing rates as of February 2012. Unless proven through the grievance redress mechanism that certain households may have been inadvertently missed out during the IOL done in December 2011 to February 2012, only those households and individuals covered in the same (per policy on cut-off date) are eligible for compensation.

10.1. Procedures for Flow of Funds

105. The IRC will request the MEF for funding for the implementation of the DRP. The funds will be forwarded to the Provincial Departments of Economy and Finance. Payment vouchers will be prepared at the Provincial Department of Economy and Finance. Payment of compensation and other entitlements as described in Chapter 6 of the DRF will be given in cash and will be distributed in village offices. The APs will be notified through the village chiefs of the schedule of payment of compensation and other entitlements.

10.2. Implementation, Administration and Contingency Costs

106. Implementation costs include payment of allowances and per diem of concerned personnel involved in the preparation and implementation of the DRF. Administration costs are 15% of the total costs of implementing the DRF. The cost estimates for the implementation of the DRF also include a provision for contingencies equivalent to 20% of the total cost of resettlement. MOWRAM and IRC will ensure that adequate funds are made available as and when necessary for the efficient and timely implementation of the resettlement activities.

10.3. Preliminary Estimate of Resettlement Costs

107. The total cost of resettlement for the original plan is US\$ 1,500,462, for proposed plan is US\$ 441,803, and for Tumnap Lok Reservoir is US\$ 472,571. Table 17 (a, b, c) provides a breakdown of the costs for resettlement in COI of original plan, proposed plan and in the reservoir respectively.

Table 17a: Summary Budget of Original Plan for Estimation Costs of DRF Implementation

Description	Unit	Rate US\$	Quantity	Cost US\$
<u>Compensation for Land</u>				
Agricultural rice land	m ²	0.3	39,352	11,805.00
Residential land	m ²	3.00	40,761	122,284.00
Sub-Total (1)				134,089.00
<u>Compensation for Houses</u>				
House (Type 1)	m ²	22	865	19,030.00
House (Type 2)	m ²	45	3,866	173,970.00
House (Type 3)	m ²	160	3,379	540,640.00
Sub-Total (2)				733,640.00
<u>Other Structures</u>				
Latrine	Unit	200	1	200.00
Grange	Unit	50	5	250.00
Stall/ Shop	Unit	60	87	5,220.00
Dug well	Unit	120	4	480.00
Pump well	Unit	350	8	2,800.00
Pond	m ²	5	144	720.00

Description	Unit	Rate US\$	Quantity	Cost US\$
Concrete fence	m	25	866	21,650.00
Steel fence	m	5	238	1,190.00
Concrete slab	m ²	5	2,402	12,010.00
Stupa	Unit	1200	2	2,400.00
Wooden stair	Unit	70	4	280.00
Concrete stair	Unit	200	2	400.00
Fuel Station	Unit	20000	1	20,000.00
Balcony	m ²	3	696	2,088.00
Sub-Total (3)				69,688.00
<u>Economic Trees</u>				
Mango	Tree	30	725	21,750.00
Coconut	Tree	20	418	8,360.00
Palm	Tree	45	360	16,200.00
Bamboo	Thicket	15	295	4,425.00
Cashew tree	Tree	13	233	3,029.00
Tamarind	Tree	15	329	4,935.00
Orange Tree	Tree	15	43	645.00
Banana	clump	3	180	540.00
Milk Tree	Tree	30	36	1,080.00
Logan	Tree	30	30	900.00
Jack Fruit	Tree	22	34	748.00
Other	Tree	5	3,034	15,170.00
Sub-Total (4)				77,782.00
<u>Public Assets</u>				
Building and Land of Ang Roka Commune Health Center	LS	25,000	1	25,000.00
Entrance Gate of Pagoda	Unit	1,700	2	3,400.00
Steel fence, Entrance Gate of Ta Phem Commune Health Center	LS	2,000	1	2,000.00
CPP Commune Office Compound Land	LS	2,000	1	2,000.00
Commune Commercial Office Compound Land	LS	1,000	1	1,000.00
Commune Police Office Compound Land	LS	1,000	1	1,000.00
Sub-Total (5)				34,400.00
<u>Allowance</u>				
Disruption Allowance	HH	40	426	17,040
Allowance for Vulnerable Groups	HH	240	67	16,080
Transportation Allowance	HH	40	1	40
Sub-Total (6)				33,160.00
<u>Income restoration program</u>				
Transitional allowance (equivalence losing rice one year)	HH	412	11	4,532.00
Sub-Total (7)				4,532.00
SUM (1)+(2)+(3)+(4)+(5)+(6)+(7)				1,087,291.00
<i>Incremental Administration Costs (15%)</i>	15%	0.15		163,094.00
Total				1,250,385.00
<i>Contingencies (20%)</i>		0.2		250,077.00
Grand Total				1,500,462

Table 17b: Summary Budget of Propose Plan for Estimation Costs of DRF Implementation

Description	Unit	Rate US\$	Quantity	Cost US\$
<u>Compensation for Land</u>				
Agricultural rice land	m ²	0.3	42,200	12,660.00
Residential land	m ²	3.00	31,368	94,104.00
Sub-Total (1)				106,764.00
<u>Compensation for Houses</u>				
House (Type 1)	m ²	22	126	2,772.00
House (Type 2)	m ²	45	1,104	49,680.00
House (Type 3)	m ²	160	81	12,960.00
Sub-Total (2)				65,412.00
<u>Other Structures</u>				

Description	Unit	Rate US\$	Quantity	Cost US\$
Latrine	Unit	200	1	200.00
Grange	Unit	50	7	350.00
Stall/ Shop	Unit	60	59	3,540.00
Dug well	Unit	120	5	600.00
Pump well	Unit	350	6	2,100.00
Pond	m ²	5	424	2,120.00
Concrete fence	m	25	402	10,037.50
Steel fence	m	5	217	1,085.00
Concrete slab	m ²	5	1,800	9,001.50
Stupa	Unit	1200	2	2,400.00
Wooden stair	Unit	70	4	280.00
Concrete stair	Unit	200	2	400.00
Balcony	m ²	3	573	1,719.00
Sub-Total (3)				33,833.00
<u>Economic Trees</u>				
Mango	Tree	30	675	20,250.00
Coconut	Tree	20	394	7,880.00
Palm	Tree	45	352	15,840.00
Bamboo	Thicket	15	307	4,605.00
Cashew tree	Tree	13	226	2,938.00
Tamarind	Tree	15	357	5,355.00
Orange Tree	Tree	15	39	585.00
Banana	clump	3	152	456.00
Milk Tree	Tree	30	27	810.00
Longan	Tree	30	16	480.00
Jack Fruit	Tree	22	30	660.00
Other	Tree	5	2,835	14,175.00
Sub-Total (4)				74,034.00
<u>Public Assets</u>				
Entrance Gate of Pagoda	Unit	1,700	2	3,400.00
Steel fence, Entrance Gate of Ta Phem Commune Health Center	LS	2,000	1	2,000.00
CPP Commune Office Compound Land	LS	2,000	1	2,000.00
Commune Commercial Office Compound Land	LS	1,000	1	1,000.00
Commune Police Office Compound Land	LS	1,000	1	1,000.00
Sub-Total (5)				9,400.00
<u>Allowance</u>				
Disruption Allowance	HH	40	368	14,720
Allowance for Vulnerable Groups	HH	240	63	15,120
Transportation Allowance	HH	40	1	40
Sub-Total (6)				29,880.00
<u>Income restoration program</u>				
Transitional allowance (equivalence losing rice one year)	HH	412	2	824.00
Sub-Total (7)				824.00
SUM (1)+(2)+(3)+(4)+(5)+(6)+(7)				320,147.00
<u>Incremental Administration Costs (15%)</u>	15%	0.15		48,022.00
Total				368,169.00
<u>Contingencies (20%)</u>		0.2		73,633.80
Grand Total				441,803.00

Table 17c: Summary Budget of the Reservoir for Estimation Costs of DRF Implementation

Description	Unit	Rate US\$	Quantity	Cost US\$
<u>Compensation for Land</u>				
Agricultural rice land	m ²	0.15	1,470,314	220,547.00
Residential land	m ²	0.50	27,025	13,513.00
Sub-Total (1)				234,060.00
<u>Compensation for Houses</u>				

Description	Unit	Rate US\$	Quantity	Cost US\$
House (Type 1)	m ²	22	32	704.00
House (Type 2)	m ²	45	50	2,250.00
House (Type 3)	m ²	160	0	-
Sub-Total (2)				2,954.00
<u>Other Structures</u>				
Latrine	Unit	200	0	-
Grange	Unit	50	0	-
Stall/ Shop	Unit	60	0	-
Dug well	Unit	120	0	-
Pump well	Unit	350	0	-
Pond	m ²	5	0	-
Concrete fence	m	25	0	-
Steel fence	m	5	0	-
Culvert		25	0	-
Concrete bridge	m ²	5	0	-
Wooden bridge	m ²	2	0	-
Concrete slab	m ²	5	0	-
Stupa	Unit	1200	0	-
Wooden stair	Unit	70	0	-
Concrete stair	Unit	200	0	-
Balcony	m ²	3	0	-
Sub-Total (3)				-
<u>Economic Trees</u>				
Mango	Tree	30	118	3,540.00
Coconut	Tree	20	57	1,140.00
Palm	Tree	45	111	4,995.00
Bamboo	Thicket	15	0	-
Cashew tree	Tree	13	0	-
Tamarind	Tree	15	32	480.00
Orange Tree	Tree	15	0	-
Banana	clump	3	14	42.00
Milk Tree	Tree	30	0	-
Logan	Tree	30	0	-
Jack Fruit	Tree	22	6	132.00
Other	Tree	5	0	-
Sub-Total (4)				10,329.00
<u>Public Assets</u>				
CPP Commune Office Compound Land	LS	0	0	-
Commune Commercial Office Compound Land	LS	0	0	-
Commune Police Office Compound Land	LS	0	0	-
Sub-Total (5)				-
<u>Allowance</u>				
Disruption Allowance	HH	40	193	7,720
Allowance for Vulnerable Groups	HH	240	46	11,040
Transportation Allowance	HH	40	3	120
Sub-Total (6)				18,880.00
<u>Income restoration program</u>				
Transitional allowance (equivalence losing rice one year)	HH	412	185	76,220.00
Sub-Total (7)				76,220.00
SUM (1)+(2)+(3)+(4)+(5)+(6)+(7)				342,443.00
<i>Incremental Administration Costs (15%)</i>	15%	0.15		51,366.00
Total				393,809.00
<i>Contingencies (20%)</i>		0.2		78,761.80
Grand Total				472,571.00

Appendix 1

IOL QUESTIONNAIRE AND SOCIO-ECONOMIC SURVEY FORM

ក្រសួងធនធានទឹក និងខ្យល់ច្របូកច្របល់
Ministry of Water Resources & Meteorology
គម្រោងសកម្មភាពស្រោចស្រូវ និងស្រោចកែលម្អ និងស្រោចប្រព័ន្ធស្រោចស្រូវ
រៀបចំសម្រាប់គម្រោងស្រោចស្រូវកែលម្អ និងស្រោចប្រព័ន្ធស្រោចស្រូវ
UPPER SLAKOU RIVER IRRIGATION RECONSTRUCTION PLAN (FEASIBILITY STUDY)
IN TAKEO PROVINCE OF CAMBODIA

សំនុំស្រាវជ្រាវ និងវាយតម្លៃការប៉ះពាល់បរិស្ថាន
INVENTORY OF LOSS SURVEY (IOL)
សស*២២២

ឈ្មោះ: ទំនប់ ប្រឡាយ អាងទឹក

លេខសម្ភាសន៍ (CENSUS ID #): ថ្ងៃខែសម្ភាសន៍ (DATE OF CENSUS): ថ្ងៃទី (DAY).....ខែ (MONTH).....ឆ្នាំ 200

ឈ្មោះអ្នកតបសម្ភាសន៍ (Name of Interviewee): ភេទ (Sex): អាយុ (Age)

ត្រូវជាអ្វីនឹងមេគ្រួសារ (Relationship to Household).....

ព័ត៌មាន វេទនាសាររបស់គ្រួសារដែលប៉ះពាល់ (BACKGROUND INFORMATION OF AFFECTED PEOPLE) គូសខាងក្រោម (Check Box)

1.1 ឈ្មោះមេគ្រួសារ (Name of Household Head):..... ភេទ (Sex) អាយុ (Age)

ID No..... មុខរបរ ចែកអាន និងសរសេរ (Age) : បាទ ទេ

មេម៉ាយ (Widow HH) ចាស់ជរា (Age HH) ពិការ (Disable HH) ចំណូលទាប (low Income) ជួលដី ក្នុងដី (Tenant, no land)

1.2 ឈ្មោះប្តី/ប្រពន្ធ (Name of Spouse) :..... អាយុ (Age)

1.3 អាសយដ្ឋានរស់នៅបច្ចុប្បន្នរបស់មេគ្រួសារ ភូមិ.....ឃុំ.....ស្រុក.....ខេត្ត.....

1.4 ទីតាំងប៉ះពាល់ (affected location) : ភូមិ (Village) :.....ឃុំ (Com) :ស្រុក (Distr).....ខេត្ត (Prov)

1.5 អំបូរជនជាតិ (Ethnic Group) :.....

1.6 សមាជិកក្នុងគ្រួសារ Household Member (ចំនួននាក់) ប្រុស (0-14 ឆ្នាំ) នាក់ (15-60 ឆ្នាំ) នាក់ (60+ ឆ្នាំ) នាក់

ស្រី (0-14 ឆ្នាំ) នាក់ (15-60 ឆ្នាំ) នាក់ (60+ ឆ្នាំ) នាក់

1.7 ប្រភពចំណូលនៃគ្រួសារ (Major source of income of Household) គូសខាងក្រោម (Check Box) បំពេញលេខក្នុងប្រអប់ 1 23

ស្រូវ (Rice)..... រ/ឆ្នាំ នេសាទ (Fishing) Riels..... រ/ឆ្នាំ

កម្មករដោយកំលាំង(Manual labor)..... រ/ឆ្នាំ លក់ដូរឬជួសជុលផ្សេងៗ (Business or trade) រ/ឆ្នាំ

ផលិតផលកសិកម្ម (Agri. products)..... រ/ឆ្នាំ ប្រាក់បៀវត្សរ៍ឬឈ្នួល (Salary, wage) រ/ឆ្នាំ

អនុផលព្រៃឈើ (Forestry product)..... រ/ឆ្នាំ ចិញ្ចឹមសត្វ (មាន់ទា គោក្របី ជ្រូក ពពែ)(Livestock)..... រ/ឆ្នាំ

សិប្បកម្ម (Handicraft) រ/ឆ្នាំ ផ្សេងៗ (Other) រ/ឆ្នាំ

សរុបចំណូលប្រចាំឆ្នាំ (Total Year Income of Household) : រ/ឆ្នាំ

សរុបចំណូលប្រចាំខែ (Total Monthly Income of Household) : \$/ខែ

ព័ត៌មានទូទៅ (GENERAL INFORMATION)

2.1-តើអ្នកបានដឹងឬទេថា មានគម្រោងនឹងមកអភិវឌ្ឍន៍ក្នុងតំបន់របស់អ្នករស់នៅ? (Do you know the this project information?) :

បាទ Yes . ពីប្រភពណា from who..... ទេ No

2.2តើអ្នកប្រើប្រាស់ទឹកពីប្រភពណា ? ទឹកស្ទឹង,ទន្លេ ទឹកត្រពាំងឬបឹង អណ្តូងលូ អណ្តូងខ្ទង ផ្សេងៗ.....

Where do you use water resources? Creeks (small steam) pondopened well pump well others

2.3តើគ្រួសារអ្នកបានអ្វីបំភ្លឺនៅពេលយប់ ? ចង្កៀង/ទៀត អាគុយ ម៉ាស៊ីនភ្លើងផ្ទាល់ខ្លួន ប្រើបណ្តាញអគ្គិសនី

How do you light at night ?petrol lamb/ candle battery own electric generatorpower supply

3. អំពីការប្រើប្រាស់ដី (LAND USED) ត្រូវ (Check)

3.1- តើគ្រួសាររបស់អ្នកប្រើប្រាស់ដីនេះតាំងពីឆ្នាំណា? (When did your family start to settle/live here?) ឆ្នាំ (Year) :

ក្រៅពីដីនេះ តើអ្នកមានដីផ្សេងទៀតឬទេដែលជាប់របស់អ្នក? (Aside from this place, is there any other land that you own?)

គ្មានទេ (No) មាន (Yes) បើមានប៉ុន្មានកន្លែង.....កន្លែង (Number of place) តើស្ថិតនៅទីណា? (Yes, Where?) ភូមិ (Village) :.....
 ឃុំ (Commune) : ស្រុក (District)..... ខេត្ត (Province)..... តើដីនោះជាប្រភេទដីអ្វី? (Type of Land?)

3.2- តារាងការប្រើប្រាស់ដី និង ដីប៉ះពាល់ តារាង ១ [Table1: Land Use and Affected Land]

No.	ប្រភេទដី	ផ្ទៃដីមានសរុប ម ^២	សរុបផ្ទៃដីប៉ះពាល់ ម ^២	កំណត់សំគាល់ Remarks
	TYPE OF LAND	TOTAL LAND (m ²)	AFFECTED AREA (m ²)	ដីប៉ះពាល់ : ១ ដីប៉ះក្នុងអាង ២ ដីប៉ះប្រឡាយ
	A	B	C	D
1	ដីស្រែ (Rice land)			
2	ដីចំការ (Chamkar)			
3	ដីស្មៅបន្លែដុះ (Vegetable garden)			
សរុបដីផលិតកម្ម (1) (Total product. land)				
4	ដីលំនៅដ្ឋាន (Residential area) (2)			
5	ដីផ្សេង (Other land) (3)			
ដីសរុបរបស់គ្រួសារ (1+2+3)				

4. អំពីការប៉ះពាល់ផ្ទះសំបែង (AFFECTED HOUSE) មាន (Yes) ទេ (No)

4.1- តើមានប៉ុន្មានគ្រួសាររស់នៅលើផ្ទះដែលប៉ះពាល់នេះ? (Number of family living in he house) ១ ២ ៣ ៤ ៥ ៦

ប្រភេទនៃការប៉ះពាល់ ត្រូវ (Type of Effect Check Box) :

- ប៉ះផ្ទះទាំងមូល នឹងត្រូវ រើថយក្រោយទៅក្នុងភាគដីដែលនៅសល់
(Totally Affected -house will move back to remaining portion of land)
- ប៉ះផ្ទះទាំងមូល នឹងត្រូវរើទៅនៅលើដី ដែលមាននៅកន្លែងផ្សេងទៀត ដោយដីផ្ទះនេះត្រូវប៉ះទាំងស្រុង
(Totally Affected – house will relocate to other areas since whole land/house will be affected)
- ប៉ះតែផ្នែកមួយនៃផ្ទះ មិនតម្រូវឱ្យផ្លាស់ប្តូរទៅកន្លែងផ្សេងទៀតទេ (Partially Affected - no relocation is required).

4.2- ប្រភេទសម្ភារៈដែលសង់ផ្ទះ (Type of Materials Used)

ជញ្ជាំង Wall : ឈើ Wood ស្លឹក Thatch លោហៈ ស៊ីម៉ង់ត៍ Cement..... m²

ដំបូល Roof: ក្បឿង Tile ស្លឹក Thatch លោហៈ ស៊ីម៉ង់ត៍ Cement m²

កំរាល Floor: ក្តារ Wood ឫស្សី Bamboo ក្បឿង Tile ស៊ីម៉ង់ត៍ Cement m²

សសរ Column : ឈើ Wood ឫស្សី Bamboo លោហៈ ស៊ីម៉ង់ត៍ Cement m³

ចំនួនជាន់នៃផ្ទះដែលប៉ះ ជាន់ផ្ទាល់ដីធ្វើអំពី..... 1 ជាន់ ធ្វើអំពី..... 2 ជាន់ ធ្វើអំពី..... លើសពី ២ ជាន់ ធ្វើអំពី.....

4.3- ប្រភេទផ្ទះដែលប៉ះពាល់ (Category of House) ប្រភេទ ១ ប្រភេទ ២ ប្រភេទ ៣ ទំហំផ្ទះប៉ះពាល់ (ប x ទ)m²

4.4- ព័ត៌មានបន្ថែមផ្សេងទៀតទាក់ទងនឹងដី ឬផ្ទះដែលប៉ះពាល់ (Additional Information about the affected land/house)

ផ្ទះ/ដីរបស់ខ្លួនផ្ទាល់ ផ្ទះ/ដីជួលគេ. (រយៈពេលបានជួល.....ខែ. ថ្លៃជួលក្នុង១ខែ\$USD ផ្សេងៗ

5. អំពីប្រភេទសំណង់ផ្សេងៗទៀតដែលប៉ះពាល់ (ដូចជា បង្គន់ របង ជង្រុក តូបលក់ដូរ កន្លែងលក់ទំនិញ ស្រះ អណ្តូងជីក, អណ្តូងស្នប់, មេតិយ៍ ។ល ។)

តារាង ២ [Table 2: AFFECTED STRUCTURES (toilet, fence, rice bin storage, small shops, Hand dug well, Tub well, Pond etc)] មាន Yes ទេ No

No	ប្រភេទសំណង់ផ្សេងៗ Type of Structure	ផ្ទៃកំរាល / ក្នុងមួយម៉ែត្រFloor Area/ m	ជញ្ជាំងធ្វើអំពី walls materials	ដំបូលធ្វើអំពី roof materials	កំណត់សំគាល់ (ជំរៅ, ប្រវែង ។ល ។) (Remarks Depth, length) (m)
1					
2					
3					
4					
5					
6					
7					
8					

6. អំពីដើមឈើដែលប៉ះពាល់ : តារាង ៣ (Table 3: AFFECTED TREES) មាន (Yes) ទេ (No)

No.	ដើមឈើដែលប៉ះ Type of Trees	កំរិតភាគដូចជា អាយុ មុខកាត់.....) Characteristics(e.g age of tree/diameter)	បរិមាណ Qty.	ចំណូលពីដើមឈើ កាលពីឆ្នាំកន្លងទៅ Earned Income derived from trees last year (\$US)	កំណត់សំគាល់ Remarks
1					
2					
3					
4					
5					
6					
7					
8					
	TOTAL				

ហត្ថលេខា និងឈ្មោះអ្នកសម្ភាសន៍

Interviewer's signature

ស្នាមមេដៃស្ត្រី និងឈ្មោះអ្នកតបសម្ភាសន៍

Interviewee's thumb prin

ហត្ថលេខា និងឈ្មោះអ្នកអវសម្ភាសន៍

Authority s signature

KINGDOM OF CAMBODIA

Nation, Religion, King



Household Socio- Economic Survey for Upper Slakou Irrigation System Rehabilitation Project

A- Questionnaire NoInterviewed Date(D/M/Y)

Name of InterviewerTeam Leader Name.....

B- Location of Affected Building and Land Use

House

No.....Village.....Commune.....District.....

Province/ City Affected Item

C- Household Information (In case absence of HH the interviewer shall interview with household member >18 Year olds)

C1- Background Information Of Affected People

- Name of Household HeadAge , Sex : M, F . Ethnic:.....Religion:.....
- HH Occupation.....Leteracy : Yes NO. Vulnerability : Disable HH Age Widow HH
- HH Address Village.....Commune.....District.....Province.....Phone No.....
- Interviewee is Household Head: Yes NO, If NO which relationship with HH?

Table 1: Household Member (The interviewer shall describe all member of the current responsibility of the HH)

#	Name of Household Member	Age	Sex	HH Relationship	Education Level	Main Occupation	Additional Occupation for HH Income
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							

Total :Person, in which
Female:.....Male:.....

Table 2: HH Main Occupation :

#	Occupation	No. of Male	No. of Female	Total (person)
	Farmer			
	On farm labor (Plug, transplanting, broadcasting, etc...)			
	Non-farm labor (Moto-taxi, house building worker)			
	Wage-worker (garment factory, land guard etc....)			
	Business (Trading, company)			
	Governmental staff (police, army, village headman, Commune chief, teacher etc..)			
	Other specify.....			
Total				

Note: The main occupation is the job or work that the household members are mainly made income for the household. In column # shall fill with number rank from 1 to 7 (1 main, 2 second, 3 third.....). For the column no. of male and female shall fill the member of household who are > 11 year olds joint with household income earned

C2- Membership of Village or Commune organization of the Affected Household

Table 3: Communities Membership of Affected Household (HH or husband and wife)

Code	Husband	Wife	Name of Communities
1	<input type="checkbox"/>	<input type="checkbox"/>	Water User Group
2	<input type="checkbox"/>	<input type="checkbox"/>	Drinking water user community (Rural water supply)
3	<input type="checkbox"/>	<input type="checkbox"/>	State credit organization
4	<input type="checkbox"/>	<input type="checkbox"/>	Micro-credit institution
5	<input type="checkbox"/>	<input type="checkbox"/>	Women community
6	<input type="checkbox"/>	<input type="checkbox"/>	Veteran or pension community
7	<input type="checkbox"/>	<input type="checkbox"/>	Religion community.....
8	<input type="checkbox"/>	<input type="checkbox"/>	Other specify.....

D- Living Condition of the Affected Household

D1- Water Source for Consumption

Table 4: Water Source for HH Consumption

#	Dry Season	Wet Season	Water Source	Location	Availability
	<input type="checkbox"/>	<input type="checkbox"/>	Drilling Well	1 <input type="checkbox"/> Near 2 <input type="checkbox"/> Far	1 <input type="checkbox"/> Easy 2 <input type="checkbox"/> Difficult
	<input type="checkbox"/>	<input type="checkbox"/>	Dig well	1 <input type="checkbox"/> Near 2 <input type="checkbox"/> Far	1 <input type="checkbox"/> Easy 2 <input type="checkbox"/> Difficult
	<input type="checkbox"/>	<input type="checkbox"/>	River/stream/pond/lake	1 <input type="checkbox"/> Near 2 <input type="checkbox"/> Far	1 <input type="checkbox"/> Easy 2 <input type="checkbox"/> Difficult
	<input type="checkbox"/>	<input type="checkbox"/>	Spring water	1 <input type="checkbox"/> Near 2 <input type="checkbox"/> Far	1 <input type="checkbox"/> Easy 2 <input type="checkbox"/> Difficult
	<input type="checkbox"/>	<input type="checkbox"/>	Rain water	1 <input type="checkbox"/> Near 2 <input type="checkbox"/> Far	1 <input type="checkbox"/> Easy 2 <input type="checkbox"/> Difficult
	<input type="checkbox"/>	<input type="checkbox"/>	Water supply networks	1 <input type="checkbox"/> Near 2 <input type="checkbox"/> Far	1 <input type="checkbox"/> Easy 2 <input type="checkbox"/> Difficult
	<input type="checkbox"/>	<input type="checkbox"/>	Other.....	1 <input type="checkbox"/> Near 2 <input type="checkbox"/> Far	1 <input type="checkbox"/> Easy 2 <input type="checkbox"/> Difficult

Note: the main water source for household consumption is the water source necessary for household member use everyday. In the column # shall fill ranking number from 1 to 7 (1 important, 2 second.....)

D2- Type of Fuel Consumption for HH Cooking**Table 5: Fuel Source for HH Cooking**

#	Fuel Source	Location		Availability	
	Firewood	1 <input type="checkbox"/> Near	2 <input type="checkbox"/> Far	1 <input type="checkbox"/> Easy	2 <input type="checkbox"/> Difficult
	Charcoal	1 <input type="checkbox"/> Near	2 <input type="checkbox"/> Far	1 <input type="checkbox"/> Easy	2 <input type="checkbox"/> Difficult
	Diesel, Kerosene	1 <input type="checkbox"/> Near	2 <input type="checkbox"/> Far	1 <input type="checkbox"/> Easy	2 <input type="checkbox"/> Difficult
	Gas	1 <input type="checkbox"/> Near	2 <input type="checkbox"/> Far	1 <input type="checkbox"/> Easy	2 <input type="checkbox"/> Difficult
	Electric	1 <input type="checkbox"/> Near	2 <input type="checkbox"/> Far	1 <input type="checkbox"/> Easy	2 <input type="checkbox"/> Difficult
	Other	1 <input type="checkbox"/> Near	2 <input type="checkbox"/> Far	1 <input type="checkbox"/> Easy	2 <input type="checkbox"/> Difficult
	Other	1 <input type="checkbox"/> Near	2 <input type="checkbox"/> Far	1 <input type="checkbox"/> Easy	2 <input type="checkbox"/> Difficult

Note: the main fuel source for household consumption is the source necessary for household member use everyday for cooking. In the column # shall fill raking number from 1 to 7 (1 important, 2 second.....)

D3- Type of Energy Consumption for HH Night Lightning**Table 6: HH Night Lightning Source**

#	Fuel Source	Location		Availability	
	Candle/ Petrol lamp	1 <input type="checkbox"/> Near	2 <input type="checkbox"/> Far	1 <input type="checkbox"/> Easy	2 <input type="checkbox"/> Difficult
	Battery	1 <input type="checkbox"/> Near	2 <input type="checkbox"/> Far	1 <input type="checkbox"/> Easy	2 <input type="checkbox"/> Difficult
	Engine generator	1 <input type="checkbox"/> Near	2 <input type="checkbox"/> Far	1 <input type="checkbox"/> Easy	2 <input type="checkbox"/> Difficult
	Electric power supply line	1 <input type="checkbox"/> Near	2 <input type="checkbox"/> Far	1 <input type="checkbox"/> Easy	2 <input type="checkbox"/> Difficult
	Solar energy	1 <input type="checkbox"/> Near	2 <input type="checkbox"/> Far	1 <input type="checkbox"/> Easy	2 <input type="checkbox"/> Difficult
	Other	1 <input type="checkbox"/> Near	2 <input type="checkbox"/> Far	1 <input type="checkbox"/> Easy	2 <input type="checkbox"/> Difficult

Note: the main energy source for household consumption is the source necessary for household member use everyday for night lightning. In the column # shall fill raking number from 1 to 7 (1 important, 2 second.....)

D4- Supported HH Facilities for Living Condition**Table 7: HH Facilities for supported living condition**

#	Supported Facility	No.	#	Supported Facility	No.
1	Radio		11	Oxcart, 1 <input type="checkbox"/> Old 2 <input type="checkbox"/> New	
2	Tape or CD		12	Rice picking machine	
3	TV		13	Water pump	
4	Tract		14	Engine generator	
5	Car		15	Battery	
6	Tractor		16	Hand phone	
7	Mini-tractor		17	Desk phone	
8	Motorbike		18	Mosquitoes net	
9	Bicycle, 1 <input type="checkbox"/> Old 2 <input type="checkbox"/> New		19	Mattress	
10	Rice harvesting machine		20	Mat	

D5- Residential house**Table 8: Type of residential House of the APs**

#	House	House Type	Ownership
1	Thatch or leaf roof & wall with Bamboo/ Raw-wood column, Ground floor or stand on bamboo floor.	1A	1 <input type="checkbox"/> HH 2 <input type="checkbox"/> Renting 3 <input type="checkbox"/> 3 th person 4 <input type="checkbox"/>
2	Thatch or leaf roof & wall with Bamboo/ Raw-wood column, Ground floor with concrete slab.	1B	1 <input type="checkbox"/> HH 2 <input type="checkbox"/> Renting 3 <input type="checkbox"/> 3 th person 4 <input type="checkbox"/>
3	Thatch or leaf roof with wooden wall and column, Ground floor with concrete slab or stand or wooden floor.	1C	1 <input type="checkbox"/> HH 2 <input type="checkbox"/> Renting 3 <input type="checkbox"/> 3 th person 4 <input type="checkbox"/>
4	Steel or plastic or fibro roof with thatch or leaf wall, Raw-wood or wooden column, Ground floor.	2A	1 <input type="checkbox"/> HH 2 <input type="checkbox"/> Renting 3 <input type="checkbox"/> 3 th person 4 <input type="checkbox"/>
5	Steel or plastic or fibro roof with steel or fibro wall, Raw-wood or wooden column, Ground floor or stand on wooden floor.	2B	1 <input type="checkbox"/> HH 2 <input type="checkbox"/> Renting 3 <input type="checkbox"/> 3 th person 4 <input type="checkbox"/>
6	Steel or plastic or fibro roof with wooden wall, Raw-wood or wooden column, Ground floor or stand on wooden floor.	2C	1 <input type="checkbox"/> HH 2 <input type="checkbox"/> Renting 3 <input type="checkbox"/> 3 th person 4 <input type="checkbox"/>
7	Steel or plastic or fibro roof with wooden wall, Wooden column, Ground floor with concrete slab.	2D	1 <input type="checkbox"/> HH 2 <input type="checkbox"/> Renting 3 <input type="checkbox"/> 3 th person 4 <input type="checkbox"/>
8	Steel or plastic or fibro roof with brick or cement wall, Concrete column, Ground floor with concrete slab.	2E	1 <input type="checkbox"/> HH 2 <input type="checkbox"/> Renting 3 <input type="checkbox"/> 3 th person 4 <input type="checkbox"/>
9	Steel or plastic or fibro roof with brick or cement or wooden wall, Concrete or wooden column, more than one story with concrete slab wooden floor.	2F	1 <input type="checkbox"/> HH 2 <input type="checkbox"/> Renting 3 <input type="checkbox"/> 3 th person 4 <input type="checkbox"/>
10	Tile roof with wooden wall, wooden column, and Ground floor stand on wooden floor.	3A	1 <input type="checkbox"/> HH 2 <input type="checkbox"/> Renting 3 <input type="checkbox"/> 3 th person 4 <input type="checkbox"/>
11	Tile roof with brick or cement wall, concrete column, and Ground floor with concrete slab.	3B	1 <input type="checkbox"/> HH 2 <input type="checkbox"/> Renting 3 <input type="checkbox"/> 3 th person 4 <input type="checkbox"/>
12	Tile roof with wooden or concrete wall, wooden or concrete column, wooden or concrete slab more than one story.	3C	1 <input type="checkbox"/> HH 2 <input type="checkbox"/> Renting 3 <input type="checkbox"/> 3 th person 4 <input type="checkbox"/>
13	Tile roof with wooden or concrete wall, wooden or concrete column, wooden or concrete slab more than 2 stories.	3D	1 <input type="checkbox"/> HH 2 <input type="checkbox"/> Renting 3 <input type="checkbox"/> 3 th person 4 <input type="checkbox"/>
14	Concrete roof with brick or concrete wall, concrete column, and ground floor with concrete slab.	4A	1 <input type="checkbox"/> HH 2 <input type="checkbox"/> Renting 3 <input type="checkbox"/> 3 th person 4 <input type="checkbox"/>
15	Concrete roof with brick or concrete wall, concrete column, and ground floor more than one story.	4B	1 <input type="checkbox"/> HH 2 <input type="checkbox"/> Renting 3 <input type="checkbox"/> 3 th person 4 <input type="checkbox"/>

Note: for Thatch or leaf or wooden house, there are 2 types: No floor or stand on wooden floor hereafter Ground Floor.

E- Land Use and Land Ownership

- When did your family start to settle/live here?Do you have land certificate? NO Yes; if Yes which providing institution Issue Date of the land certificate.....(D/M/Y)
- Did you paid for the land use? NO Yes; if Yes how much did you paid?\$US
- Do you have plan for buying additional land? NO Yes; if Yes for what?.....
- Did you sold own land for few year ago? NO Yes; if Yes
 - What Type of Land Use..... Why sell.....
 - Area of the sold land.....Cost\$US
 - Name of Buyer Address.....
- Do you plan for selling own lend? NO Yes; if Yes Why?
- How many HH living on the affected land? 0 1 2 3 4 (HH)

Table 8: Total HH Land

Type of Land Use	Own Land		Land for renting		Total Area (m ²)	Remarks
	(m ²)	Location	(m ²)	Location		
Low land rice field						
Up land rice field						
Chamkar						
Residential land						
Non-cultivated land						
Other.....						
Total						

F- Livestock

Table 10: HH Husbandry

Type of Animal	No. (Productive)	Raising Animal	Type of Animal	No. (Productive)	Raising Animal
Chicken		1 <input type="checkbox"/> Own 2 <input type="checkbox"/> exchange	Pig		1 <input type="checkbox"/> Own 2 <input type="checkbox"/> exchange
Duck		1 <input type="checkbox"/> Own 2 <input type="checkbox"/> exchange	Goat		1 <input type="checkbox"/> Own 2 <input type="checkbox"/> exchange
Duck for egg		1 <input type="checkbox"/> Own 2 <input type="checkbox"/> exchange	Cow/ Ox		1 <input type="checkbox"/> Own 2 <input type="checkbox"/> exchange
Large Duck		1 <input type="checkbox"/> Own 2 <input type="checkbox"/> exchange	Buffalo		1 <input type="checkbox"/> Own 2 <input type="checkbox"/> exchange
Fish		1 <input type="checkbox"/> Own 2 <input type="checkbox"/> exchange	Horse		1 <input type="checkbox"/> Own 2 <input type="checkbox"/> exchange
សរុប					

Note: for exchanged animal, no of productive shall be divided by 2

G- Expenditure and Income of Household

- G1- Expenditure

- Rice	Riel/year	Riel/month
- Food	Riel/year	Riel/month
- Health	Riel/year	Riel/month
- Education	Riel/year	Riel/month
- Clothes	Riel/year	Riel/month
- Phone	Riel/year	Riel/month
- Fuel/electricity	Riel/year	Riel/month
- Trip	Riel/year	Riel/month
- Tax (Moto & Car)	Riel/year	Riel/month
- Wedding/ceremony	Riel/year	Riel/month
- Dept	Riel/year	Riel/month
- Other	Riel/year	Riel/month
Total Expenditure :	Riel/year	Riel/month
Total Expenditure	\$/year	\$/month

- G2-Household Income

- Salary/wages	Riel/year	Riel/month
- Labuor (construction worker, ..)	Riel/year	Riel/month
- Commerce/ business	Riel/year	Riel/month
- Agricultural product (Corn, bean, sesames)	Riel/year	Riel/month
- Animal raising (Cattle, pig, duck, chicken, etc)	Riel/year	Riel/month
- Handicraft (Sawmill, rice mill, ice producing)	Riel/year	Riel/month
- Forestry	Riel/year	Riel/month
- Fishery	Riel/year	Riel/month
- Other (Descrip)	Riel/year	Riel/month
Total Income :	Riel/year	Riel/month
Total Income	\$/year	\$/month

Note: compare income and expenditure. If the income is smaller than expenditure the interviewee must find the methodology to ask her/him again to find out the reality of the household.

Interviewer's signature.

Interviewee's thumb Print

ព្រះរាជាណាចក្រកម្ពុជា

ជាតិ សាសនា ព្រះមហាក្សត្រ

២០១៥/២០១៥

សំនួរស្ទាបស្ទង់ និងអនុវត្តការងារសេដ្ឋកិច្ចសង្គម(បំពោះគ្រួសារ)នៃគម្រោង: Upper Slakou Irrigation System Rehabilitation Project

ក- លេខសម្ភាសន៍ ថ្ងៃខែឆ្នាំសម្ភាសន៍ ថ្ងៃទីខែឆ្នាំ/ម៉ោង

ឈ្មោះអ្នកសម្ភាសន៍.....ឈ្មោះប្រធានអង្កេត

ខ- ទីតាំងសំណង់ និងជីវិតដែលគ្រួសារប៉ះពាល់

ផ្ទះលេខ.....ភូមិ.....ឃុំខ័ណ្ឌ / ស្រុក

ខេត្ត / ក្រុងគឺឡើយម៉ែត្រគិតពីទីរួមខេត្ត ផលប៉ះពាល់លើ.....

គ- ព័ត៌មានទូទៅនៃគ្រួសារ (ករណីមេគ្រួសារអវត្តមាន, ត្រូវសម្ភាសន៍ជាមួយអ្នកនៅផ្ទះ ដែលអាចមានសិទ្ធិឆ្លើយជំនួសមេគ្រួសារបាន)

គ១. ស្ថានភាពរបស់គ្រួសារ :

ឈ្មោះមេគ្រួសារ : អាយុឆ្នាំ , ភេទ : ប្រុស ស្រី , ជនជាតិ :..... , សាសនា:.....

- មុខរបរចេះអាន និងសរសេរ : បាទ ទេ , កាយសម្បទា : ពិការ ចាស់ជរា មេម៉ាយ

- អាស័យដ្ឋានរស់នៅបច្ចុប្បន្នរបស់មេគ្រួសារ

ភូមិ.....ឃុំ.....ស្រុក.....ខេត្ត.....លេខទូរស័ព្ទ.....

- អ្នកឆ្លើយតបសម្ភាសន៍ជាមេគ្រួសារ : មិនមែន មែន ។ បើមិនមែន, តើអ្នកត្រូវជាអ្វីក្នុងគ្រួសារ?.....

តារាង១: សមាជិកគ្រួសារ(យកតាមបណ្តាំគ្រួសារ) (បើមានច្រើនគ្រួសារត្រូវពិពណ៌នាសរុបសមាជិកទាំងអស់នោះ និងបញ្ជាក់អំពីមេគ្រួសារនីមួយៗផង)

ល.រ	ឈ្មោះសមាជិកគ្រួសារ	អាយុ	ភេទ	ពាក់ព័ន្ធ មេគ្រួសារ	កំរិតវប្បធម៌ ថ្នាក់ទី	មុខរបរ និងអាជីព	ការងារបន្ថែមទៀតក្រៅ ពីមុខរបរ និងអាជីពនេះ
១							
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សរុបទាំងអស់ :នាក់

តារាង២ : មុខរបរជាចំបងសំរាប់គ្រួសារនេះ :

ល.រ	មុខរបរ	ចំនួនបុរស	ចំនួនស្ត្រី	សរុប
	កសិករ (ធ្វើស្រែ/ចំការ)			
	ស៊ីឈ្នួល ធ្វើកសិកម្ម (ដក ស្នូង ភ្នំរាស់ ច្រូត)			
	ស៊ីឈ្នួលក្រៅពីកសិកម្ម (រត់ម៉ូតូ រឹម៉ក កម្មករសំណង់)			
	កម្មករ មានប្រាក់ខែ (កាត់ដេរ ចាំដីឱ្យគេ បើកបរ)			
	ជំនួញ (លក់ដូរ ក្រុមហ៊ុន)			
	មន្ត្រីរាជការ (យោធា នគរបាល មេភូមិ មេឃុំ គ្រូបង្រៀន....)			
	ផ្សេងៗ.....			
		សរុប		

សំគាល់: មុខរបរចំបងគឺមុខរបរណាដែលចាំបាច់ខានមិនបាន / មុខរបរដែលមានចំណូលច្រើនជាងគេ ត្រូវបង់លេខតាមលំដាប់ចុះពី ១ ដល់ ៧ (១ ចំបង,២បន្ទាប់, ៣ ញឹកញាប់, ៤ ម្តងក្តាល, ៥.....)ក្នុងតារាងជួរឈរ កន្លែងលេខរៀង ។ ចំនួនមនុស្សគឺចាប់ពីអាយុ ១១ ឆ្នាំ ដល់អាយុ ៦១ ឆ្នាំ

គ២. ការមូលដ្ឋានសេវាសហគមន៍ក្នុងភូមិ ឬឃុំ របស់គ្រួសារ

តារាង៣ : សមាជិកភាពនៃសហគមន៍ /ក្រុម របស់ប្តី និង ប្រពន្ធ

កូដ	ប្តី	ប្រពន្ធ	សមាជិកសហគមន៍ / ក្រុម
១	<input type="checkbox"/>	<input type="checkbox"/>	ក្រុមកសិករប្រើប្រាស់ទឹក
២	<input type="checkbox"/>	<input type="checkbox"/>	ក្រុមអ្នកប្រើប្រាស់ទឹកស្អាត (អណ្តូង)
៣	<input type="checkbox"/>	<input type="checkbox"/>	សមាគមន៍ឥណទានរបស់រដ្ឋ
៤	<input type="checkbox"/>	<input type="checkbox"/>	ក្រុមឥណទានរបស់ស្ថាប័នប៊ីក្រូហិរញ្ញវត្ថុ
៥	<input type="checkbox"/>	<input type="checkbox"/>	សមាគមន៍ស្ត្រី
៦	<input type="checkbox"/>	<input type="checkbox"/>	សមាគមន៍យុទ្ធសាស្ត្រជំនួយសិទ្ធិ ឬពិការ
៧	<input type="checkbox"/>	<input type="checkbox"/>	សមាគមន៍សាសនា.....
៨	<input type="checkbox"/>	<input type="checkbox"/>

ឃ - អំណើលក្នុងខ្លួនសំរាប់របស់គ្រួសារ

ឃ១. ការប្រើប្រាស់ទឹក

តារាង៤ : ប្រភពនៃការប្រើប្រាស់ទឹករបស់គ្រួសារ

ល.រ	រដូវប្រាំង	រដូវវស្សា	ប្រភព	ទីតាំង		ស្ថានភាពយកមកប្រើ	
	<input type="checkbox"/>	<input type="checkbox"/>	អណ្តូងខ្ទង	1 <input type="checkbox"/> ជិត	2 <input type="checkbox"/> ឆ្ងាយ	1 <input type="checkbox"/> ងាយ	2 <input type="checkbox"/> ពិបាក
	<input type="checkbox"/>	<input type="checkbox"/>	អណ្តូងជីក(គ្មានខ្នោះឬ លូ)	1 <input type="checkbox"/> ជិត	2 <input type="checkbox"/> ឆ្ងាយ	1 <input type="checkbox"/> ងាយ	2 <input type="checkbox"/> ពិបាក
	<input type="checkbox"/>	<input type="checkbox"/>	ទន្លេ ស្ទឹង អូរ ត្រពាំង ស្រះ	1 <input type="checkbox"/> ជិត	2 <input type="checkbox"/> ឆ្ងាយ	1 <input type="checkbox"/> ងាយ	2 <input type="checkbox"/> ពិបាក
	<input type="checkbox"/>	<input type="checkbox"/>	ទឹកចេញ	1 <input type="checkbox"/> ជិត	2 <input type="checkbox"/> ឆ្ងាយ	1 <input type="checkbox"/> ងាយ	2 <input type="checkbox"/> ពិបាក
	<input type="checkbox"/>	<input type="checkbox"/>	ទឹកភ្លៀង	1 <input type="checkbox"/> ជិត	2 <input type="checkbox"/> ឆ្ងាយ	1 <input type="checkbox"/> ងាយ	2 <input type="checkbox"/> ពិបាក
	<input type="checkbox"/>	<input type="checkbox"/>	បណ្តាញទឹកស្អាត	1 <input type="checkbox"/> ជិត	2 <input type="checkbox"/> ឆ្ងាយ	1 <input type="checkbox"/> ងាយ	2 <input type="checkbox"/> ពិបាក
	<input type="checkbox"/>	<input type="checkbox"/>	1 <input type="checkbox"/> ជិត	2 <input type="checkbox"/> ឆ្ងាយ	1 <input type="checkbox"/> ងាយ	2 <input type="checkbox"/> ពិបាក

សំគាល់: ប្រភពទឹកចំបងគឺប្រភពណាដែលចាំបាច់ខានមិនបាន ប្រើប្រាស់ជាប្រចាំ ត្រូវបង់លេខពី ១ដល់៧ តាមភាពចាំបាច់ក្នុងតារាងជួរឈរកន្លែងលេខរៀង ។

២២. ការធ្វើប្រាសាទសំរាប់បំបាត់ជំងឺសាបា

តារាង៥ : ប្រភពនៃការប្រើថាមពលសំរាប់បំបាត់ជំងឺសាបា

ល.រ	ប្រភព	ទីតាំង		ស្ថានភាពយកមកប្រើ	
	អុស	1□ជិត	2□ឆ្ងាយ	1□ងាយ	2□ពិបាក
	ធូង	1□ជិត	2□ឆ្ងាយ	1□ងាយ	2□ពិបាក
	ប្រេងឥន្ធនៈ (ប្រេងកាត ម៉ាស៊ូត)	1□ជិត	2□ឆ្ងាយ	1□ងាយ	2□ពិបាក
	ហ្គាស	1□ជិត	2□ឆ្ងាយ	1□ងាយ	2□ពិបាក
	អគ្គិសនី	1□ជិត	2□ឆ្ងាយ	1□ងាយ	2□ពិបាក
	.....	1□ជិត	2□ឆ្ងាយ	1□ងាយ	2□ពិបាក
	.....	1□ជិត	2□ឆ្ងាយ	1□ងាយ	2□ពិបាក

សំគាល់: ប្រភពថាមពលចំបងគឺប្រភពណាដែលចាំបាច់ខានមិនបាន ប្រើប្រាស់ជាប្រចាំ ត្រូវបង់លេខពី ១ដល់៧ តាមភាពចាំបាច់ក្នុងតារាងជួរឈរកន្លែងលេខរៀង

២៣. ការធ្វើប្រាសាទសំរាប់បំបាត់ជំងឺ

តារាង៦ : ប្រភពនៃការប្រើថាមពលសំរាប់បំបាត់ជំងឺ

ល.រ	ប្រភព	ទីតាំង		ស្ថានភាពយកមកប្រើ	
	ទៀន/ចង្កៀង(ប្រេងកាត ម៉ាស៊ូត)	1□ជិត	2□ឆ្ងាយ	1□ងាយ	2□ពិបាក
	អាគុយ	1□ជិត	2□ឆ្ងាយ	1□ងាយ	2□ពិបាក
	ម៉ាស៊ីនភ្លើង	1□ជិត	2□ឆ្ងាយ	1□ងាយ	2□ពិបាក
	បណ្តាញអគ្គិសនី	1□ជិត	2□ឆ្ងាយ	1□ងាយ	2□ពិបាក
	ពន្លឺព្រះអាទិត្យ	1□ជិត	2□ឆ្ងាយ	1□ងាយ	2□ពិបាក
	.....	1□ជិត	2□ឆ្ងាយ	1□ងាយ	2□ពិបាក

សំគាល់: ប្រភពថាមពលចំបងគឺប្រភពណាដែលចាំបាច់ខានមិនបាន ប្រើប្រាស់ជាប្រចាំ ត្រូវបង់លេខពី ១ដល់៧

តាមភាពចាំបាច់ក្នុងតារាងជួរឈរកន្លែងលេខរៀង

២៤. ឧបករណ៍ធ្វើប្រាសាទក្នុងគ្រួសារ

តារាង៧: ការប្រើប្រាស់ឧបករណ៍នានាសំរាប់សំរួលជីវភាពក្នុងគ្រួសារ

ល.រ	ឧបករណ៍	ចំនួន	ល.រ	ឧបករណ៍	ចំនួន
១	ទូរទស្សន៍		១១	រទេះគោ/ក្របី	
២	ម៉ាញ៉េ ឬ CD		១២	ម៉ាស៊ីនបោកស្រូវ	
៣	វិទ្យុ		១៣	ម៉ាស៊ីនបូមទឹក	
៤	រថយន្តដឹកទំនិញ		១៤	ម៉ាស៊ីនភ្លើង	
៥	រថយន្តតូច		១៥	អាគុយ	
៦	ត្រាក់ទ័រ		១៦	ទូរស័ព្ទដៃ	
៧	គោយន្ត		១៧	ទូរស័ព្ទលើតុ	
៨	ម៉ូតូ		១៨	មុង	
៩	កង់		១៩	ពួក	
១០	ម៉ាស៊ីនច្រូតស្រូវ		២០	កន្ទេល	

២៥. ការស្ទង់មតិ

តារាង៨ : ប្រភេទផ្ទះសំបែងរស់នៅសព្វថ្ងៃរបស់គ្រួសារ រូបថត:.....

ល.រ	ប្រភេទផ្ទះសំបែង	ចំណាត់ថ្នាក់	ភាពជាក់មូសិទ្ធិ
១	ដំបូល និង ជញ្ជាំងស្លឹក/ស្បូវ, សរសរឬស្បូវ/កូនឈើ, គ្មានកំរាល/រនាប,ផ្ទាល់ដី	1A	1 <input type="checkbox"/> គ្រួសារ 2 <input type="checkbox"/> ជួលគេ 3 <input type="checkbox"/> របស់គេ 4 <input type="checkbox"/> ...
២	ដំបូល និង ជញ្ជាំងស្លឹក/ស្បូវ, សរសរឬស្បូវ/កូនឈើ, កំរាលសាប, ជាន់ផ្ទាល់ដី	1B	1 <input type="checkbox"/> គ្រួសារ 2 <input type="checkbox"/> ជួលគេ 3 <input type="checkbox"/> របស់គេ 4 <input type="checkbox"/> ...
៣	ដំបូលស្លឹក/ស្បូវ, ជញ្ជាំង, សរសរឬស្បូវ/កូនឈើ, កំរាលសាប, ជាន់ផ្ទាល់ដី	1C	1 <input type="checkbox"/> គ្រួសារ 2 <input type="checkbox"/> ជួលគេ 3 <input type="checkbox"/> របស់គេ 4 <input type="checkbox"/> ...
៤	ដំបូលសង្កសី/ហ្វីប្រ/ប្លាស្ទិក,ជញ្ជាំងស្លឹក/ស្បូវ, សរសរកូនឈើ/ឈើ, គ្មានកំរាល, ជាន់ផ្ទាល់ដី	2A	1 <input type="checkbox"/> គ្រួសារ 2 <input type="checkbox"/> ជួលគេ 3 <input type="checkbox"/> របស់គេ 4 <input type="checkbox"/> ...
៥	ដំបូលសង្កសី/ហ្វីប្រ/ប្លាស្ទិក,ជញ្ជាំងសង្កសី/ហ្វីប្រ, សរសរកូនឈើ/ឈើ, គ្មានកំរាល, ផ្ទាល់ដី	2B	1 <input type="checkbox"/> គ្រួសារ 2 <input type="checkbox"/> ជួលគេ 3 <input type="checkbox"/> របស់គេ 4 <input type="checkbox"/> ...
៦	ដំបូលលោហៈ/ហ្វីប្រ/ប្លាស្ទិក,ជញ្ជាំងឈើ, សរសរកូនឈើ/ឈើ, គ្មានកំរាល, ជាន់ផ្ទាល់ដី	2C	1 <input type="checkbox"/> គ្រួសារ 2 <input type="checkbox"/> ជួលគេ 3 <input type="checkbox"/> របស់គេ 4 <input type="checkbox"/> ...
៧	ដំបូលលោហៈ/ហ្វីប្រ/ប្លាស្ទិក,ជញ្ជាំងឈើ, សរសរឈើ, កំរាលបេតុង, ជាន់ផ្ទាល់ដី	2D	1 <input type="checkbox"/> គ្រួសារ 2 <input type="checkbox"/> ជួលគេ 3 <input type="checkbox"/> របស់គេ 4 <input type="checkbox"/> ...
៨	ដំបូលលោហៈ/ហ្វីប្រ/ប្លាស្ទិក,ជញ្ជាំងឥដ្ឋ, សរសរបេតុង, កំរាលបេតុង, ជាន់ផ្ទាល់ដី	2E	1 <input type="checkbox"/> គ្រួសារ 2 <input type="checkbox"/> ជួលគេ 3 <input type="checkbox"/> របស់គេ 4 <input type="checkbox"/> ...
៩	ដំបូលលោហៈ/ហ្វីប្រ/ប្លាស្ទិក, ជញ្ជាំង សរសរ និង កំរាលឈើ/បេតុង, ច្រើនជាង២ជាន់	2F	1 <input type="checkbox"/> គ្រួសារ 2 <input type="checkbox"/> ជួលគេ 3 <input type="checkbox"/> របស់គេ 4 <input type="checkbox"/> ...
១០	ដំបូលក្បឿង, ជញ្ជាំង សរសរ និង កំរាលឈើ, ជាន់ផ្ទាល់ដី	3A	1 <input type="checkbox"/> គ្រួសារ 2 <input type="checkbox"/> ជួលគេ 3 <input type="checkbox"/> របស់គេ 4 <input type="checkbox"/> ...
១១	ដំបូលក្បឿង, ជញ្ជាំងឥដ្ឋ សរសរ និង កំរាលបេតុង, ជាន់ផ្ទាល់ដី	3B	1 <input type="checkbox"/> គ្រួសារ 2 <input type="checkbox"/> ជួលគេ 3 <input type="checkbox"/> របស់គេ 4 <input type="checkbox"/> ...
១២	ដំបូលក្បឿង, ជញ្ជាំងឈើ/ឥដ្ឋ, សរសរ និងកំរាលឈើ/បេតុង, ច្រើនជាង២ជាន់	3C	1 <input type="checkbox"/> គ្រួសារ 2 <input type="checkbox"/> ជួលគេ 3 <input type="checkbox"/> របស់គេ 4 <input type="checkbox"/> ...
១៣	ដំបូលក្បឿង, ជញ្ជាំងឈើ/ឥដ្ឋ, សរសរ និងកំរាលឈើ/បេតុង, មាន២ជាន់	3D	1 <input type="checkbox"/> គ្រួសារ 2 <input type="checkbox"/> ជួលគេ 3 <input type="checkbox"/> របស់គេ 4 <input type="checkbox"/> ...
១៤	ដំបូលបេតុង, ជញ្ជាំងឥដ្ឋ, សរសរ និងកំរាលបេតុង, ជាន់ផ្ទាល់ដី	4A	1 <input type="checkbox"/> គ្រួសារ 2 <input type="checkbox"/> ជួលគេ 3 <input type="checkbox"/> របស់គេ 4 <input type="checkbox"/> ...
១៥	ដំបូលបេតុង, ជញ្ជាំងឥដ្ឋ, សរសរ និងកំរាលបេតុង, មាន២ជាន់	4B	1 <input type="checkbox"/> គ្រួសារ 2 <input type="checkbox"/> ជួលគេ 3 <input type="checkbox"/> របស់គេ 4 <input type="checkbox"/> ...

សំគាល់: ចំពោះជាន់សំរាប់ផ្ទះ ស្លឹក ឬឈើ មានពីរប្រភេទ គឺកំរាលផ្ទាល់ដី និង កំរាលផុតពីដីដែលមានកល់សរសរ ចាត់ទុកថាជា **ជាន់ផ្ទាល់ដី**

១ - អំពីការប្រើប្រាស់ និងការកាន់កាប់ដី

- ១- តើអ្នកមកកាន់កាប់ដីនេះតាំងពីឆ្នាំណា ?មានការអនុញ្ញាតិដែរឬទេ? គ្មាន មាន បើមាន, តើស្ថាប័នផ្ទះកំណាអនុញ្ញាតិ? តើអ្នកមានប័ណ្ណសំគាល់ការកាន់កាប់ដីនេះដែរឬទេ? គ្មាន មាន បើមាន, នៅថ្ងៃខែឆ្នាំណា.....
- ២- តើអ្នកមានចំណាយប្រាក់លើការប្រើប្រាស់ដីនេះឬទេ? គ្មាន មាន បើមាន, តើចំណាយប៉ុន្មាន?រៀល (គិតជាដុល្លា.....ដុល្លា)
- ៣- តើអ្នកមានគំរោងទិញដីបន្ថែមទៀតឬទេនៅពេលអនាគត ? គ្មាន មាន បើមាន, ទិញដើម្បីធ្វើអ្វី ?
.....
- ៤- តើអ្នកបានលក់ដីដែរឬទេ កាលពី ២-៣ ឆ្នាំមុន ? គ្មាន មាន
- ជាប្រភេទដីអ្វី ? ព្រោះអ្វី ?
- ទំហំដី..... ផ្ទៃប៉ុន្មាន?រៀល. (គិតជាដុល្លា.....)
- ទៅឱ្យនរណា ?រស់នៅទីណា?.....
- ៥- តើអ្នកមានគំរោងលក់ដីដែរឬទេ នាពេលអនាគត ? គ្មាន មាន ព្រោះអ្វី ?
.....
- ៦- តើមានប៉ុន្មានគ្រួសាររស់នៅលើដីឡូត៍នេះ? ០១២៣៤

តារាង ៖ ដឹកយន្តសរុបរបស់គ្រួសារ

ការប្រើប្រាស់ដី	ដីផ្ទាល់ខ្លួន		មានដីសំរាប់ជួល		ផ្ទៃដីសរុប	សំគាល់
	ហ.ត	ទីតាំង	ហ.ត	ទីតាំង		
ដីធ្វើស្រែទំនាប						
ដីធ្វើស្រែទួល						
ដីដាំដំណាំផ្សេងៗ						
ដីភូមិ						
ដី.....						
សរុប						

ច - រំពឹងទុកចំណាយ និងចំណូលរបស់គ្រួសារ

ច១. ប្រាក់ចំណាយ

- ស្រូវ/អង្ករ រៀល/ឆ្នាំ.....រៀល/១ខែ
- ម្ហូបអាហារ រៀល/ឆ្នាំ..... រៀល/១ខែ
- សុខភាព រៀល/ឆ្នាំ..... រៀល/១ខែ
- អប់រំ រៀល/ឆ្នាំ..... រៀល/១ខែ
- សំលៀកបំពាក់ រៀល/ឆ្នាំ..... រៀល/១ខែ
- ទូរស័ព្ទ រៀល/ឆ្នាំ..... រៀល/១ខែ
- ប្រេង/អគ្គិសនី រៀល/ឆ្នាំ..... រៀល/១ខែ
- ការធ្វើដំណើរ..... រៀល/ឆ្នាំ..... រៀល/១ខែ
- ពន្ធផ្សេងៗ(ម៉ូតូ, រថយន្ត) រៀល/ឆ្នាំ..... រៀល/១ខែ
- ពិធីបុណ្យ/អាពាហ៍ពិពាហ៍ រៀល/ឆ្នាំ..... រៀល/១ខែ
- សងបំណុលគេ..... រៀល/ឆ្នាំ..... រៀល/១ខែ
- ផ្សេងៗ រៀល/ឆ្នាំ..... រៀល/១ខែ

ចំណាយសរុបប្រចាំខែ :..... រៀល គិតជាដុល្លា

ចំណាយសរុបប្រចាំឆ្នាំ : រៀល គិតជាដុល្លា

ច២. រំពឹងទុកចំណូលរបស់គ្រួសារ :

- ប្រាក់ខែ ឬប្រាក់បៀវត្ស..... រៀល/ឆ្នាំ..... រៀល/១ខែ
- កម្មករប្រើកំលាំងសុទ្ធសាធ (លីសែង ម៉ូតូឌុប កម្មករសំណង់ ។ល ។) រៀល / ឆ្នាំ..... រៀល/១ខែ
- ធ្វើជំនួញ ឬលក់ដូរ រៀល / ឆ្នាំ..... រៀល/១ខែ
- កសិផល(ស្រូវ ពោត រៀល ក្នុង ១ខែ សណែន ល្ង ។ល ។) រៀល / ឆ្នាំ..... រៀល/១ខែ
- ចិញ្ចឹមសត្វ (គោ ក្របី មាន់ ទា ជ្រូក ពពែ ត្រី ក្រពើ ។ល ។) រៀល / ឆ្នាំ..... រៀល/១ខែ
- សិប្បកម្ម (ម៉ាស៊ីនកិនស្រូវ ទឹកកក បូមទឹក ។ល ។) រៀល / ឆ្នាំ..... រៀល/១ខែ
- អនុផលព្រៃឈើ រៀល / ឆ្នាំ..... រៀល/១ខែ
- នេសាទ រៀល / ឆ្នាំ..... រៀល/១ខែ
- ផ្សេងៗ (ពិពណ៌នា) រៀល / ឆ្នាំ..... រៀល/១ខែ

ចំណូលសរុបប្រចាំខែ :..... រៀលជាដុល្លា រៀល/១ខែ

ចំណូលសរុបប្រចាំឆ្នាំរៀល ជាដុល្លា

ចំនួនស្រូវកម្រិតចំណូល.....

បញ្ជាក់: ត្រូវបូកប្រាក់ចំណូលប្រចាំឆ្នាំនៃក្នុងពេលសម្ភាសន៍ រួចធ្វើការប្រៀបធៀបជាមួយចំណាយ

ចំណូលត្រូវច្រើនជាងចំណាយ ។ បើចំណូលតិចជាង ចំណាយ ត្រូវរកវិធីស្របនៃម

ឬធ្វើការផ្សព្វផ្សាយជាមួយអ្នកតបសម្ភាសន៍នេះឡើងវិញ ។

ហត្ថលេខា និងឈ្មោះអ្នកសម្ភាសន៍

ស្នាមមេដៃស្ត្រី និងឈ្មោះអ្នកតបសម្ភាសន៍

Appendix 2
Results of IOL Survey of Original Plan

MC 33+SC 3U+SC 3D

#	Quarries No.	CH00	Hh Name		Village, Commune Name	Type of Affected House (m ²)			Have Other Land	Total cultivated	Affected Area		No. hh
			Hh Head No	Hh Name		Type 1	Type 2	Type 3			Area	Percentage	
1	002/001	CH0-000-050	4	ចេន ផាន	Thnot Chum	0 Saray	38	35	30	41	45	46	28
2	004/004	CH0-000-100	5	អង្គ ហ៊ុន	Thnot Chum	0 Saray	5000	225	5000	75	0%	0	1%
3	002/006	CH0-000-050	5	កែន ហ៊ុន	Thnot Chum	0 Saray	5000	1200	5000	150	0%	0	2%
4	004/001	CH0-200-250	5	គុយ ហ៊ុន	Thnot Chum	0 Saray	30000	1200	30000	150	0%	0	0%
5	002/012	CH0-150-200	5	ស៊ុយ ហ៊ុន	Thnot Chum	0 Saray	5000	0	5000	100	0%	tenant	0%
6	003/007	CH0-250-300	5	ចាប ស៊ុយ	Thnot Chum	0 Saray	1500	400	1500	100	0%	0	5%
7	002/003	CH0-350-400	5	គាប ស៊ុយ	Thnot Chum	0 Saray	26500	0	26500	150	1%	0	1%
8	004/002	CH0-400-450	5	គុយ ស៊ុយ	Thnot Chum	0 Saray	5000	300	5000	200	0%	0	4%
9	004/002	CH0-450-500	5	គុយ ស៊ុយ	Thnot Chum	0 Saray	18000	2500	18000	250	0%	0	1%
10	003/008	CH0-550-600	5	គុយ ស៊ុយ	Thnot Chum	0 Saray	20000	1500	20000	750	0%	0	3%
11	002/009	CH0-600-650	5	គុយ ស៊ុយ	Thnot Chum	0 Saray	25000	1500	25000	150	0%	0	1%
12	004/001	CH0-650-700	5	គុយ ស៊ុយ	Thnot Chum	0 Saray	10000	2000	10000	200	0%	0	2%
13	003/002	CH0-650-700	5	គុយ ស៊ុយ	Thnot Chum	0 Saray	10000	200	10000	50	1%	0	0%
14	002/002	CH0-700-750	5	គុយ ស៊ុយ	Thnot Chum	0 Saray	5000	750	5000	25	0%	0	0%
15	001/005	CH0-700-750	5	គុយ ស៊ុយ	Thnot Chum	0 Saray	7000	750	7000	75	0%	0	1%
16	001/011	CH0-750-800	5	គុយ ស៊ុយ	Thnot Chum	0 Saray	10000	4000	10000	200	0%	0	1%
17	002/010	CH0-800-850	5	គុយ ស៊ុយ	Thnot Chum	0 Saray	15000	4000	15000	200	0%	0	1%
18	001/006	CH0-800-850	5	គុយ ស៊ុយ	Thnot Chum	0 Saray	16000	1050	18000	75	0%	0	0%
19	002/011	CH0-850-900	5	គុយ ស៊ុយ	Thnot Chum	0 Saray	20000	3000	20000	225	0%	0	1%
20	003/004	CH0-850-900	5	គុយ ស៊ុយ	Thnot Chum	0 Saray	10000	1000	10000	20	0%	0	0%
21	001/009	CH0-900-950	5	គុយ ស៊ុយ	Thnot Chum	0 Saray	60000	800	60000	20	0%	0	0%
22	001/008	CH0-900-950	5	គុយ ស៊ុយ	Thnot Chum	0 Saray	4500	485	4500	135	0%	0	3%
23	002/004	CH0-950-000	5	គុយ ស៊ុយ	Thnot Chum	0 Saray	15000	500	15000	250	0%	0	2%
24	001/007	CH0-950-000	5	គុយ ស៊ុយ	Thnot Chum	0 Saray	0	1250	0	100	0%	0	8%
25	008/001	CH1-050-100	5	គុយ ស៊ុយ	Thnot Chum	0 Saray	6000	2800	6000	200	0%	0	2%
26	003/008	CH1-050-100	5	គុយ ស៊ុយ	Thnot Chum	0 Saray	8000	4200	8000	0	0%	0	0%
27	001/003	CH1-100-150	5	គុយ ស៊ុយ	Thnot Chum	0 Saray	18000	500	18000	0	0%	0	0%
28	001/004	CH1-150-200	5	គុយ ស៊ុយ	Thnot Chum	0 Saray	10000	0	10000	280	3%	0	3%
29	003/003	CH1-150-200	5	គុយ ស៊ុយ	Thnot Chum	0 Saray	5000	950	5000	95	0%	0	2%
					Thnot Chum	0 Saray	5000	1100	5000	150	0%	0	2%

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#	Quarries No.	CH 00.	Hh Head Name		Village, Communito Name			Type of Affected House (m ²)			Have Other Land		Total cultivated	Affected Area		loss culti. lands>10%	No. h/h losses total	
			Hh Head kh	Hh Name	Village Name	Commune Name	Type 1	Type 2	Type 3	Rice Land m ²	Residen m ²	Rice Land		Residential	loss cultivate			total land loss = 100%
1	2	3	4	5	6	7	38	39	40	41	42	43	44	45	46	47	48	49
30	002/008	CH1+200-250	ជ្រំ ឌុន	Thou Chhon	Thnot Chum	O Saray				30500	1520	30500		100	0%	0	0%	0
31	002/007	CH1+200-250	ស៊ីម ហ៊ុក លី	Sem Borali	Thnot Chum	O Saray				5000	0	5000	50		1%	0	1%	0
32	003/001	CH1+200-250	ហ៊ុន ហ៊ុន	Ouch Ho	Thnot Chum	O Saray				5000	1380	5000		230	0%	0	4%	0
33	006/002	CH1+250-300	អ៊ឹម សុន	Em Soru	Thnot Chum	O Saray				15000	800	15000			0%	0	0%	0
34	004/005	CH1+250-300	លុប ឌុន	Nop Noun	Thnot Chum	O Saray				20800	400	20800		100	0%	0	0%	0
35	001/010	CH1+300-350	ហ៊ុន សុន	Hun Savorn	Thnot Chum	O Saray				8000	4200	8000			0%	0	0%	0
36	002/005	CH1+350-400	ម៉ុ ឌុន	Mom Hieng	Thnot Chum	O Saray				10000	1200	10000		150	0%	0	1%	0
37	004/003	CH1+350-450	ជ្រំ ឌុន	Thou Chhaim	Thnot Chum	O Saray				10000	1200	10000	500		5%	0	4%	0
38	003/006	CH1+400-450	ស៊ីម សុន	Sum Sohen	Thnot Chum	O Saray				5000	600	5000	300		6%	0	5%	0
39	003/005	CH1+450-550	ភីន ហ៊ុន	Phin Boran	Thnot Chum	O Saray				5000	2400	5000	200		4%	0	3%	0
40	001/002	CH1+500-550	ភី សុន	Ky Saroeun	Thnot Chum	O Saray				3000	0	3000	65		2%	0	2%	0
41	001/001	CH1+300-350	ជ្រំ លី	Chiv Ly	Thnot Chum	O Saray				400	600	400		65	0%	0	7%	0
42	004/006	CH0+100-150	ហ៊ុន ឌុន	Huy Rin	Thnot Chum	O Saray				10000	7500	10000	750		8%	0	4%	0
43	002/001	CH1+650-700	ផែន សុន	Ngeth Say	Trapaing Krassang	O Saray				2800	3850	2800	475		17%	1	7%	0
44	002/013	CH1+750-850	ស៊ី ហ៊ុន	Sam Hoen	Trapaing Krassang	O Saray				25000	2500	25000	380		2%	0	1%	0
45	004/007	CH1+650-950	ប្រាក់ សុន	Prak Lorn	Trapaing Krassang	O Saray				10000	2000	10000	315		3%	0	3%	0
46	002/018	CH1+950-CH2	ពៅ សុន	Kao Nat	Trapaing Krassang	O Saray				10000	450	10000	140		1%	0	1%	0
47	002/014	CH1+950-CH2	យន់ ហ៊ុន	Yuos Chhoeun	Trapaing Krassang	O Saray				10000	1500	10000	155		2%	0	1%	0
48	002/019	CH2+650-150	ស៊ី ហ៊ុន	Sam Hoen	Trapaing Krassang	O Saray				25000	2500	25000	840		3%	0	3%	0
49	002/015	CH2+150-200	ហ៊ុន ឌុន	Hem Channouol	Trapaing Krassang	O Saray				20000	4000	20000	175		1%	0	1%	0
50	002/016	CH2+200-250	អ៊ឹម ឌុន	Em Khann	Trapaing Krassang	O Saray				10000	750	10000	260		3%	0	2%	0
51	004/008	CH2+250-300	ហ៊ុន សុន	Hun Sarou	Trapaing Krassang	O Saray				20000	1400	20000	250		1%	0	1%	0
52	003/004	CH2+300-350	ហ៊ុន សុន	Hem Sambo	Trapaing Krassang	O Saray				10000	2000	10000	760		8%	0	6%	0
53	004/009	CH2+350-400	ហ៊ុន សុន	Hoen Saveth	Trapaing Krassang	O Saray				2500	2100	2500	210		8%	0	5%	0
54	004/010	CH2+400-450	ឌីន ហ៊ុន	Miech La	Trapaing Krassang	O Saray				16000	875	16000	400	150	0%	0	1%	0
55	004/011	CH2+450-550	ឌីន ហ៊ុន	Ork Chhoeun	Trapaing Krassang	O Saray				15000	2500	15000			3%	0	2%	0
56	002/018	CH2+550-600	អ៊ឹម ឌុន	Y Horn	Trapaing Krassang	O Saray				15000	1600	15000		315	0%	0	2%	0
57	002/017	CH2+600-700	ឌីន ឌុន	Chh Chorn	Trapaing Krassang	O Saray				12000	300	12000	330		3%	0	3%	0
58	003/003	CH2+650-700	ហ៊ុន ហ៊ុន	Bun Khoeun	Trapaing Krassang	O Saray				10100	2750	10100		110	0%	0	1%	0

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#	Quarries No.	Cr100-CH	WH Head Name	Village, Commune Name	Type of Affected House (m ²)			Have Other Land		Total cultivated	Affected Area		No. h/h loose total			
					Type	Type	Type	Rice Land	Other Land		Rice Land	Other Land				
59	004/011	CH-700-750	វិទ្យា ធីតា	Bun Sokunthea	39	39	78	5000	100	43	74	165	0	0	3%	0
60	002/012	CH-700-750	ធីតា វិទ្យា	Peak Bang Aornng Khangheung				7000	345		240		0	0	3%	0
61	003/015	CH-750-800	ឃុំស្រីរៀង	Yuos Chhoeun				10000	1500			250	0	0	2%	0
62	003/016	CH-750-800	វិទ្យា ធីតា	Muth Hai				2850	1300		350		12%	1	6%	0
63	003/014	CH-850-900	អូរសាវា	Um Sarath				5000	2000		45		1%	0	1%	0
64	020/19	CH-800-850	ឃុំស្រីរៀង	Ley Saran				5567	1080		120		2%	0	2%	0
65	001/007	CH-900-950	នាង សំរោង	NAK Sam Arh				15000	500		95		1%	0	1%	0
66	002/010	CH-850-CH-900	ឃុំស្រីរៀង	Ley Saran				10000	1820			260	0%	0	2%	0
67	002/011	CH-850-CH-900	ស្រី ធីតា	Suon Penh				1480	750		185		13%	1	6%	0
68	003/013	CH-900-950	ស្រី ធីតា	Por Thim				1100	500		105		10%	0	7%	0
69	003/007	CH-950-100	ស្រី ធីតា	Em Him				7400	875		300		4%	0	4%	0
70	002/003	CH-100-150	ស្រី ធីតា	Pen Than				6000	1250		315		5%	0	4%	0
71	003/012	CH-150-250	ស្រី ធីតា	Rong Dy				8100	992		630		8%	0	7%	0
72	001/006	CH-250-350	ស្រី ធីតា	Ngn Sophoa				4000	2500		375		9%	0	8%	0
73	003/011	CH-350-400	ស្រី ធីតា	Orm Moeun				5882	450		315		5%	0	5%	0
74	003/010	CH-400-450	ស្រី ធីតា	Men Khan				16600	600		160		1%	0	1%	0
75	003/009	CH-450-550	ស្រី ធីតា	Suon Ban				8000	3000		150		2%	0	3%	0
76	001/005	CH-550-600	ស្រី ធីតា	Sok Moeun				15000	250		155		1%	0	1%	0
77	003/008	CH-550-600	ស្រី ធីតា	Sum Khan				5385	150		275		5%	0	5%	0
78	001/004	CH-600-650	ស្រី ធីតា	Sok Rin				5000	200		215		4%	0	4%	0
79	003/006	CH-650-700	ស្រី ធីតា	Chhem Vuth				6000	1500			150	0%	0	2%	0
80	003/005	CH-700-750	ស្រី ធីតា	Em Leng				5000	870			145	0%	0	2%	0
81	003/004	CH-750-850	ស្រី ធីតា	Ouch Thol				8150	56		450		6%	0	5%	0
82	001/003	CH-850-900	ស្រី ធីតា	Phan Chanthol				8000	2000		250		3%	0	3%	0
83	002/007	CH-900-950	ស្រី ធីតា	Hun Lon				5000	2500		105		2%	0	1%	0
84	002/006	CH-950-1000	ស្រី ធីតា	Sao Sarom				5000	2750		275		6%	0	4%	0
85	003/003	CH-950-1000	ស្រី ធីតា	Ngn Kheida				7000	1000			250	0%	0	3%	0
86	002/008	CH-1050-100	ស្រី ធីតា	Sao Sarom				10000	500		175		2%	0	2%	0
87	002/005	CH-1100-150	ស្រី ធីតា	Teang Png				7000	900		90		1%	0	1%	0

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#	Counaires No.	Ch. ID.	Hh Head Name		Village Name	Commune Name	Type of Affected House (m ²)			Have Other Land		Total cultivated	Affected Area		No. h/ha loss total		
			Hh Head Kh	Hh Head Sv			Type 1	Type 2	Type 3	Area (m ²)	Position (m)		AM/1000 Land	AM/1000 Area		Area Cultivated	Area Loss
88	001/002	CH-100-150	ប៊ែន សុវណនារ៉ា	ប៊ែន សុវណនារ៉ា	Peak Bang Aomg	Trapsang Thum Khangchaur	30	30	40	4000	300	4000	4.5	100	0	2%	0
89	002/004	CH-100-150	ធួប សារ៉េត	ធួប សារ៉េត	Peak Bang Aomg	Trapsang Thum Khangchaur	70	70	10000	10000	720	10000	180	120	0	3%	0
90	001/001	CH-150-200	ម៉ម ធួក	ម៉ម ធួក	Peak Bang Aomg	Trapsang Thum Khangchaur	680	680	7000	7000	680	7000	85	85	0	1%	0
91	003/017	CH-200-250	ក្រុង សុខស៊ី	ក្រុង សុខស៊ី	Peak Bang Aomg	Trapsang Thum Khangchaur	920	920	2000	2000	920	2000	230	230	0	6%	0
92	003/002	CH-200-250	កាន់ ប៊ុន	កាន់ ប៊ុន	Peak Bang Aomg	Trapsang Thum Khangchaur	500	500	3000	3000	500	3000	135	135	0	4%	0
93	002/002	CH-250-300	ស្រី តេក	ស្រី តេក	Peak Bang Aomg	Trapsang Thum Khangchaur	1250	1250	500	500	1250	500	125	125	1	7%	0
94	003/001	CH-300-350	មេសា កោ	មេសា កោ	Peak Bang Aomg	Trapsang Thum Khangchaur	9000	9000	1000	1000	9000	1000	175	175	0	6%	0
95	002/001	CH-350-550	តេប ម៉ា	តេប ម៉ា	Peak Bang Aomg	Trapsang Thum Khangchaur	10000	10000	800	800	10000	10000	1000	1000	FALSE	9%	0
96	002/001	CH-550-750	កុង ណេត	កុង ណេត	Ang Trav	Trapsang Thum Khangchaur	6800	6800	260	260	6800	6800	235	260	0	7%	0
97	003/001	CH-750-800	ម៉េយ ណេត	ម៉េយ ណេត	Ang Trav	Trapsang Thum Khangchaur	3700	3700	200	200	3700	3700	185	185	0	5%	0
98	003/002	CH-750-800	ស្វែង ណាង	ស្វែង ណាង	Ang Trav	Trapsang Thum Khangchaur	7500	7500	870	870	7500	7500	75	145	0	3%	0
99	001/001	CH-800-CH-00	ប៊ុន តឿ	ប៊ុន តឿ	Ang Trav	Trapsang Thum Khangchaur	7000	7000	750	750	7000	7000	725	725	1	9%	0
100	001/002	CH-800-650	ម៉ែ ឆាប	ម៉ែ ឆាប	Ang Trav	Trapsang Thum Khangchaur	8000	8000	300	300	8000	8000	355	355	0	4%	0
101	002/002	CH-850-100	សុក ធួន	សុក ធួន	Ang Trav	Trapsang Thum Khangchaur	2000	2000	300	300	2000	2000	185	185	0	6%	0
102	003/003	CH-100-250	ធួន ធួន	ធួន ធួន	Ang Trav	Trapsang Thum Khangchaur	15000	15000	460	460	15000	15000	460	460	0	3%	0
103	002/003	CH-250-300	ធួន ធួន	ធួន ធួន	Ang Trav	Trapsang Thum Khangchaur	2500	2500	250	250	2500	2500	200	200	0	7%	0
104	002/004	CH-850-900	ធួន ធួន	ធួន ធួន	Ang Trav	Trapsang Thum Khangchaur	17000	17000	378	378	17000	17000	378	250	0	3%	0
105	003/004	CH-900-950	ហាង ធួន	ហាង ធួន	Ang Trav	Trapsang Thum Khangchaur	10000	10000	250	250	10000	10000	200	200	0	2%	0
106	001/003	CH-950-CH-00	ផាត ស៊ីន	ផាត ស៊ីន	Ang Trav	Trapsang Thum Khangchaur	5000	5000	285	285	5000	5000	95	95	0	2%	0
107	001/004	CH-950-650	ម៉ាម ធួន	ម៉ាម ធួន	Ang Trav	Trapsang Thum Khangchaur	30000	30000	660	660	30000	30000	370	370	0	1%	0
108	001/005	CH-950-100	ធួន ធួន	ធួន ធួន	Ang Trav	Trapsang Thum Khangchaur	17000	17000	2500	2500	17000	17000	150	150	0	1%	0
109	001/006	CH-100-150	ស្រី ធួន	ស្រី ធួន	Ang Trav	Trapsang Thum Khangchaur	10000	10000	700	700	10000	10000	100	100	0	1%	0
110	003/005	CH-100-150	ត្រី ធួន	ត្រី ធួន	Ang Trav	Trapsang Thum Khangchaur	3500	3500	900	900	3500	3500	150	150	0	3%	0
111	001/001	CH-150-200	ធួន ធួន	ធួន ធួន	Prey Kvav	Trapsang Thum Khangchaur	4000	4000	1200	1200	4000	4000	195	195	0	4%	0
112	003/001	CH-150-200	ស្រី ធួន	ស្រី ធួន	Prey Kvav	Trapsang Thum Khangchaur	7000	7000	1000	1000	7000	7000	165	165	0	2%	0
113	001/002	CH-200-250	ធួន ធួន	ធួន ធួន	Prey Kvav	Trapsang Thum Khangchaur	3000	3000	1600	1600	3000	3000	230	230	0	5%	0
114	001/003	CH-250-300	ត្រី ធួន	ត្រី ធួន	Prey Kvav	Trapsang Thum Khangchaur	5000	5000	750	750	5000	5000	185	185	0	3%	0
115	004/001	CH-300-350	ត្រី ធួន	ត្រី ធួន	Prey Kvav	Trapsang Thum Khangchaur	10000	10000	1000	1000	10000	10000	175	175	0	2%	0
116	003/002	CH-350-400	ហ៊ុន សារុន	ហ៊ុន សារុន	Prey Kvav	Trapsang Thum Khangchaur	10000	10000	1200	1200	10000	10000	160	160	0	2%	0

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#	Quarries No.	Ch.O.D.	Hh Head Name		Village, Commune Name	Type of Affected House (m ²)			Havo Other Land		Total cultivated	Rice		Loss cultivated Land 10%	Loss culti. Land 10%	No. h/ loss total
			MS Head B	Hh Name		Type 1	Type 2	Type 3	Rice Land (m ²)	Other Land (m ²)		AF Rice Land	Restorand			
117	004/002	CH6-400-450	វ៉ែន វ៉ាន់	Ven Vanny	Prey Kvay Khangchoung	30	39	40	6000	500	6000	185	3%	0	3%	0
118	002/001	CH6-400-450	ផ្កិត ស៊ីវុល	Pech Sovasam	Prey Kvay Khangchoung				8400	600	8400	105	1%	0	1%	0
119	003/003	CH6-450-500	លៀង ឌុន	Leng Khon	Prey Kvay Khangchoung				10000	100	10000	125	1%	0	1%	0
120	003/004	CH6-450-500	ស៊ែន អ៊ែន	Pen Eng	Prey Kvay Khangchoung				5000	1000	5000	100	2%	0	2%	0
121	002/002	CH6-500-550	ប៉ែន ឌុន	Pos Nih	Prey Kvay Khangchoung				10000	1000	10000	120	1%	0	1%	0
122	003/005	CH6-550-600	គាំ វ៉ែន	Korm Vorn	Prey Kvay Khangchoung				30000	380	30000	380	0%	0	1%	0
123	003/006	CH6-650-750	ប៉ែន ឌុន	Pos Nih	Prey Kvay Khangchoung				10000	1000	10000	510	5%	0	5%	0
124	002/003	CH6-750-850	ប្រាំ អ៊ែន	Phum Phoeap	Prey Kvay Khangchoung				5000	1400	5000	285	6%	0	5%	0
125	002/004	CH6-800-850	ឌុន វ៉ែន	Duch Vann	Prey Kvay Khangchoung				8000	355	8000	255	3%	0	3%	0
126	002/005	CH6-850-950	ឌុន វ៉ែន	Duong Rein	Prey Kvay Khangchoung				15000	350	15000	100	1%	0	2%	0
127	002/006	CH6-950-CH7	ស៊ែន អ៊ែន	Sem Oeun	Prey Kvay Khangchoung				8000	355	8000	225	3%	0	2%	0
128	003/001	CH6-950-CH7	ឌុន អ៊ែន អ៊ែន	Ngoun Sokhea	Bra Keap Khangchoung				8000	480	8000	280	3%	0	3%	0
129	003/002	CH7-000-050	ប៊ុន អ៊ែន	Ou Sophea	Prey Kvay Khangchoung				5000	300	5000	135	3%	0	3%	0
130	003/003	CH7-050-100	ឌុន អ៊ែន	Ream Rattih	Bra Keap Khangchoung				10000	1000	10000	150	2%	0	1%	0
131	003/004	CH7-100-150	អ៊ែន អ៊ែន	Ath Lai	Bra Keap Khangchoung				31520	2000	31520	435	1%	0	1%	0
132	003/005	CH7-150-250	ចាន់ អ៊ែន អ៊ែន	Chan Eangsun	Bra Keap Khangchoung				5480	400	5480	310	6%	0	5%	0
133	003/006	CH7-250-300	អ៊ែន អ៊ែន	Ath Lai	Bra Keap Khangchoung				31520	2000	31520	190	1%	0	1%	0
134	003/007	CH7-300-350	ស៊ែន អ៊ែន	Ly Noeun	Bra Keap Khangchoung				3450	400	3450	345	10%	FALSE	9%	0
135	003/008	CH7-350-400	ស៊ែន អ៊ែន	Pen Ham	Bra Keap Khangchoung				1945	600	1945	95	5%	0	4%	0
136	003/009	CH7-400-500	យួន ប៊ុន អ៊ែន	Yoon Bunarath	Bra Keap Khangchoung				2000	2810	2000	435	0%	0	9%	0
137	003/010	CH7-500-600	ឌុន អ៊ែន	Nou Buntha	Bra Keap Khangchoung				10000	100	10000	450	5%	0	5%	0
138	003/011	CH7-600-650	ឌុន អ៊ែន	Ou Vanna	Bra Keap Khangchoung				5000	600	5000	200	4%	0	4%	0
139	002/001	CH7-650-700	ឌុន អ៊ែន	Tob Nien	Bra Keap Khangchoung				3198	650	3198	155	5%	0	4%	0
140	002/002	CH7-650-700	ស៊ែន អ៊ែន	Sao Vrak	Bra Keap Khangchoung				8000	0	8000	185	0%	0	2%	0
141	001/001	CH6-100	ឌុន អ៊ែន	Peang Tuon	Thnot Chum O Sary				5000	820	5000	60	0%	0	1%	0
142	001/002	CH6-150-250	ឌុន អ៊ែន	Ouch Ran	Thnot Chum O Sary				7000	1000	7000	195	3%	0	2%	0
143	002/001	CH6-000-100	ឌុន អ៊ែន	Nop Vocun	Thnot Chum O Sary				8000	800	8000	45	0%	0	1%	0
144	002/002	CH6-100-150	ឌុន អ៊ែន	Peang Hoesun	Thnot Chum O Sary				5000	1000	5000	75	0%	0	1%	0
145	003/001	CH6-050	អ៊ែន អ៊ែន	Phoeuk La	Thnot Chum O Sary	21			5000	1200	5000	95	0%	0	2%	0

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#	Our name No.	Ch.100	Hh Head Name		Village, Commune Name	Type of Affected House (m ²)			Have Other Land		Total cultivated	M. Rice Land		Less cultivated	Less cultivated Land-10%	Less cultivated Land-10%	No. Hh lease total
			Khmer	English		Type 1	Type 2	Type 3	Rice	Other		M. Rice Land	Other				
146	003/002	CH-250-300	សំរោង ឧស	Sorn Khan	Thnot Chum	O Sarey	30		7000	2500	7000	41	45	0%	0	2%	0
147	004/001	CH-400-650	ព្រំ សំរោង	Keo Nang	Thnot Chum	O Sarey			10000	1517	10000			0%	0	2%	0
148	001/003	CH-500-550	សំរោង ព្រំ	Chhem Teary	Trapaing Kraasng	O Sarey			3000	240	3000			0%	0	1%	0
149	001/004	CH-750-800	សំរោង ព្រំ	Ngath Rean	Trapaing Kraasng	O Sarey			5000	0	5000	45		1%	0	1%	0
150	001/005	CH-800-850	សំរោង ព្រំ	Sem Uon	Trapaing Kraasng	O Sarey			5500	600	5500			0%	0	1%	0
151	001/006	CH-800-950	សំរោង ព្រំ	El Dany	Trapaing Kraasng	O Sarey			5000	1500	5000			0%	0	1%	0
152	001/007	CH-950-CH1	សំរោង ព្រំ	Sok Sarom	Trapaing Kraasng	O Sarey			4000	2000	4000			0%	0	1%	0
153	001/008	CH1-000-050	សំរោង ព្រំ	Mom Thol	Trapaing Kraasng	O Sarey			10000	315	10000			0%	0	0%	0
154	001/009	CH1-050-100	សំរោង ព្រំ	Men Sovannara	Trapaing Kraasng	O Sarey	34		0	275	0					12%	0
155	001/010	CH1-100-150	សំរោង ព្រំ	Mom Sokhan	Trapaing Kraasng	O Sarey		38	1000	600	1000			0%	0	4%	0
156	001/011	CH1-150-200	សំរោង ព្រំ	Prak Mom	Trapaing Kraasng	O Sarey			10000	400	10000			0%	0	0%	0
157	001/012	CH1-200-250	សំរោង ព្រំ	Nhong Sophy	Trapaing Kraasng	O Sarey		50	10000	750	10000			0%	0	0%	0
158	001/013	CH1-250-300	សំរោង ព្រំ	Mom Nevom	Trapaing Kraasng	O Sarey			5000	600	5000			0%	0	1%	0
159	002/003	CH-450-500	សំរោង ព្រំ	Neang Chantha	Trapaing Kraasng	O Sarey	40.5		10000	1000	10000			0%	0	1%	0
160	002/004	CH-550-600	សំរោង ព្រំ	Chhem Chantha	Trapaing Kraasng	O Sarey			20000	625	20000	75		0%	0	0%	0
161	002/005	CH-800-950	សំរោង ព្រំ	Em Sim	Trapaing Kraasng	O Sarey			7000	1000	7000			0%	0	1%	0
162	002/006	CH-950-CH1	សំរោង ព្រំ	Tul Din	Trapaing Kraasng	O Sarey			10000	600	10000			0%	0	0%	0
163	002/007	CH1-050	សំរោង ព្រំ	Yem Yen	Trapaing Kraasng	O Sarey			10000	2500	10000	60		1%	0	0%	0
164	002/008	CH1-050-100	សំរោង ព្រំ	Sum Sam Hem	Trapaing Kraasng	O Sarey			5000	600	5000	45		1%	0	1%	0
165	002/009	CH1-100-150	សំរោង ព្រំ	Phum Touch	Trapaing Kraasng	O Sarey		24	10000	600	10000			0%	0	0%	0
166	002/010	CH1-150-200	សំរោង ព្រំ	Ek Nem	Trapaing Kraasng	O Sarey			5000	440	5000			0%	0	1%	0
167	002/010'	CH1-200-250	សំរោង ព្រំ	Meach Charity	Trapaing Kraasng	O Sarey			10000	600	10000			0%	0	1%	0
168	002/011	CH1-250-300	សំរោង ព្រំ	Om Teb	Trapaing Kraasng	O Sarey			7000	1750	7000			0%	0	1%	0
169	002/012	CH1-300-350	សំរោង ព្រំ	Kung Sarosun	Trapaing Kraasng	O Sarey			5000	500	5000			0%	0	1%	0
170	002/013	CH1-350-400	សំរោង ព្រំ	Pen Socheat	Trapaing Kraasng	O Sarey			0	250	0					12%	0
171	002/014	CH1-400-450	សំរោង ព្រំ	Or Rien	Trapaing Kraasng	O Sarey			7000	220	7000			0%	0	0%	0
172	002/015	CH1-450-480	សំរោង ព្រំ	Chuop No	Trapaing Kraasng	O Sarey			10000	280	10000			0%	0	0%	0
173	002/016	CH1-480-500	សំរោង ព្រំ	In Neath	Trapaing Kraasng	O Sarey			15000	1000	15000			0%	0	0%	0
174	002/017	CH1-500-510	សំរោង ព្រំ	Mom Nevy	Trapaing Kraasng	O Sarey			15000	1500	15000			0%	0	1%	0

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#	Quarries No.	CH-00-	Hh Head kh	Hh Head Name	Village Name	Commune Name	Type of Affected House (m ²)			Have Other Land		Total cultivated	Affected Area		loss culti. land>10%	No. hth losse total		
							Type 1	Type 2	Type 3	Rice Land m ²	Residen m ²		Aff. Rice Land	Residential				
1	2	3	4	5	6	7	38	39	40	41	42	43	44	45	46	47	48	49
175	002/018	CH-000-350	ព្រែក លន	Prak Lorn	Trapaing Krasaing	O Saray				10000	2000	10000			0%	0	2%	0
176	002/019	CH-030-450	គោត ណេ	Keat Nav	Trapaing Krasaing	O Saray				10000	660	10000			0%	0	0%	0
177	003/003	CH-040-500	លីម ព្រីធារេត	Lim Pichdareth	Trapaing Krasaing	O Saray				5000	450	5000			0%	0	1%	0
178	003/004	CH-050-550	អែម ទូច	Em Touch	Trapaing Krasaing	O Saray				5000	2500	5000	150		3%	0	2%	0
179	003/005	CH-080-900	តៅ សារ៉ាត	Tao Sarath	Trapaing Krasaing	O Saray				5000	750	5000			0%	0	1%	0
180	003/006	CH-090-950	កោ នាត	Kao Nat	Trapaing Krasaing	O Saray				5000	750	5000			0%	0	1%	0
181	003/007	CH-060-CH1	សុំណ ច័ន	Sum Ngooun	Trapaing Krasaing	O Saray				10000	2500	10000			0%	0	1%	0
182	003/008	CH-000-650	ផុន ម៉េង	Phun Mang	Trapaing Krasaing	O Saray				5000	500	5000			0%	0	1%	0
183	003/009	CH-050-100	ផែន ត្បុក	Ngeith Boeuk	Trapaing Krasaing	O Saray	32			5000	1000	5000			0%	0	1%	0
184	003/011	CH-100-150	អំ តុល	Am Tol	Trapaing Krasaing	O Saray	38			4000	150	4000			0%	0	0%	0
185	003/012	CH-150-200	អ៊ុក ឡេង	Ouk Leng	Trapaing Krasaing	O Saray				10000	4000	10000			0%	0	1%	0
186	003/013	CH-200-250	គោត សុំន	Keat Seun	Trapaing Krasaing	O Saray	47 25			10000	935	10000			0%	0	0%	0
187	003/014	CH-250-300	ម៉ុម តុល	Mom Tol	Trapaing Krasaing	O Saray	42			7000	2400	7000			0%	0	1%	0
188	004/002	CH-000-650	វ៉ាត ឡា	Vath La	Trapaing Krasaing	O Saray	128			7000	160	7000			0%	0	0%	0
189	004/003	CH-050-700	ខ្វែក ច័ន	Ok Chhoeun	Trapaing Krasaing	O Saray				10000	1200	10000			0%	0	1%	0
190	002/001	CH-00-CH-100	ម៉ុត ធីន	Mot Chantha	Pey Talay	Trapaing Thum Khangchaur					2450	0		410			17%	0
191	002/013	CH-100-CH-150	ធីន ធីន	Ek Chhem	Pey Talay	Trapaing Thum Khangchaur				5000		5000	190		4%	0	4%	0
192	003/007	CH-150-CH-150	ព្រី ធីន	Pich Pon	Pey Talay	Trapaing Thum Khangchaur				3000	900	3000			0%	0	4%	0
193	003/006	CH-150-CH-200	រ៉ាល ច័ន	Real Bunareth	Pey Talay	Trapaing Thum Khangchaur				4000		4000	210		5%	0	5%	0
194	001/001	CH-200-CH-250	ច័ន ច័ន	Chhem Chantha	Pey Talay	Trapaing Thum Khangchaur					800	0		20		0	3%	0
195	001/004	CH-200-CH-250	រ៉ាល ធីន	Real Soren	Pey Talay	Trapaing Thum Khangchaur				800		800	140		18%	1	18%	0
196	003/013	CH-250-CH-300	រ៉ាល ហាក់	Real Haek	Pey Talay	Trapaing Thum Khangchaur				10000	700	10000	165		2%	0	2%	0
197	003/010	CH-150-CH-150	ច័ន ច័ន	Chan Chot	Pey Talay	Trapaing Thum Khangchaur				15230		15230	230		2%	0	2%	0
198	002/003	CH-350-CH-400	យ៉េន សំបាត	Yos Sambath	Pey Talay	Trapaing Thum Khangchaur				5100		5100	255		5%	0	5%	0
199	002/011	CH-400-CH-450	សា ច័ន	Sa Chantha	Pey Talay	Trapaing Thum Khangchaur					1680	0		210		0	13%	0
200	003/003	CH-450-CH-500	ច័ន ហុល	Choun Hol	Pey Talay	Trapaing Thum Khangchaur				10000	660	10000			0%	0	2%	0
201	002/010	CH-050-CH-550	តូប សំរ៉េល	Tob Sam-ol	Pey Talay	Trapaing Thum Khangchaur					2600	0				0	10%	0
202	001/011	CH-050-CH-600	កែត ធីន	Kot Reung	Pey Talay	Trapaing Thum Khangchaur				17000		17000	135		1%	0	1%	0
203	003/011	CH-050-CH-600	ច័ន ហុល	Choun Hol	Pey Talay	Trapaing Thum Khangchaur				10000		10000	95		1%	0	1%	0

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#	Quarries No.	Ch. ID	M/H Name	Village Name		Type of Affected House (m ²)			Have Other Land		Total cultivated	Affected Area		No. h/h loose total		
				Village Name	M/H Name	Type 1	Type 2	Type 3	Post Land (m ²)	Other Land (m ²)		Att. Rice Land	Att. (Non-Rice)		Less Cultivate Lands (0%)	Att. (Rice)	Att. (Non-Rice)
204	001/008	២១-៥០-០១-៥៤	នេត ឧទានប្រា	ព្រៃប្រាសាទ	ព្រៃប្រាសាទ	33	39	40	5000	870	5000	44	145	0	2%	0
205	003/002	២១-៥០-០១-៥៤	កូន សាន់	ព្រៃប្រាសាទ	ព្រៃប្រាសាទ				6000		6000	200		3%	0	3%
206	001/010	២១-៥០-០១-៧៦	កូន រតន	ព្រៃប្រាសាទ	ព្រៃប្រាសាទ				17000		17000	160		1%	0	1%
207	002/007	២១-៥០-០១-៧៦	ប្រាសាទ ព្រៃប្រាសាទ	ព្រៃប្រាសាទ	ព្រៃប្រាសាទ					2750	0		405	0	15%	0
208	001/007	២១-៧០-០១-៧៦	លេង រតន	ព្រៃប្រាសាទ	ព្រៃប្រាសាទ		42		4000		4000		42	0	1%	0
209	002/005	២១-៧០-០១-៧៦	នេត ឧន	ព្រៃប្រាសាទ	ព្រៃប្រាសាទ					480	0		90	0	19%	0
210	002/004	២១-៧០-០១-៧៦	អូរ វណ្ណ	ព្រៃប្រាសាទ	ព្រៃប្រាសាទ	56				480	0		105	0	22%	0
211	001/012	២១-៧០-០១-៨០	អូរ វណ្ណ	ព្រៃប្រាសាទ	ព្រៃប្រាសាទ				5000	480	5000		160	0	3%	0
212	001/003	២១-៧០-០១-៨០	អូរ វណ្ណ	ព្រៃប្រាសាទ	ព្រៃប្រាសាទ				30000		30000	105		0%	0	0%
213	003/015	២១-៥០-០១-៨០	ប្រាសាទ លុច	ព្រៃប្រាសាទ	ព្រៃប្រាសាទ		48		5000	350	5000		58	0	1%	0
214	001/002	២១-៥០-០១-៥៤	លា ថេន	ព្រៃប្រាសាទ	ព្រៃប្រាសាទ		126		5000	270	5000		45	0	1%	0
215	003/005	២១-៥០-០១-៥៤	អូរ វណ្ណ	ព្រៃប្រាសាទ	ព្រៃប្រាសាទ		135			270	0		45	0	17%	0
216	002/002	២១-៥០-០១-៥៤	អូរ វណ្ណ	ព្រៃប្រាសាទ	ព្រៃប្រាសាទ					2000	0		50	0	3%	0
217	002/012	២១-៥០-០១-៥៤	សេត ចាន់	ព្រៃប្រាសាទ	ព្រៃប្រាសាទ					800	0		100	0	13%	0
218	003/001	២១-៥០-០១-៥៤	អូរ វណ្ណ	ព្រៃប្រាសាទ	ព្រៃប្រាសាទ					270	0		45	0	17%	0
219	003/009	២១-៥០-០១-៥៤	នេត សុផា	ព្រៃប្រាសាទ	ព្រៃប្រាសាទ				4000		4000		13	0	0%	0
220	003/004	២១-៥០-០១-៥៤	អូរ វណ្ណ	ព្រៃប្រាសាទ	ព្រៃប្រាសាទ				3500		3500			0%	0	0%
221	001/009	២១-៥០-០១-៥៤	អូរ វណ្ណ	ព្រៃប្រាសាទ	ព្រៃប្រាសាទ				5000		5000		61	0	1%	0
222	001/006	២១-៥០-០១-៥៤	អូរ វណ្ណ	ព្រៃប្រាសាទ	ព្រៃប្រាសាទ	29.9			6800		6800		89	0	1%	0
223	001/005	២១-៥០-០១-៥៤	អូរ វណ្ណ	ព្រៃប្រាសាទ	ព្រៃប្រាសាទ				15230	120	15230		15	0	0%	0
224	002/008	២១-៥០-០១-៥៤	អូរ វណ្ណ	ព្រៃប្រាសាទ	ព្រៃប្រាសាទ		178.5			420	0		53	0	13%	0
225	003/014	២១-៥០-០១-៥៤	អូរ វណ្ណ	ព្រៃប្រាសាទ	ព្រៃប្រាសាទ				4000	24	4000		24	0	1%	0
226	003/008	២១-៥០-០១-៥៤	អូរ វណ្ណ	ព្រៃប្រាសាទ	ព្រៃប្រាសាទ		66.67		5800	4800	5800		87	0	1%	0
227	003/012	២១-៥០-០១-៥៤	អូរ វណ្ណ	ព្រៃប្រាសាទ	ព្រៃប្រាសាទ				5000	48	5000		48	0	1%	0
228	002/006	២១-៥០-០១-៥៤	អូរ វណ្ណ	ព្រៃប្រាសាទ	ព្រៃប្រាសាទ				0	205	0		20	0	10%	0
229	003/016	២១-៥០-០១-៥៤	អូរ វណ្ណ	ព្រៃប្រាសាទ	ព្រៃប្រាសាទ		75		5000	165	5000		38	0	1%	0
230	003/017	២១-៥០-០១-៥៤	អូរ វណ្ណ	ព្រៃប្រាសាទ	ព្រៃប្រាសាទ			72	1720	78	1720		72	0	4%	0
231	002/013	២១-៥០-០១-៥៤	អូរ វណ្ណ	ព្រៃប្រាសាទ	ព្រៃប្រាសាទ		30.55		3000	100	3000		24	0	1%	0
232	003/018	២១-៥០-០១-៥៤	អូរ វណ្ណ	ព្រៃប្រាសាទ	ព្រៃប្រាសាទ		68.65	61.8	2000	697	2000		103	0	4%	0

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#	Qu. no. No.	Ch.100.	Mh Head Name	Village, Commune Name		Type of Affected House (m ²)			Have Other Landm	Total cultivated	Affection Area		No. Mh house total
				Village Name	Commune Name	Type 1	Type 2	Type 3			Rice	Other		Use other lands (0%)	Use other lands (100%)
#	Qu. no. No.	Ch.	Mh Head Name	Village Name	Commune Name	Type 1	Type 2	Type 3	Rice Land (m ²)	Other Land (m ²)	Use other lands (0%)	Use other lands (100%)	
233	001/013	CH1-050-100	វិជ័យ ស៊ុន	Sre Kvaav	Chang Tang	38	75	40	2000	200	0%	1%	
234	003/019	CH1-050-100	វិជ័យ ឡុន	Sre Kvaav	Chang Tang		24.36		10000	406	0%	0%	
235	003/020	CH1-050-100	យុន ថា	Sre Kvaav	Chang Tang				10000	2730	0%	2%	
236	001/014	CH1-100-150	យន ធី	Sre Kvaav	Chang Tang		112		4000	320	0%	1%	
237	002/023	CH1-100-150	រតនា ថន	Sre Kvaav	Chang Tang			55	1000	90	0%	2%	
238	003/032	CH1-100-150	ស៊ី ឆ	Sre Kvaav	Chang Tang		108		25000	284	0%	0%	
239	003/033	CH1-100-150	ឃី សាន	Sre Kvaav	Chang Tang		29.5		8000	150	0%	0%	
240	002/024	CH1-100-150	ស៊ី សុផាន	Sre Kvaav	Chang Tang			47.84	4000	1785	0%	4%	
241	001/034	CH1-100-150	វ៉ាន វ៉ានវ៉ាន	Sre Kvaav	Chang Tang		24.3		200	70	0%	10%	
242	003/035	CH1-150-200	ម៉ាត ឃីម	Sre Kvaav	Chang Tang				1000	72	0%	3%	
243	001/031	CH1-150-200	សុន ធី	Sre Kvaav	Chang Tang			75.6	2000	1166	0%	1%	
244	001/032	CH1-150-200	អ៊ែង ប៊ុន	Sre Kvaav	Chang Tang				0	182	0	13%	
245	002/025	CH1-150-200	សុន ឆ	Sre Kvaav	Chang Tang		108		0	100	0	25%	
246	001/033	CH1-150-200	ចាង ឃីម	Sre Kvaav	Chang Tang			115.2	5000	182	0%	0%	
247	003/082	CH1-150-200	ថាម វ៉ាន	Sre Kvaav	Chang Tang			108	10000	270	0%	0%	
248	002/026	CH1-150-200	អ៊ែង ឃីម	Sre Kvaav	Chang Tang			66	2000	1000	0%	9%	
249	002/027	CH1-150-200	ថាម ឆ	Sre Kvaav	Chang Tang		54		3500	180	0%	1%	
250	002/028	CH1-150-200	វ៉ាន វ៉ាន	Sre Kvaav	Chang Tang		54		1700	180	0%	3%	
251	001/034	CH1-150-200	អ៊ែង ឃីម	Sre Kvaav	Chang Tang		53		1000	182	0%	3%	
252	001/035	CH1-200-250	អ៊ែង ឃីម	Sre Kvaav	Chang Tang	17.6			1000	194	0%	2%	
253	001/036	CH1-200-250	ផ្កា ឃីម	Sre Kvaav	Chang Tang	20.5	54		1700	180	0%	5%	
254	001/037	CH1-200-250	រៀន ឃីម	Sre Kvaav	Chang Tang		90		5000	90	0%	1%	
255	002/083	CH1-200-250	ស៊ី ឆ	Sre Kvaav	Chang Tang			257.4	15000	257	0%	5%	
256	001/038	CH1-200-250	ឃីម ឆ	Sre Kvaav	Chang Tang			75	2000	75	0%	1%	
257	002/029	CH1-200-250	វ៉ាន ឃីម	Sre Kvaav	Chang Tang			61	2000	180	0%	2%	
258	003/036	CH1-250-300	ស៊ី ឆ	Sre Kvaav	Chang Tang	43.2			10000	216	0%	0%	
259	002/030	CH1-250-300	វ៉ាន ឃីម	Sre Kvaav	Chang Tang			66.4	3000	98	0%	1%	
260	003/037	CH1-250-300	វ៉ាន ឃីម	Sre Kvaav	Chang Tang			51.6	4000	151	0%	1%	
261	001/039	CH1-250-300	ឃីម ឆ	Sre Kvaav	Chang Tang			58.5	4000	90	0%	1%	

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No.	Quarries No.	Hh Head Name	Village, Commune Name		Number of Affected Tree													Affected Property																						
			Village Name	Commune Name	Total Hh Number	Munrab	Mungo	Coconut	Palm	Bamboo	Canhaw	Tamulim	Orange	Banana	Mill tree	Lotus	Jackfruit	Other	No. of Total	Yield Storage	No. of	Dug well	No. of	Pump well	No. of	Post	m	Steel For	m	No. of	Convent	m ²	concrete	m ²	wood	No. of	concrete	m ²	Balcony	
262	002/038	CH1-290-300	ចំរើន វិប	អ៊ុយ វ៉ាម	ឆ្នេរ ត្រពាំង	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
263	003/039	CH1-300-350	ស្រែ ត្រពាំង	ស្រែ ត្រពាំង	ឆ្នេរ ត្រពាំង	5	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
264	003/040	CH1-290-300	ស្រែ ត្រពាំង	ស្រែ ត្រពាំង	ឆ្នេរ ត្រពាំង	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
265	001/040	CH1-300-350	ស្រែ ត្រពាំង	ស្រែ ត្រពាំង	ឆ្នេរ ត្រពាំង	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
266	003/041	CH1-300-350	ស្រែ ត្រពាំង	ស្រែ ត្រពាំង	ឆ្នេរ ត្រពាំង	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
267	001/041	CH1-300-350	ស្រែ ត្រពាំង	ស្រែ ត្រពាំង	ឆ្នេរ ត្រពាំង	3	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
268	001/042	CH1-300-350	ស្រែ ត្រពាំង	ស្រែ ត្រពាំង	ឆ្នេរ ត្រពាំង	2	1	2	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
269	002/031	CH1-350-400	ស្រែ ត្រពាំង	ស្រែ ត្រពាំង	ឆ្នេរ ត្រពាំង	5	0	13	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
270	003/042	CH1-350-400	ស្រែ ត្រពាំង	ស្រែ ត្រពាំង	ឆ្នេរ ត្រពាំង	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
271	001/043	CH1-400-450	ស្រែ ត្រពាំង	ស្រែ ត្រពាំង	ឆ្នេរ ត្រពាំង	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
272	001/044	CH1-400-450	ស្រែ ត្រពាំង	ស្រែ ត្រពាំង	ឆ្នេរ ត្រពាំង	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
273	002/032	CH1-400-450	ស្រែ ត្រពាំង	ស្រែ ត្រពាំង	ឆ្នេរ ត្រពាំង	9	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
274	001/035	CH1-400-450	ស្រែ ត្រពាំង	ស្រែ ត្រពាំង	ឆ្នេរ ត្រពាំង	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
275	002/033	CH1-400-450	ស្រែ ត្រពាំង	ស្រែ ត្រពាំង	ឆ្នេរ ត្រពាំង	7	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
276	001/046	CH1-450-500	ស្រែ ត្រពាំង	ស្រែ ត្រពាំង	ឆ្នេរ ត្រពាំង	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
277	003/042	CH1-400-450	ស្រែ ត្រពាំង	ស្រែ ត្រពាំង	ឆ្នេរ ត្រពាំង	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
278	003/043	CH1-500-550	ស្រែ ត្រពាំង	ស្រែ ត្រពាំង	ឆ្នេរ ត្រពាំង	6	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
279	001/047	CH1-500-550	ស្រែ ត្រពាំង	ស្រែ ត្រពាំង	ឆ្នេរ ត្រពាំង	3	1	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
280	002/034	CH1-600-650	ស្រែ ត្រពាំង	ស្រែ ត្រពាំង	ឆ្នេរ ត្រពាំង	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
281	002/035	CH1-600-650	ស្រែ ត្រពាំង	ស្រែ ត្រពាំង	ឆ្នេរ ត្រពាំង	5	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
282	001/048	CH1-600-650	ស្រែ ត្រពាំង	ស្រែ ត្រពាំង	ឆ្នេរ ត្រពាំង	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
283	001/108	CH1-550-600	ស្រែ ត្រពាំង	ស្រែ ត្រពាំង	ឆ្នេរ ត្រពាំង	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
284	001/049	CH1-600-650	ស្រែ ត្រពាំង	ស្រែ ត្រពាំង	ឆ្នេរ ត្រពាំង	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
285	001/050	CH1-600-650	ស្រែ ត្រពាំង	ស្រែ ត្រពាំង	ឆ្នេរ ត្រពាំង	5	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
286	001/051	CH1-650-700	ស្រែ ត្រពាំង	ស្រែ ត្រពាំង	ឆ្នេរ ត្រពាំង	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
287	002/037	CH1-650-700	ស្រែ ត្រពាំង	ស្រែ ត្រពាំង	ឆ្នេរ ត្រពាំង	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
288	002/038	CH1-650-700	ស្រែ ត្រពាំង	ស្រែ ត្រពាំង	ឆ្នេរ ត្រពាំង	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
289	001/052	CH1-650-700	ស្រែ ត្រពាំង	ស្រែ ត្រពាំង	ឆ្នេរ ត្រពាំង	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
290	001/053	CH1-700-750	ស្រែ ត្រពាំង	ស្រែ ត្រពាំង	ឆ្នេរ ត្រពាំង	7	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

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#	Qu. naires No.	CH.00.	H/h Head Name		Village, Commune Name		Type of Affected House (m ²)			Have Other Land		Total cultivated	Affected Area		loss cultivate	loss culti. land> 10%	total land loss = total land loss = 100%	No. h/h losse total
			CH	H/h Head kh	HH Name	Village Name	Commune Name	Type 1	Type 2	Type 3	Rice Land m ²		Residen m ²	Aff. Rice Land					Residential
1	2	3	4	5	6	7	38	39	40	41	42	43	44	45	46	47	48	49
262	002/038	CH1+250-300	ហ៊ុយ វិស	Him Vorn	Sre Kvav	Cheang Tong		37		1700	96	1700		49	0%	0	3%	0
263	003/039	CH1+300-350	ស៊ុន សាត	Suong Sat	Sre Kvav	Cheang Tong		35.7		1800	250	1800		37	0%	0	2%	0
264	003/040	CH1+250-300	ស៊ិន វិស	Sorn Den	Sre Kvav	Cheang Tong		79.2		1800	504	1800		84	0%	0	4%	0
265	001/040	CH1+300-350	តៀក តៀង	Sheak Shoemur	Sre Kvav	Cheang Tong				7000	368	7000		46	0%	0	1%	0
266	003/041	CH1+300-350	តៀក ស៊ុយ៉ាត	Sheak Sovanara	Sre Kvav	Cheang Tong				1800	153	1800		59	0%	0	3%	0
267	001/041	CH1+300-350	គឹម ស៊ុនហៃ	Kim Soknay	Sre Kvav	Cheang Tong	18.2			2000	336	2000		42	0%	0	2%	0
268	001/042	CH1+300-350	តៀក តៀង	Sheak Shoemur	Sre Kvav	Cheang Tong				7000	860	7000		108	0%	0	1%	0
269	002/031	CH1+350-400	យស សម្បត្តិ	Yuosh Sombath	Sre Kvav	Cheang Tong	120			9000	1000	9000		114	0%	0	1%	0
270	003/042	CH1+350-400	យស សម្បត្តិ	Khim Saravong	Sre Kvav	Cheang Tong		112		10000	2940	10000		245	0%	0	2%	0
271	001/043	CH1+400-450	ម៉ែ ម៉ាប	Mom Mab	Sre Kvav	Cheang Tong				3000	200	3000		50	0%	0	2%	0
272	001/044	CH1+400-450	សុប រៀម	Nop Rim	Sre Kvav	Cheang Tong	99.4			1000	600	1000		60	0%	0	4%	0
273	002/032	CH1+400-450	លីម ធា	Nip Kea	Sre Kvav	Cheang Tong				1000	720	1000		60	0%	0	3%	0
274	001/035	CH1+400-450	ចេង សុបត្តិ	Cheng Songly	Sre Kvav	Cheang Tong	303.2			20000	693	20000		87	0%	0	0%	0
275	002/033	CH1+400-450	ស៊ុន ណា	Nou Nan	Sre Kvav	Cheang Tong		82.39		6500	780	6500		130	0%	0	2%	0
276	001/046	CH1+450-500	យុក គ្រឹក	Khok Nhet	Sre Kvav	Cheang Tong	111.72			5000	531	5000		59	0%	0	1%	0
277	003/042	CH1+400-450	សោ សាន	Sau Sann	Sre Kvav	Cheang Tong		103.75		8000	874	8000		104	0%	0	1%	0
278	003/043	CH1+500-550	ផ្កា លីម ធា	Ung Peng Ngor	Sre Kvav	Cheang Tong		67		16000	1120	16000		112	0%	0	1%	0
279	001/047	CH1+500-550	ម៉ែ ធា	Nguon Seng	Sre Kvav	Cheang Tong				1000	263	1000		38	0%	0	3%	0
280	002/034	CH1+500-550	ស្រែ ធា	Hem Saren	Sre Kvav	Cheang Tong		111.76		3600	616	3600		77	0%	0	2%	0
281	002/035	CH1+600-650	យស វៀ	Yuosh Lay	Sre Kvav	Cheang Tong		27		40000	229	40000		72	0%	0	0%	0
282	001/048	CH1+600-650	ម៉ែ ធា	Chom Chandara	Sre Kvav	Cheang Tong			65	5000	656	5000		41	0%	0	1%	0
283	001/108	CH1+550-600	ស៊ុន វិស	Tham Vanna	Sre Kvav	Cheang Tong				10000	714	10000		119	0%	0	1%	0
284	001/049	CH1+600-650	តៀក ស៊ុយ៉ាត	Rith Sovat	Sre Kvav	Cheang Tong		113.7		7000	519	7000		87	0%	0	1%	0
285	001/050	CH1+600-650	ម៉ែ ធា	Mon Sophon	Sre Kvav	Cheang Tong			43.92	5000	1236	5000		103	0%	0	2%	0
286	001/051	CH1+650-700	ធា ធា	Chan Shoemur	Sre Kvav	Cheang Tong	37.84			1800	344	1800		43	0%	0	2%	0
287	002/037	CH1+650-700	ស៊ុន វិស	Som Sodany	Sre Kvav	Cheang Tong		39.12		1000	6916	1000		33	0%	0	0%	0
288	002/038	CH1+650-700	ម៉ែ ធា	Din Sovisal	Sre Kvav	Cheang Tong		77.49		1500	340	1500		425	0%	0	23%	0
289	001/052	CH1+650-700	ម៉ែ ធា	Tim Sokha	Sre Kvav	Cheang Tong		75.2		7000	181	7000		130	0%	0	2%	0
290	001/053	CH1+700-750	ម៉ែ ធា	Mon Phav	Sre Kvav	Cheang Tong		69.3		1500	1960	1500		146	0%	0	4%	0

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#	Quarries No.	Ch100	Hh Head Name		Village Name	Type of Affected House (m ²)			Have Other Land		Total cultivated	Allotted Area		Loss with JMS (%)	Loss with JMS (%)	No. hh loss total
			Hh Head (U)	Hh Head (B)		Type 1	Type 2	Type 3	Total Land (m ²)	Rice Land (m ²)		AR (Rice Land)	AR (Road)				Loss with JMS (%)	Loss with JMS (%)
291	001107	CH1-750-800	ម៉ែ ឡូ	ម៉ែ ឡូ	Chuang Tong	39	39	40	10000	450	10000	44	45	0%	0%	0
292	003044	CH1-750-800	អ៊ុន ផ្លែ	អ៊ុន ផ្លែ	Chuang Tong				5000	500	5000		50	0%	0%	0
293	002039	CH1-750-800	ឡូ ធីន	ឡូ ធីន	Chuang Tong	51.81			5000	1085	5000		110	0%	0%	0
294	001054	CH1-750-800	ម៉ែន ឆាន់	ម៉ែន ឆាន់	Chuang Tong				5000	1280	5000		158	0%	0%	0
295	001055	CH1-850-850	ម៉ែន ឆាន់	ម៉ែន ឆាន់	Chuang Tong				3000	1500	3000	120	150	4%	0%	0
296	001056	CH1-850-900	ឆាន់ ឆាន់	ឆាន់ ឆាន់	Chuang Tong	107.04			6000	907	6000		160	0%	0%	0
297	003045	CH1-850-900	ស៊ុន ស៊ុន	ស៊ុន ស៊ុន	Chuang Tong				8000	3492	8000		194	0%	0%	0
298	001057	CH1-850-2-000	គេន ឡូ	គេន ឡូ	Chuang Tong	88			5000	48	5000		40	0%	0%	0
299	002040	CH2-850-050	ធីន ស៊ុន	ធីន ស៊ុន	Chuang Tong				6000	3225	6000	162		3%	0%	0
300	002041	CH2-850-100	ធីន ស៊ុន	ធីន ស៊ុន	Chuang Tong				15000	300	15000	185		1%	0%	0
301	002042	CH2-100-150	គេន ឆាន់	គេន ឆាន់	Chuang Tong				1000	2040	1000		163	0%	0%	0
302	002042	CH2-150-200	គេន ឆាន់	គេន ឆាន់	Chuang Tong				50000	650	50000	44		0%	0%	0
303	002043	CH2-250-300	ឆាន់ ឆាន់	ឆាន់ ឆាន់	Chuang Tong				5000	3488	5000	435		9%	0%	0
304	001058	CH2-250-300	ឆាន់ ឆាន់	ឆាន់ ឆាន់	Chuang Tong				3000	780	3000		85	0%	0%	0
305	002044	CH2-300-350	ស៊ុន ឆាន់	ស៊ុន ឆាន់	Chuang Tong	30			1700	450	1700		75	0%	0%	0
306	002045	CH2-300-350	ស៊ុន ឆាន់	ស៊ុន ឆាន់	Chuang Tong				3000	708	3000		85	0%	0%	0
307	001059	CH2-300-350	ឆាន់ ឆាន់	ឆាន់ ឆាន់	Chuang Tong				15000	1251	15000		209	0%	0%	0
308	002045	CH2-350-400	ឆាន់ ឆាន់	ឆាន់ ឆាន់	Chuang Tong				4500	1110	4500		111	0%	0%	0
309	001060	CH2-350-400	ឆាន់ ឆាន់	ឆាន់ ឆាន់	Chuang Tong				3000	882	3000		112	0%	0%	0
310	002046	CH2-400-450	ស៊ុន ឆាន់	ស៊ុន ឆាន់	Chuang Tong				1500	748	1500		84	0%	0%	0
311	002047	CH2-400-450	ឆាន់ ឆាន់	ឆាន់ ឆាន់	Chuang Tong				6000	905	6000		91	0%	0%	0
312	002049	CH2-500-550	ឆាន់ ឆាន់	ឆាន់ ឆាន់	Chuang Tong				4000	0	0		205	0%	0%	0
313	001061	CH2-550-600	ឆាន់ ឆាន់	ឆាន់ ឆាន់	Chuang Tong				7700	7700	7700	270		4%	0%	0
314	001062	CH2-600-650	ឆាន់ ឆាន់	ឆាន់ ឆាន់	Chuang Tong				2000	2000	2000	270		14%	1	0
315	001063	CH2-650-700	ឆាន់ ឆាន់	ឆាន់ ឆាន់	Chuang Tong				7700	7700	7700	385		5%	0%	0
316	003046	CH2-700-750	ឆាន់ ឆាន់	ឆាន់ ឆាន់	Chuang Tong				10000	2000	10000		250	0%	0%	0
317	003047	CH2-750-800	ឆាន់ ឆាន់	ឆាន់ ឆាន់	Chuang Tong				10000	1400	10000		175	0%	0%	0
318	003048	CH2-800-850	ឆាន់ ឆាន់	ឆាន់ ឆាន់	Chuang Tong				15000	2842	15000		280	0%	0%	0
319	001064	CH2-850-900	ឆាន់ ឆាន់	ឆាន់ ឆាន់	Chuang Tong				7000	1645	7000	140		2%	0%	0

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#	Quarries No.	CH00	H/h Head Name		Village, Commune Name		Type of Affected House (m ²)			Have Other Land		Total cultivated	Affected Area		loss culti- land > 10%	loss cultivate	totl land losse	No. h/h losse total
			H/h Head kh	H/h Name	Village Name	Commune Name	Type 1	Type 2	Type 3	Road Land m ²	Residen m ²		Aff. Rice Land	Residential				
1	2	3	4	5	6	7	35	39	40	41	42	43	44	45	46	47	48	49
320	003/049	CH2-600-950	ចាន់ សុផា	Chan Sothea	Chypak	Cheang Tong				15000	2475	15000		275	0%	0	2%	0
321	002/050	CH2-650-CH3-001	ស៊ុន យ៉ាណា	Sen Yanda	Chypak	Cheang Tong					3200	0		160	0%	0	5%	0
322	001/051	CH3-00-050	ឯក សំរោង	Ek Som-eun	Chypak	Cheang Tong				4000	185	4000		185	0%	0	4%	0
323	003/050	CH3-050-100	គង់ ច័ន្ទ	Kong Chentha	Chypak	Cheang Tong				5000	1400	5000		175	0%	0	10%	0
324	001/055	CH3-050-100	ទ័យ ញ៉ាត្រី	Tem Gnah	Chypak	Cheang Tong				2000	1300	2000		130	0%	0	4%	0
325	001/056	CH3-100-150	ទ័យ វិបុល	Ti Vibol	Chypak	Cheang Tong					800	0		100	0%	0	13%	0
326	001/057	CH3+150-200	ទ័យ សុភ័ណ្ណ	Ti Sokvan	Chypak	Cheang Tong				6000	1550	6000		155	0%	0	2%	0
327	002/052	CH3+150-200	ស្រី វណ្ណា	Sor Vontha	Chypak	Cheang Tong					1550	0		155	0%	0	10%	0
328	002/053	CH3-200-250	ព្រីង ចាន់ធុន	Pring Chanthon	Chypak	Cheang Tong						0		155	0%	0	6%	0
329	003/051	CH3+250-300	កែវ វិបុល	Kem Uok	Ta Mom	Ta Phem				3000	1012	3000		230	0%	0	1%	0
330	001/058	CH3+250-300	ចាប សារ៉េន	Chab Saveourn	Ta Mom	Ta Phem				17000	300	17000	105		1%	0	8%	0
331	003/052	CH3+300-350	អ៊ុំ ឫស	Om Born	Ta Mom	Ta Phem				5000	1000	5000	475		10%	0	1%	0
332	003/053	CH3+300-350	ចាប សារ៉េន	Chab Saveourn	Ta Mom	Ta Phem				17000	300	17000	105		1%	0	1%	0
333	003/054	CH3+350-400	អ៊ុក ញ៉ាត្រី	Ouk Nhev	Ta Mom	Ta Phem				13500	1110	13500		165	0%	0	5%	0
334	003/055	CH3+350-400	យេង ច័ន្ទ	Yuesh Chinda	Ta Mom	Ta Phem				500	2040	500		120	0%	0	2%	0
335	002/054	CH3+350-400	សាន់ ស៊ាន់	San Nisarinn	Ta Mom	Ta Phem				10000	5145	10000		245	0%	0	4%	0
336	003/056	CH3+550-600	នេក នី	Nek Ny	Ta Mom	Ta Phem				4000	1320	4000		220	0%	0	2%	0
337	003/057	CH3+600-650	នូវ គុន	Nouv Kuon	Ta Mom	Ta Phem				8710	1290	8710		215	0%	0	2%	0
338	001/059	CH3+650-700	ប៊ុត ញ៉ាត្រី	Bot Thoeurn	Ta Mom	Ta Phem				8000	1200	8000		200	0%	0	5%	0
339	003/058	CH3+650-700	តឹង ណាន់	Ting Nun	Ta Mom	Ta Phem				8000	2050	8000		205	0%	0	2%	0
340	001/070	CH3+800-850	ចាក់ រិន	Chak Rin	Ta Mom	Ta Phem				3000	2160	3000		270	0%	0	1%	0
341	002/055	CH3+850-900	អ៊ុក ច័ន្ទ	Ouk Chantha	Ta Mom	Ta Phem				8000	1400	8000		140	0%	0	5%	0
342	002/056	CH3+850-900	ស៊ុន សារី	Sun Shay	Ta Mom	Ta Phem				2000	1750	2000		175	0%	0	2%	0
343	002/057	CH3+900-950	កែវ ញ៉ាត្រី	Kem Phoeurn	Ta Mom	Ta Phem				5000	225	5000	275		6%	0	4%	0
344	001/071	CH3+950+4000	នូវ គុន	Nouv Mel	Ta Mom	Ta Phem				6000	500	6000	230		4%	0	2%	0
345	002/058	CH4-000-650	ប៊ុត ឈឹក	Bot Chhit	Ta Mom	Ta Phem				8000	2275	8000		228	0%	0	1%	0
346	001/072	CH4-050-100	ឯក ឫស	Ek Mom	Ta Mom	Ta Phem				8000	920	8000		115	0%	0	2%	0
347	002/059	CH4-150-100	សោ តូច	Sao Touch	Ta Mom	Ta Phem				5000	1110	5000		100	0%	0	2%	0
348	001/073	CH4+100-150	អ៊ុក ច័ន្ទ	Ouch Chantha	Ta Mom	Ta Phem				1600	500	1600	95		6%	0	5%	0

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#	Qu.naires No.	CH.00.	H/h Head		Village, Commune		Type of Affected House (m ²)			Have		Affected Area		loss cultivate	loss culti. land> 10%	No. h/h	
			H/h Head kh	Name	Village Name	Commune Name	Type 1	Type 2	Type 3	Rice Land m ²	Other Land	Rice	Residential				total land loss =
#	Ou.naires	CH	H/h Head kh	Name	Village Name	Commune Name	Type 1	Type 2	Type 3	Rice Land m ²	Other Land	Aff. Rice Land	Aff. Residential	loss cultivate	loss culti. land> 10%	total land loss =	
1	2	3	4	5	6	7	38	39	40	41	42	44	45	46	47	48	49
349	003/058	CH4-150-200	លីត វ៉ុន	Chhit Oun	Ta Mom	Ta Phem				4000	600	325		8%	0	7%	0
350	001/074	CH4-150-200	នីន ហាត	Ngin Sanh	Ta Mom	Ta Phem				6000	500	413		7%	0	6%	0
351	001/075	CH4-200-250	ធីតា ធីតា	Ouk Chhork	Ta Mom	Ta Phem				2500	700	65		3%	0	2%	0
352	001/076	CH4-250-350	វ៉ុន ធីតា	Oung Phany	Ta Mom	Ta Phem				3500	750	375		11%	1	9%	0
353	002/060	CH4-350-400	ព្រហ្ម វ៉ុន	Preab Men	Ta Mom	Ta Phem				10000	1200	370		4%	0	3%	0
354	002/061	CH4-400-500	ហ៊ុយ វ៉ុន	Him Von	Ta Mom	Ta Phem				10000	500	170		2%	0	2%	0
355	001/077	CH4-450-500	ម៉ឺ ហាត	Mey Sarath	Ta Mom	Ta Phem				7000	1000	235		3%	0	3%	0
356	001/078	CH4-500-550	សាវ ហ៊ុន	Shang Sokny	Ta Mom	Ta Phem				10000	644		115	0%	0	1%	0
357	002/062	CH4-500-550	វ៉ុន ហ៊ុន	Van Pov	Ta Mom	Ta Phem				5000	1100		110	0%	0	2%	0
358	003/059	CH4-550-600	ធីតា ធីតា	Nhor Phalla	Ta Mom	Ta Phem				5000	1280		160	0%	0	3%	0
359	002/063	CH4-600-650	សាវ វ៉ុន	San Bros	Mrum	Ta Phem				3600	400		100	0%	0	3%	0
360	002/064	CH4-650-700	ស៊ី វ៉ុន	Sey Sokhom	Mrum	Ta Phem				10000	2000		100	0%	0	1%	0
361	002/065	CH4-650-700	ស៊ី វ៉ុន	Kem Phan	Mrum	Ta Phem				1800	1080		135	0%	0	5%	0
362	002/066	CH4-700-750	នី ធីតា	Nou Chammony	Mrum	Ta Phem				2800	2800		200	0%	0	4%	0
363	002/067	CH4-750-800	ហ៊ុយ វ៉ុន	Hem Ret	Mrum	Ta Phem				6000	3240		270	0%	0	3%	0
364	001/079	CH4-800-900	ធីតា វ៉ុន	Chem Me	Mrum	Ta Phem				5100	1880	180		4%	0	6%	0
365	001/080	CH4-850-900	ធីតា វ៉ុន	Chem Me	Mrum	Ta Phem				5100	765		85	0%	0	1%	0
366	001/081	CH4-900-950	លីត វ៉ុន	Chhem Vanna	Mrum	Ta Phem				3500	522		87	0%	0	2%	0
367	001/063	CH4-950-CH5-05	លីត វ៉ុន	Chhem Vanna	Mrum	Ta Phem				3500	2500		390	0%	0	7%	0
368	002/068	CH4-900-950	សាវ វ៉ុន	Sor Kemieng	Mrum	Ta Phem				3000	489		82	0%	0	2%	0
369	001/082	CH4-900-950	វ៉ុន វ៉ុន	Kun Touch	Mrum	Ta Phem				1500	125		42	0%	0	3%	0
370	003/060	CH5-000-100	ស៊ី វ៉ុន	Heak Sarat	Mrum	Ta Phem				6000	3500	260		4%	0	3%	0
371	002/069	CH5-100-150	សាវ វ៉ុន	Sek Heng	Mrum	Ta Phem				5000	650	255		5%	0	5%	0
372	003/061	CH5-250-300	សាវ វ៉ុន	Sor Romg	Mrum	Ta Phem				4000	2500	310		8%	0	5%	0
373	003/062	CH5-200-250	ធីតា វ៉ុន	Kam Chantha	Mrum	Ta Phem				5000	2500	117		2%	0	2%	0
374	002/070	CH5-300-350	សាវ វ៉ុន	Chea Soth	Mrum	Ta Phem				3600	880		110	0%	0	2%	0
375	002/071	CH5-350-450	សាវ វ៉ុន	Hak Chek	Mrum	Ta Phem				5000	1650	345		7%	0	9%	0
376	001/084	CH5-450-500	សាវ វ៉ុន	Chrouk Van	Mrum	Ta Phem				2150	2500		215	0%	0	5%	0
377	002/072	CH5-600-650	ធីតា វ៉ុន	Doul Seangly	Mrum	Ta Phem				2401	2750	245		10%	1	5%	0

MC 33+SC 3U+SC 3D

#	Quaires No.	CH-00	Hh Head Name		Village, Commune Name		Type of Affected House (m ²)			Have Other Land		Total cultivated	Affected Area		loss cultivate lands > 10%	No. hh losses total		
			Hh Head kh	Hh Name	Village Name	Commune Name	Type 1	Type 2	Type 3	Rice Land	Residential		Rice	Residential			loss cultivate	total land loss = 100%
1	2	3	4	5	6	7	38	39	40	41	42	43	44	45	46	47	48	49
378	002/074	CH5-550-600	ខុល ព្រៃប្រាំង	Doul Seangly	Mrum	Ta Phom		72		2401	2750	2401		275	0%	0	5%	0
379	002/073	CH5-550-600	គីឡូត	Kam Doul	Mrum	Ta Phom	30			1296	2000	1296	180	65	14%	1	7%	0
380	001/085	CH5-650-700	បឹង តា	Pong Thea	Mrum	Ta Phom				2500	0	0		210	0%	0	8%	0
381	002/075	CH5-700-750	ម្លូង ថង	Mom Thom	Mrum	Ta Phom		192		7000	690	7000		300	0%	0	4%	0
382	003/063	CH5-700-750	ភ្នំ ពោធិ៍	Sam Phansout	Mrum	Ta Phom				1500	0	0		110	0%	0	7%	0
383	002/076	CH5-600-660	ស្រែ ល្បី	Seng Seha	Mrum	Ta Phom				10000	1980	10000		165	0%	0	1%	0
384	002/079	CH5-300-350	ស្រែ ក្រវាត់	Lok Vesna	Mrum	Ta Phom				12000	2500	12000	145		1%	0	1%	0
385	002/080	CH4-600-660	ព្រៃ ម្លូង	Pet Mom	Mrum	Ta Phom				10000	250	10000	120		1%	0	1%	0
386	002/081	CH5-150-200	ស្រែ ក្រវាត់	Lok Kuriha	Mrum	Ta Phom				7000	2250	7000	115		2%	0	1%	0
387	002/082	CH5-150-250	ស្រែ ក្រវាត់	Lok Mab	Mrum	Ta Phom				10000	350	10000	340		3%	0	3%	0
388	003/064	CH5-650-800	បឹង ល្បី	Ben Heng	Mohasena	Ta Phom				7000	1400	7000		175	0%	0	2%	0
389	003/065	CH5-650-900	ស្រែ ក្រវាត់	Chay Sokheng	Mohasena	Ta Phom				6500	520	6500		52	0%	0	1%	0
390	002/067	CH5-950-CH6-000	ស្រែ ក្រវាត់	Kao Kemlong	Mohasena	Ta Phom				10000	484	10000		110	0%	0	1%	0
391	003/066	CH6-00-060	ស្រែ ល្បី	Seng Lem	Mohasena	Ta Phom		105		5000	600	5000		75	0%	0	1%	0
392	002/078	CH6-00-050	ស្រែ ក្រវាត់	Seng Vat	Mohasena	Ta Phom		69		2300	220	2300		55	0%	0	2%	0
393	001/086	CH6-00-060	ស្រែ ព្រៃប្រាំង	Ouch Seang	Mohasena	Ta Phom				5000	1400	5000		175	0%	0	3%	0
394	003/067	CH6-050-150	ស្រែ ក្រវាត់	Oct Gno	Mohasena	Ta Phom				10000	1320	10000		165	0%	0	1%	0
395	002/079	CH6-150-200	ស្រែ ក្រវាត់	Hak Ky	Mohasena	Ta Phom		30		5000	1340	5000		168	0%	0	3%	0
396	003/068	CH6-150-200	ស្រែ ក្រវាត់	Hak Chea	Mohasena	Ta Phom		77.7		15000	1328	15000		1475	0%	0	9%	0
397	001/087	CH6-200-250	ស្រែ ក្រវាត់	Leng Kermhak	Mohasena	Ta Phom		50		4000	200	4000		50	0%	0	1%	0
398	001/088	CH6-200-250	ស្រែ ក្រវាត់	Thon Ron	Mohasena	Ta Phom		44		1300	196	1300		49	0%	0	3%	0
399	001/089	CH6-200-250	ស្រែ ក្រវាត់	Nao Savuth	Mohasena	Ta Phom				5000	535	5000		76	0%	0	1%	0
400	003/070	CH6-300-350	ស្រែ ក្រវាត់	Sam Phansout	Mohasena	Ta Phom				15000		15000	250		2%	0	2%	0
401	002/080	CH6-350-400	ស្រែ ល្បី	Nget Yern	Mohasena	Ta Phom				2352	245	2352		245	10%	1	10%	0
402	002/081	CH6-400-450	ស្រែ ក្រវាត់	Ten Soa	Mohasena	Ta Phom				6000	2500	6000		250	0%	0	3%	0
403	002/082	CH6-450-500	ស្រែ ក្រវាត់	Ea Puthsat	Mohasena	Ta Phom				2500	2000	2500	125		5%	0	3%	0
404	001/090	CH6-450-500	ស្រែ ក្រវាត់	Tol Veasna	Mohasena	Ta Phom				5000		5000	135		3%	0	3%	0
405	003/071	CH6-500-550	ស្រែ ក្រវាត់	Och Sophia	Mohasena	Ta Phom				12000	2226	12000		210	0%	0	1%	0
406	001/091	CH6-500-600	ស្រែ ក្រវាត់	Khem Net	Mohasena	Ta Phom				3000	1400	3000		140	0%	0	3%	0

MC 33+SC 3U+SC 3D

#	Quaires No.	CH-00	Hh Head Name	Village, Commune Name		Type of Affected House (m ²)			Have Other Land		Total cultivated	Affected Area		loss culti. land> 10%	total land loss = 100%	No. hh losses total		
				Village Name	Commune Name	Type 1	Type 2	Type 3	Rice Land m ²	Residen m ²		Aff. Rice Land	Residential				loss cultivate	total land loss
1	2	3	4	5	6	7	36	39	40	41	42	43	44	45	46	47	48	49
407	003/072	CH6-500-600	គោល ឌុំន	Koul Ngon	Mohasena	Ta Phum				5300	1760	5300		176	0%	0	2%	0
408	001/092	CH6-550-650	ភ្នំបី ព្រៃន	Phum Tran	Mohasena	Ta Phum				8000	2240	8000		280	0%	0	3%	0
409	001/093	CH6-600-650	គ្រែប គ្រែប	Leng Kermhak	Mohasena	Ta Phum				4000	480	4000		160	0%	0	4%	0
410	002/083	CH6-650-700	គោល គី	Koul Ry	Mohasena	Ta Phum				2809	2000	2809		265	0%	0	6%	0
411	001/094	CH6-700-800	គោល គ្រែប	Koul Cheung	Mohasena	Ta Phum				2000	1800	2000		300	0%	0	8%	0
412	001/095	CH6-750-800	ឧប ស្ទឹង	Doung Som-on	Mohasena	Ta Phum				3000	2405	3000		185	0%	0	3%	0
413	001/096	CH6-800-850	ស្ទឹង គីន	Sok Vantha	Mohasena	Ta Phum				8000	1160	8000		145	0%	0	2%	0
414	002/084	CH6-800-900	ស្ទឹង លួន	Lem Loun	Mohasena	Ta Phum				5000	1550	5000		155	0%	0	2%	0
415	002/085	CH6-900-950	ស្ទឹង លួន	Sam Lem	Mohasena	Ta Phum				3000	1500	3000		150	0%	0	3%	0
416	003/073	CH6-950-CH7-00	ស្ទឹង លួន	Phum Nat	Mohasena	Ta Phum				20000	2030	20000		145	0%	0	1%	0
417	001/097	CH7-650-700	គោល ឌុំន	Chheng Khon	Prey Chhouteal	Ang Ta Saom				5000	1125	5000	50		1%	0	1%	0
418	002/086	CH7-700-750	គោល ឌុំន	Chheng Khon	Prey Chhouteal	Ang Ta Saom				5000	1125	5000		113	0%	0	2%	0
419	001/098	CH7-350-400	ស្ទឹង យួន	Buth Bona	Chhouteal	Ang Ta Saom				5000	300	5000	250		5%	0	5%	0
420	001/099	CH7-550-650	គោល គ្រែប	Chheng Varina	Chhouteal	Ang Ta Saom				5000	250	5000	340		7%	0	6%	0
421	001/100	CH7-450-550	ស្ទឹង គីន	Vann Siphon	Chhouteal	Ang Ta Saom				15000	325	15000	316		2%	0	2%	0
422	001/101	CH6-950-CH7-00	ស្ទឹង លួន	San Son	Chhouteal	Ang Ta Saom				10500	2700	10500		450	0%	0	3%	0
423	001/002	CH7-800-900	ស្ទឹង គីន	Ruos Koy	Chhouteal	Ang Ta Saom				10000	1000	10000	415		4%	0	4%	0
424	001/103	CH7-550-600	ស្ទឹង គីន	Hok Cheng	Chhouteal	Ang Ta Saom				15000	345	15000	155		1%	0	1%	0
425	001/104	CH7-900-950	ស្ទឹង គីន	Mam Phanna	Chhouteal	Ang Ta Saom				16000	500	16000	245		2%	0	1%	0
426	002/087	CH7-650-100	ស្ទឹង គីន	Nhem Than	Chhouteal	Ang Ta Saom				18000	2025	18000	328		2%	0	2%	0
427	001/105	CH7-700-800	គោល គី	Chheng Ser	Chhouteal	Ang Ta Saom				16000	3150	16000		315	0%	0	2%	0
428	002/088	CH7-350-450	ស្ទឹង គីន	Svay Sok	Chhouteal	Ang Ta Saom				25000	4000	25000	265		1%	0	1%	0
429	003/074	CH7-650-CH8-00	គោល គី	Vong Phalla	Chhouteal	Ang Ta Saom				15000	1000	15000	325		2%	0	2%	0
430	002/089	CH7-450-500	ស្ទឹង គីន	Kul Khen	Chhouteal	Ang Ta Saom				5000	800	5000	230		5%	0	4%	0
431	002/090	CH7-150-250	ស្ទឹង គីន	Nhem Than	Chhouteal	Ang Ta Saom				8100	2025	8100	405		5%	0	4%	0
432	002/091	CH7-100-150	គោល គី	Chor Ly	Chhouteal	Ang Ta Saom				15000	2750	15000		275	0%	0	2%	0
433	003/075	CH7-750-800	ស្ទឹង គីន	Prak Kalyan	Chhouteal	Ang Ta Saom				22850	500	22850	265		1%	0	1%	0
434	002/092	CH7-650-700	គោល គី	Chheng Pros	Chhouteal	Ang Ta Saom				4500	1500	4500		198	0%	0	3%	0
435	002/093	CH6-900-CH7-00	ស្ទឹង គីន	Khiev Samorn	Chhouteal	Ang Ta Saom				10000	2650	10000		265	0%	0	2%	0

MC 33+SC 3U+SC 3D

#	Quaires No.	CH00-	H/h Head Name		Village, Commune Name		Type of Affected House (m ²)			Have Other Land		Total cultivated	Affected Area		loss cultivate	loss culti. land> 10%	total land losse	No. h/h losse total
			H/h Head kh	HH Name	Village Name	Commune Name	Type 1	Type 2	Type 3	Rice Land m ²	Residen m ²		Aff. Rice Land	Residential				
1	2	3	4	5	6	7	38	39	40	41	42	43	44	45	46	47	48	49
436	002/084	CH7-250-300	ប៊ុន តោកា	Bun Sopheha	Prey Chhneutal	Ang Ta Saom				15000	1150	15000		115	0%	0	1%	0
437	003/075	CH7-300-350	ប៊ុន ប៊ុនយ៉ាង	Buth Bunyann	Prey Chhneutal	Ang Ta Saom				11000	300	11000	145		1%	0	1%	0
438	001/106	CH8-100-150	ម៉ែន ណាំ	Men Narom	Prey Chhneutal	Ang Ta Saom				18000	2500	18000	60		0%	0	0%	0
439	003/076	CH8-250-300	អៀន ធម៌	Eun Em	Prey Chhneutal	Ang Ta Saom				1200	1560	1200	60		5%	0	2%	0
440	003/077	CH8-150-200	ហៀន ព័ន្ធក	Heng Ponlok	Prey Chhneutal	Ang Ta Saom				6000	200	6000	300		5%	0	5%	0
441	003/078	CH8-300-350	អៀន ម៉ាត់	Eun Many	Prey Chhneutal	Ang Ta Saom				1200	230	1200	60		5%	0	4%	0
442	003/079	CH8-650-100	ហៀន ណាំ	Nhon Rasmey	Prey Chhneutal	Ang Ta Saom				4000	2550	4000		255	0%	0	4%	0
443	003/080	CH8-300-350	អៀន តេត	Eun Rotha	Prey Chhneutal	Ang Ta Saom				1300	3000	1300	65		5%	0	2%	0
444	003/081	CH8-150-200	ហៀន ព័ន្ធក	Heng Ponley	Prey Chhneutal	Ang Ta Saom				4000	2500	4000	200		5%	0	3%	0
445	003/082	CH8-650-100	សែន គីមព័ន្ធក	Seng Kemsreng	Prey Chhneutal	Ang Ta Saom				15000	200	15000	85		1%	0	1%	0
446	003/083	CH8-100-200	សៅ តេតណាំ	Soa Sophong	Prey Chhneutal	Ang Ta Saom				20000	250	20000	405		2%	0	2%	0
		426		HH			865	3866.35	1675.45	3400776	493377	3400776	39022	40021		11		0

Appendix 3
Results of IOL Survey of Proposed Plan

Affected Property

Number of Affected Trees

H/M Head

CH.00

#	Quantities	CH.00	H/M Head	Caretaker Name	Caretaker	Number of Affected Trees												Affected Property																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
						01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900	901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950	951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021	1022	1023	1024	1025	1026	1027	1028	1029	1030	1031	1032	1033	1034	1035	1036	1037	1038	1039	1040	1041	1042	1043	1044	1045	1046	1047	1048	1049	1050	1051	1052	1053	1054	1055	1056	1057	1058	1059	1060	1061	1062	1063	1064	1065	1066	1067	1068	1069	1070	1071	1072	1073	1074	1075	1076	1077	1078	1079	1080	1081	1082	1083	1084	1085	1086	1087	1088	1089	1090	1091	1092	1093	1094	1095	1096	1097	1098	1099	1100	1101	1102	1103	1104	1105	1106	1107	1108	1109	1110	1111	1112	1113	1114	1115	1116	1117	1118	1119	1120	1121	1122	1123	1124	1125	1126	1127	1128	1129	1130	1131	1132	1133	1134	1135	1136	1137	1138	1139	1140	1141	1142	1143	1144	1145	1146	1147	1148	1149	1150	1151	1152	1153	1154	1155	1156	1157	1158	1159	1160	1161	1162	1163	1164	1165	1166	1167	1168	1169	1170	1171	1172	1173	1174	1175	1176	1177	1178	1179	1180	1181	1182	1183	1184	1185	1186	1187	1188	1189	1190	1191	1192	1193	1194	1195	1196	1197	1198	1199	1200	1201	1202	1203	1204	1205	1206	1207	1208	1209	1210	1211	1212	1213	1214	1215	1216	1217	1218	1219	1220	1221	1222	1223	1224	1225	1226	1227	1228	1229	1230	1231	1232	1233	1234	1235	1236	1237	1238	1239	1240	1241	1242	1243	1244	1245	1246	1247	1248	1249	1250	1251	1252	1253	1254	1255	1256	1257	1258	1259	1260	1261	1262	1263	1264	1265	1266	1267	1268	1269	1270	1271	1272	1273	1274	1275	1276	1277	1278	1279	1280	1281	1282	1283	1284	1285	1286	1287	1288	1289	1290	1291	1292	1293	1294	1295	1296	1297	1298	1299	1300	1301	1302	1303	1304	1305	1306	1307	1308	1309	1310	1311	1312	1313	1314	1315	1316	1317	1318	1319	1320	1321	1322	1323	1324	1325	1326	1327	1328	1329	1330	1331	1332	1333	1334	1335	1336	1337	1338	1339	1340	1341	1342	1343	1344	1345	1346	1347	1348	1349	1350	1351	1352	1353	1354	1355	1356	1357	1358	1359	1360	1361	1362	1363	1364	1365	1366	1367	1368	1369	1370	1371	1372	1373	1374	1375	1376	1377	1378	1379	1380	1381	1382	1383	1384	1385	1386	1387	1388	1389	1390	1391	1392	1393	1394	1395	1396	1397	1398	1399	1400	1401	1402	1403	1404	1405	1406	1407	1408	1409	1410	1411	1412	1413	1414	1415	1416	1417	1418	1419	1420	1421	1422	1423	1424	1425	1426	1427	1428	1429	1430	1431	1432	1433	1434	1435	1436	1437	1438	1439	1440	1441	1442	1443	1444	1445	1446	1447	1448	1449	1450	1451	1452	1453	1454	1455	1456	1457	1458

#	Quarines	CH100	Hh Head		Type of Affected			Have		Total	Affected Area		%	No. Hh	%	No. Hh
			Hh Head (Name)	Village (Name)	Commune (Name)	Type 1	Type 2	Type 3	Res. Area (m ²)		Res. Area (m ²)	Area, Price (m ²)					Area, Price (m^{2})
1	002001	CH0-000-050	ជន ពាង	Chen Phan	Throt Chum	O Salary			5,000	225	5,225	75	0%	0	1%	0
2	004004	CH0-000-100	ហេង ហ៊ុន	Heng Hoon	Throt Chum	O Salary			5,000	1,200	6,200	150	0%	0	2%	0
3	002006	CH0-000-050	កែវ ហាង	Kim Han	Throt Chum	O Salary			30,000	1,200	31,200	150	0%	0	0%	0
4	004001	CH0-200-250	ស៊ុយ ហ៊ុយ	Sam Hui	Throt Chum	O Salary			5,000		5,000		0%	tenant	0%	0
5	002012	CH0-150-200	ចាន់ ហាង	Chan Sorn	Throt Chum	O Salary			1,500	400	1,900	100	0%	0	5%	0
6	003007	CH0-250-300	យុត ថាវ	Khuch Thar	Throt Chum	O Salary			26,500		26,500	150	1%	0	1%	0
7	002003	CH0-350-400	ធួន កែវ	Neam Vich	Throt Chum	O Salary			5,000	300	5,300	200	0%	0	4%	0
8	004002	CH0-400-450	អ៊ាត ឡាត	Ok Nhoth	Throt Chum	O Salary			18,000	2,500	20,500	250	0%	0	1%	0
9	004002	CH0-450-500	ឌុយ ហ៊ុន	Day Boan	Throt Chum	O Salary			20,000	1,500	21,500	750	0%	0	3%	0
10	003008	CH0-550-600	ម៉ុយ ហាង	Tim Hal	Throt Chum	O Salary			25,000	1,500	26,500	150	0%	0	1%	0
11	002009	CH0-600-650	ស៊ុយ ឌុយ	Chap Trou	Throt Chum	O Salary			10,000	2,000	12,000	200	0%	0	2%	0
12	004001	CH0-650-700	គឹម សុយធី	Kim Sambath	Throt Chum	O Salary			10,000	200	10,200	50	0%	0	0%	0
13	003002	CH0-650-700	ដេន លី	Dan Ly	Throt Chum	O Salary			5,000	750	5,750	25	0%	0	0%	0
14	002002	CH0-700-750	យ៉ុង ស៊ុយ	Khoun Sop	Throt Chum	O Salary			7,000	750	7,750	75	0%	0	1%	0
15	001005	CH0-700-750	ហេង ហ៊ុន	Heng Suan	Throt Chum	O Salary			10,000	4,000	14,000	200	0%	0	1%	0
16	001011	CH0-750-800	កុន ម៉ាត	Suan Mak	Throt Chum	O Salary			15,000	4,000	19,000	200	0%	0	1%	0
17	002010	CH0-800-850	ស្រា ម៉ុយ	Sor Mom	Throt Chum	O Salary			18,000	1,050	19,050	75	0%	0	0%	0
18	001006	CH0-800-850	ស្រាម សាវ៉ាង	Ham Sahn	Throt Chum	O Salary			20,000	3,000	23,000	225	0%	0	1%	0
19	002011	CH0-850-900	អ៊ែន សុខ ភាង	Ang Sokang	Throt Chum	O Salary			10,000	1,000	11,000	20	0%	0	0%	0
20	003004	CH0-850-900	អ៊ែន ហ៊ុន	Ang Nop	Throt Chum	O Salary			60,000	600	60,600	20	0%	0	0%	0
21	001009	CH0-900-950	សុខ សាវ៉ាង	Sak Sath	Throt Chum	O Salary			4,500	485	4,985	135	0%	0	3%	0
22	001008	CH0-900-950	សុខ សាវ៉ាង	Suan Sarn	Throt Chum	O Salary			15,000	500	15,500	250	0%	0	2%	0
23	002004	CH0-950-1000	ប្រាក់ ម៉ុយ	Prak Mom	Throt Chum	O Salary				1,250	1,250	100	0%	0	6%	0
24	001007	CH0-950-1000	ធួន យី	Chuen Vy	Throt Chum	O Salary			6,000	2,900	8,900	200	0%	0	2%	0
25	005001	CH1-050-100	យ៉ុង សាវ៉ាង	Hun Savom	Throt Chum	O Salary			8,000	4,200	12,200		0%	0	0%	0
26	003009	CH1-050-100	អ៊ែន ឌុយ	En Noy	Throt Chum	O Salary			18,000	500	18,500		0%	0	0%	0
27	001003	CH1-100-150	ឡាត យ៉ុន	Quah Ho	Throt Chum	O Salary			10,000		10,000	280	3%	0	3%	0
28	001004	CH1-150-200	គឹម សុយធី	Kim Sui On	Throt Chum	O Salary			5,000	850	5,850	95	0%	0	2%	0
29	003003	CH1-150-200	គឹម ពាង	Kim Phap	Throt Chum	O Salary			5,000	1,100	6,100	150	0%	0	2%	0

#	Quarries	CH.00-	H/h Head		Type of Affected			Have		Total	Affected Area		%	No. h/h	%	No. h/h	land=100%	
			H/h Head kh	H/h Head Name	Village Name	Commune Name	Type 1	Type 2	Type 3		Rice Land m ²	Residen m ²						Cultivated	Aff. rice land	Aff. residen. land	% loss cult. land	land=10%	land=100%
1	2	3	4	5	6	7	38	39	40	41	42	43	44	45	46	47	48	49
30	002/008	CH1+200-250	ច្រាំង	Thou Chhon	Thnot Chum	O Saray				30,500	1,520	32,020		100	0%	0	0%	0
31	002/007	CH1+200-250	ស្រែ យ៉ាត	Sem Borali	Thnot Chum	O Saray				5,000		5,000	50		1%	0	1%	0
32	003/001	CH1+200-250	វាល	Ouch Ho	Thnot Chum	O Saray				5,000	1,380	6,380		230	0%	0	4%	0
33	006/002	CH1+250-300	វាល	Em Som	Thnot Chum	O Saray				15,000	800	15,800			0%	0	0%	0
34	004/005	CH1+250-300	វាល	Nop Noun	Thnot Chum	O Saray				20,800	400	21,200		100	0%	0	0%	0
35	001/010	CH1+300-350	វាល	Hun Savorn	Thnot Chum	O Saray				8,000	4,200	12,200			0%	0	0%	0
36	002/006	CH1+350-400	វាល	Mom Heng	Thnot Chum	O Saray				10,000	1,200	11,200		150	0%	0	1%	0
37	004/003	CH1+350-450	វាល	Thou Chiam	Thnot Chum	O Saray				10,000	1,200	11,200	500		4%	0	4%	0
38	003/006	CH1+400-450	វាល	Sam Sohen	Thnot Chum	O Saray				5,000	600	5,600	300		5%	0	5%	0
39	003/005	CH1+450-550	វាល	Phin Boran	Thnot Chum	O Saray				5,000	2,400	7,400	200		3%	0	3%	0
40	001/002	CH1+500-550	វាល	Ky Saeoun	Thnot Chum	O Saray				3,000		3,000	65		2%	0	2%	0
41	001/001	CH1+300-350	វាល	Chiv Ly	Thnot Chum	O Saray				400	600	1,000		65	0%	0	7%	0
42	004/006	CH1+100-150	វាល	Huy Rin	Thnot Chum	O Saray				10,000	7,500	17,500	750		4%	0	4%	0
43	002/001	CH1+650-700	វាល	Nyeth Say	Trapaing Krasaing	O Saray				2,800	3,850	6,650	475		7%	0	7%	0
44	002/013	CH1+750-850	វាល	Sam Houm	Trapaing Krasaing	O Saray				25,000	2,500	27,500	380		1%	0	1%	0
45	004/007	CH1+850-950	វាល	Phak Lom	Trapaing Krasaing	O Saray				10,000	2,000	12,000	315		3%	0	3%	0
46	002/018	CH1+950-CH2	វាល	Kao Nal	Trapaing Krasaing	O Saray				10,000	450	10,450	140		1%	0	1%	0
47	002/014	CH1+550-CH2	វាល	Yuei Chroum	Trapaing Krasaing	O Saray				10,000	1,500	11,500	155		1%	0	1%	0
48	002/019	CH2+650-150	វាល	Sam Houm	Trapaing Krasaing	O Saray				25,000	2,500	27,500	840		3%	0	3%	0
49	002/015	CH2+150-200	វាល	Hem Chamroum	Trapaing Krasaing	O Saray				20,000	4,000	24,000	175		1%	0	1%	0
50	002/016	CH2+200-250	វាល	Em Khann	Trapaing Krasaing	O Saray				10,000	750	10,750	260		2%	0	2%	0
51	004/008	CH2+250-300	វាល	Hun Sarou	Trapaing Krasaing	O Saray				20,000	1,400	21,400	250		1%	0	1%	0
52	003/004	CH2+300-350	វាល	Hem Sarnbo	Trapaing Krasaing	O Saray				10,000	2,000	12,000	760		6%	0	6%	0
53	004/009	CH2+350-400	វាល	Hoeun Saveth	Trapaing Krasaing	O Saray				2,500	2,100	4,600	210		5%	0	5%	0
54	004/010	CH2+400-450	វាល	Miech La	Trapaing Krasaing	O Saray				16,000	875	16,875		150	0%	0	1%	0
55	004/011	CH2+450-550	វាល	Ok Chhoeun	Trapaing Krasaing	O Saray				15,000	2,500	17,500	400		2%	0	2%	0
56	002/018	CH2+550-600	វាល	Y Horn	Trapaing Krasaing	O Saray				15,000	1,600	16,600		315	0%	0	2%	0
57	002/017	CH2+600-700	វាល	Chih Chom	Trapaing Krasaing	O Saray				12,000	300	12,300	330		3%	0	3%	0
58	003/003	CH2+650-700	វាល	Bun Khooun	Trapaing Krasaing	O Saray				10,100	2,750	12,850		110	0%	0	1%	0

#	Quarries	CH.00-	HM Head		Type of Affected				Have			Total		Affected Area		%	No. h/h	%	No. h/h	No. h/h
			HM Head (km)	HM Head (m)	Cracks (mm)	Cracks (mm)	Type 1	Type 2	Type 3	Peak Area (m ²)	Peak Area (m ²)	Crack Area (m ²)	Crack Area (m ²)	Crack Area (m ²)	Crack Area (m ²)					
59	004011	CH2-700-750	បឹង ស្រីព្រី	Bun Sotuchea	Trapping						5,000	100	5,100	165	0%	0%	0	3%	0	0
60	002012	CH2-700-750	ម៉ៅ ពុល	Mam Tai	Peak Bang Aong						7,000	345	7,345	240	3%	3%	0	3%	0	0
61	003015	CH2-750-800	យាស ព្រៃបឹង	Yeeh Chocoun	Peak Bang Aong						10,000	1,500	11,500	250	0%	0%	0	2%	0	0
62	003016	CH2-750-850	ម៉ៅ សុក	Mach Ha	Peak Bang Aong						2,650	1,300	4,150	350	8%	8%	0	6%	0	0
63	003014	CH2-850-900	អ៊ុំ សាតក	Um Sarath	Peak Bang Aong						5,000	2,000	7,000	45	1%	1%	0	1%	0	0
64	02019	CH2-900-950	ឡី សាតក	Ley Saran	Peak Bang Aong						5,567	1,080	6,647	120	2%	2%	0	2%	0	0
65	01007	CH2-900-950	នាង សំពត	Ma Sam Ath	Peak Bang Aong						16,000	500	16,500	95	1%	1%	0	1%	0	0
66	002010	CH2-950-CH3-00	ឡី សាតក	Ley Saran	Peak Bang Aong						10,000	1,600	11,600	250	0%	0%	0	2%	0	0
67	002011	CH2-950-CH3-00	ស្រី ព្រៃ	Suen Poth	Peak Bang Aong						1,480	750	2,230	165	6%	6%	0	6%	0	0
68	003013	CH3-000-050	ម៉ៅ ម៉ៃ	Por Thom	Peak Bang Aong						1,100	500	1,600	105	7%	7%	0	7%	0	0
69	003007	CH3-050-100	អ៊ុំ ម៉ៃ	Em Hem	Peak Bang Aong						7,400	875	8,275	300	4%	4%	0	4%	0	0
70	002003	CH3-100-150	ស្រី ព្រៃ	Pen Thom	Peak Bang Aong						6,000	1,250	7,250	315	4%	4%	0	4%	0	0
71	003012	CH3-150-250	ស្រី ម៉ៃ	Rong Dy	Peak Bang Aong						8,100	992	9,092	630	7%	7%	0	7%	0	0
72	001006	CH3-250-350	ស្រី ស្រី	Ngan Sophea	Peak Bang Aong						4,000	2,500	6,500	375	6%	6%	0	6%	0	0
73	003011	CH3-350-400	ព្រៃ ម៉ៃ	Orm Meoun	Peak Bang Aong						5,882	450	6,332	315	5%	5%	0	5%	0	0
74	003010	CH3-400-450	ស្រី ម៉ៃ	Men Khan	Peak Bang Aong						16,600	600	17,200	160	1%	1%	0	1%	0	0
75	003009	CH3-450-550	ស្រី ព្រៃ	Suen Ban	Peak Bang Aong						8,000	3,000	11,000	150	1%	1%	0	3%	0	0
76	001005	CH3-550-600	ស្រី ព្រៃ	Sak Meoun	Peak Bang Aong						15,000	250	15,250	155	1%	1%	0	1%	0	0
77	003008	CH3-550-600	ស្រី ព្រៃ	Sum Khan	Peak Bang Aong						5,385	150	5,535	275	5%	5%	0	5%	0	0
78	001004	CH3-600-650	ស្រី ព្រៃ	Sak Ren	Peak Bang Aong						5,000	200	5,200	215	4%	4%	0	4%	0	0
79	003006	CH3-650-700	ស្រី ព្រៃ	Chhem Muth	Peak Bang Aong						6,000	1,500	7,500	150	0%	0%	0	2%	0	0
80	003005	CH3-700-750	អ៊ុំ ម៉ៃ	Em Leng	Peak Bang Aong						5,000	870	5,870	145	0%	0%	0	2%	0	0
81	003004	CH3-750-850	ស្រី ព្រៃ	Oudt Thol	Peak Bang Aong						6,150	66	6,206	450	5%	5%	0	5%	0	0
82	001003	CH3-850-900	ព្រៃ ម៉ៃ	Phu Chantel	Peak Bang Aong						8,000	2,000	10,000	250	3%	3%	0	3%	0	0
83	002007	CH3-900-950	ស្រី ព្រៃ	Hun Uen	Peak Bang Aong						5,000	2,500	7,500	105	1%	1%	0	1%	0	0
84	002006	CH3-950-1000	ស្រី ស្រី	Sao Sarom	Peak Bang Aong						5,000	2,750	7,750	275	4%	4%	0	4%	0	0
85	003003	CH3-950-1000	ព្រៃ ម៉ៃ	Nop Kalada	Peak Bang Aong						7,000	1,000	8,000	250	0%	0%	0	3%	0	0
86	002008	CH4-050-100	ស្រី ស្រី	Hen Sopha	Peak Bang Aong						10,000	500	10,500	175	2%	2%	0	2%	0	0

#	Quarries	CH-00	HM Head	Type of Affected			Have		Total	Affected Area		%	No. Mh	%	No. hh
				Type 1	Type 2	Type 3	Area Land (m ²)	Traps (m ²)		Area (m ²)	Area (m ²)				
87	002005	CH4-100-150	Teang Pring	Trapsing Thum Khangchoung			7,000	900	7,900	90	1%	0	1%	0	
88	001002	CH4-100-150	Pen Sorners	Peak Bang Aong Khangchoung			4,300	300	4,600	100	0%	0	0%	0	
89	002004	CH4-100-150	Nhep Samet	Trapsing Thum Khangchoung			10,720	720	11,440	180	2%	0	2%	0	
90	001001	CH4-150-200	Mom Mok	Trapsing Thum Khangchoung			7,860	680	8,540	85	0%	0	0%	0	
91	003017	CH4-200-250	Tang Saly	Trapsing Thum Khangchoung			2,820	920	3,740	230	0%	0	0%	0	
92	003002	CH4-200-250	Kan Bel	Trapsing Thum Khangchoung			3,500	500	4,000	135	0%	0	0%	0	
93	002002	CH4-250-300	Nget Tek	Trapsing Thum Khangchoung			1,750	1,250	3,000	125	7%	0	7%	0	
94	003001	CH4-300-350	Maech Kaa	Trapsing Thum Khangchoung			10,000	1,000	11,000	700	7%	0	7%	0	
95	002001	CH4-350-550	Tep Mom	Trapsing Thum Khangchoung			10,900	900	11,800	1000	9%	0	9%	0	
96	002001	CH4-550-750	Kung Neza	Ang Trav			7,060	260	7,320	235	3%	0	3%	0	
97	003001	CH4-750-800	Mey Mach	Trapsing Thum Khangchoung			3,900	200	4,100	165	5%	0	5%	0	
98	003002	CH4-750-800	Sang Nang	Trapsing Thum Khangchoung			8,370	870	9,240	75	1%	0	1%	0	
99	001001	CH4-800-CH5-00	Bun Lho	Trapsing Thum Khangchoung			7,750	750	8,500	725	9%	0	9%	0	
100	001002	CH5-000-050	Men Neang	Trapsing Thum Khangchoung			6,300	300	6,600	355	4%	0	4%	0	
101	002002	CH5-050-100	Sak Oun	Trapsing Thum Khangchoung			2,300	300	2,600	165	6%	0	6%	0	
102	003003	CH5-100-250	Thun Yan	Trapsing Thum Khangchoung			16,500	1,500	18,000	460	3%	0	3%	0	
103	002003	CH5-250-300	Char Upor	Trapsing Thum Khangchoung			2,750	250	3,000	200	7%	0	7%	0	
104	002004	CH5-650-900	Chay Nhang	Trapsing Thum Khangchoung			19,500	2,500	22,000	378	2%	0	2%	0	
105	003004	CH5-900-950	Hang Khuang	Trapsing Thum Khangchoung			10,250	250	10,500	200	0%	0	0%	0	
106	001003	CH5-950-CH6-00	Phun Sen	Trapsing Thum Khangchoung			5,285	285	5,570	95	0%	0	0%	0	
107	001004	CH6-050-050	Men Ching	Trapsing Thum Khangchoung			30,650	650	31,300	370	0%	0	0%	0	
108	001005	CH6-050-100	Chay Nhang	Trapsing Thum Khangchoung			19,500	2,500	22,000	150	0%	0	0%	0	
109	001006	CH6-100-150	Ngem Pros	Trapsing Thum Khangchoung			10,700	700	11,400	100	0%	0	0%	0	
110	003005	CH6-100-150	Pov Thel	Trapsing Thum Khangchoung			4,400	900	5,300	150	0%	0	0%	0	
111	001001	CH6-150-200	Khun Chantay	Trapsing Thum Khangchoung			5,200	1,200	6,400	195	4%	0	4%	0	
112	003001	CH6-150-200	Som Nhor	Trapsing Thum Khangchoung			8,000	1,000	9,000	165	2%	0	2%	0	
113	001002	CH6-200-250	Neang Angkua	Trapsing Thum Khangchoung			4,600	1,600	6,200	230	5%	0	5%	0	
114	001003	CH6-250-300	Kao Vrak	Trapsing Thum Khangchoung			5,750	750	6,500	185	0%	0	0%	0	

#	Quarries	CH-00	Hh Head		Type of Affected			Have			Total	Affected Area		No. Mh	%	No. Mh	%
			Hh Head No.	Hh Head Name	Type 1	Type 2	Type 3	Area (m ²)	Area (ha)	Area (m ²)		Area (ha)	Area (m ²)					Area (ha)
115	004001	CH6-300-350	ព្រំ ព្រំ	Prum Phasap	Trapsing Thum Khangchoung				10,000	1,000	11,000	175		2%	0	2%	0
116	003002	CH6-350-400	ស្រែ ព្រំ	Hun Sakum	Trapsing Thum Khangchoung				10,000	1,200	11,200	180		2%	0	2%	0
117	004002	CH6-400-450	ស្រែ ព្រំ	Von Vanny	Trapsing Thum Khangchoung				6,000	500	6,500	195		3%	0	3%	0
118	002001	CH6-400-450	ស្រែ ព្រំ	Poch Sovann	Trapsing Thum Khangchoung				8,400	600	9,000	105		1%	0	1%	0
119	003003	CH6-450-500	ស្រែ ព្រំ	Long Khon	Trapsing Thum Khangchoung				10,000	100	10,100	125		1%	0	1%	0
120	003004	CH6-450-500	ស្រែ ព្រំ	Pen Eng	Trapsing Thum Khangchoung				5,000	1,000	6,000	100		2%	0	2%	0
121	002002	CH6-500-550	ស្រែ ព្រំ	Poa Hen	Trapsing Thum Khangchoung				10,000	1,000	11,000	120		1%	0	1%	0
122	003005	CH6-550-650	ស្រែ ព្រំ	Kam Vern	Trapsing Thum Khangchoung				30,000	380	30,380		380	0%	0	1%	0
123	003006	CH6-650-750	ស្រែ ព្រំ	Poa Hen	Trapsing Thum Khangchoung				10,000	1,000	11,000	510		5%	0	5%	0
124	002003	CH6-750-850	ព្រំ ព្រំ	Prum Phasap	Trapsing Thum Khangchoung				5,000	1,400	6,400	295		5%	0	5%	0
125	002004	CH6-800-850	ស្រែ ព្រំ	Duch Vern	Trapsing Thum Khangchoung				8,000	365	8,365	265		3%	0	3%	0
126	002005	CH6-850-950	ស្រែ ព្រំ	Duong Ruan	Trapsing Thum Khangchoung				15,300	340	15,640	100	190	1%	0	2%	0
127	002006	CH6-950-CH7	ស្រែ ព្រំ	Sam Ooun	Trapsing Thum Khangchoung				9,000	368	9,368	225		2%	0	2%	0
128	003001	CH6-950-CH7	ស្រែ ព្រំ	Ngoun Sokkua	Trapsing Thum Khangchoung				9,000	480	9,480	260		3%	0	3%	0
129	003002	CH7-000-050	ស្រែ ព្រំ	Ou Sophoa	Trapsing Thum Khangchoung				5,000	300	5,300	135		3%	0	3%	0
130	003003	CH7-050-100	ស្រែ ព្រំ	Ream Ruetth	Trapsing Thum Khangchoung				10,000	1,000	11,000	190		1%	0	1%	0
131	003004	CH7-100-150	ស្រែ ព្រំ	An Lai	Trapsing Thum Khangchoung				31,520	2,000	33,520	435		1%	0	1%	0
132	003005	CH7-150-250	ស្រែ ព្រំ	Chan Engchin	Trapsing Thum Khangchoung				5,480	400	5,880	310		5%	0	5%	0
133	003006	CH7-250-300	ស្រែ ព្រំ	An Lai	Trapsing Thum Khangchoung				31,520	2,000	33,520	190		1%	0	1%	0
134	003007	CH7-300-350	ស្រែ ព្រំ	Ly Nouun	Trapsing Thum Khangchoung				3,450	400	3,850	345		9%	0	9%	0
135	003008	CH7-350-400	ស្រែ ព្រំ	Pen Ham	Trapsing Thum Khangchoung				1,945	600	2,545	95		4%	0	4%	0
136	003009	CH7-400-500	ស្រែ ព្រំ	Yoo Bunarath	Trapsing Thum Khangchoung				2,000	2,610	4,610		435	0%	0	9%	0
137	003010	CH7-500-600	ស្រែ ព្រំ	Neu Bouda	Trapsing Thum Khangchoung				10,000	100	10,100	450		4%	0	5%	0
138	003011	CH7-600-650	ស្រែ ព្រំ	Ou Vanna	Trapsing Thum Khangchoung				5,000	600	5,600	200		4%	0	4%	0
139	002001	CH7-650-700	ស្រែ ព្រំ	Toh Hen	Trapsing Thum Khangchoung				3,198	660	3,848	155		4%	0	4%	0
140	002002	CH7-650-700	ស្រែ ព្រំ	Soo Vrak	Trapsing Thum Khangchoung				8,000		8,000		155	0%	0	2%	0
141	002001	CH7-700-750	ស្រែ ព្រំ	Duong Sim	Trapsing Thum Khangchoung				10,000	500	10,500	95		1%	0	1%	0
142	004002	CH7-850-900	ស្រែ ព្រំ	Chhem Thon	Trapsing Thum Khangchoung				17,200	1,120	18,320	430		2%	0	2%	0

#	Quarries	CH00	H/H Head		Type of Affected			Have			Affected Area			No. h/h	%	No. h/h	%	No. h/h
			CH00	H/H Head	Commune (Name)	Type 1	Type 2	Type 3	Area (m ²)	Area (m ²)	Area (m ²)	Area (m ²)	Area (m ²)					
143	001001	CH7-850-900	វិស ធី	In Chantrey	Trapaing Thum Khangbong				5,000	125	5,125	145		3%	0	3%	0	
144	004003	CH7-850-900	ប៉ សុរាណ	Pan Sopheap	Trapaing Thum Khangbong				6,000	500	6,500	185		3%	0	3%	0	
145	004005	CH7-900-950	ត្រី ឥសាន	Kim Tola	Trapaing Thum Khangbong				13,000	1,000	14,000	170		1%	0	1%	0	
146	004006	CH7-900-950	សុំ ចាន់ធីត	Cham Chaneth	Trapaing Thum Khangbong				5,800	4,900	10,500	810		8%	0	8%	0	
147	004001	CH8-100-150	ត្រៃ យ ឆន្ទ	Cham Thoun	Trapaing Thum Khangbong				3,000	1,400	4,400	175		4%	0	4%	0	
148	002001	CH8-150-200	ត្រៃ យ ឆន្ទ	Nhem Soun	Trapaing Thum Khangbong				25,000	2,750	27,750	215		1%	0	1%	0	
149	002002	CH8-150-200	ត្រៃ យ ឆន្ទ	Krach Sophan	Trapaing Thum Khangbong				5,000	165	5,165		28	0%	0	1%	0	
150	001002	CH8-200-250	ឫ ធី ធី	Touch Mom	Trapaing Thum Khangbong				30,000	720	30,720		120	0%	0	0%	0	
151	002003	CH8-200-250	តុ យ ឆន្ទ	Tab Nan	Trapaing Thum Khangbong				7,000	650	7,650		50	0%	0	1%	0	
152	001002	CH8-200-250	តុ យ ឆន្ទ	Koy Nai	Trapaing Thum Khangbong				8,000	365	8,365		28	0%	0	0%	0	
153	001003	CH8-200-250	ឃី ឆន្ទ	Yun Soun	Trapaing Thum Khangbong				1,000	165	1,165		28	0%	0	2%	0	
154	002004	CH8-200-250	ឃី ឆន្ទ	Yun Yong	Trapaing Thum Khangbong				5,000	330	5,330		28	0%	0	1%	0	
155	002005	CH8-250-300	តុ ឆន្ទ	Don Vohy	Trapaing Thum Khangbong				10,000	1,450	11,450		145	0%	0	1%	0	
156	001004	CH8-250-300	តុ ឆន្ទ	Dr Mom	Trapaing Thum Khangbong				5,000	1,800	6,800		150	0%	0	2%	0	
157	002006	CH8-300-350	តុ ឆន្ទ	Sen Kuthsa	Trapaing Thum Khangbong		35		5,000	210	5,210		35	0%	0	1%	0	
158	001006	CH8-300-350	ប៉ ឆន្ទ	Et Chhem	Trapaing Thum Khangbong				6,000	432	6,432		120	0%	0	2%	0	
159	002007	CH8-350-400	តុ ឆន្ទ	Chum Chandara	Trapaing Thum Khangbong				10,000	2,000	12,000		650	0%	0	6%	0	
160	001001	CH9-100	តុ ឆន្ទ	Puang Tuon	O Saray				5,000	820	5,820		60,000	0%	0	1%	0	
161	001002	CH9-150-250	តុ ឆន្ទ	Ouch Ran	O Saray				7,000	1,000	8,000	195,000		2%	0	2%	0	
162	002001	CH9-300-100	តុ ឆន្ទ	Nap Voan	O Saray				8,000	800	8,800		45,000	0%	0	1%	0	
163	002002	CH9-100-150	តុ ឆន្ទ	Puang Houan	O Saray				5,000	1,000	6,000		75,000	0%	0	1%	0	
164	003001	CH9-450	តុ ឆន្ទ	Phosak La	O Saray		21		5,000	1,200	6,200		95,000	0%	0	2%	0	
165	003002	CH9-250-300	តុ ឆន្ទ	Sorn Khan	O Saray				7,000	2,500	9,500		150,000	0%	0	2%	0	
166	004001	CH9-000-050	តុ ឆន្ទ	Koo Nang	O Saray				10,000	1,517	11,517		185,000	0%	0	2%	0	
167	001003	CH9-500-550	តុ ឆន្ទ	Chhem Teary	O Saray				3,000	240	3,240		24,000	0%	0	1%	0	
168	001004	CH9-750-800	តុ ឆន្ទ	Ngath Rin	O Saray				5,000		5,000	45,000		1%	0	1%	0	
169	001005	CH9-800-850	តុ ឆន្ទ	Sam Uen	O Saray				5,500	600	6,100		45,000	0%	0	1%	0	
170	001006	CH9-900-950	តុ ឆន្ទ	El Dary	O Saray				5,000	1,500	6,500		90,000	0%	0	1%	0	

#	Quarries	CH.00-	Hh Head			Type of Affected				Have			Total			Affected Area			No. h/h	%	No. h/h	%	No. h/h	%
			CH	Hh Head kh	Hh Head Name	Village Name	Commune Name	Type 1	Type 2	Type 3	Rice Land m ²	Residen m ²	Cultivated	Affe. rice land	Aff. residen. land	% loss cult. land	% loss cult. land	land-10%							land-10%	land-100%
1	2	3	4	5	6	7	38	39	40	41	42	43	44	45	46	47	48	49						
171	001007	CH0-950-CH1	គុំរ៉េ សុខីម	Sok Sarom	Trapang Krasang	O Saray				4,000	2,000	6,000		60.00	0%	0	1%	0						
172	001008	CH1+000-650	ម៉ែម ពុល	Mom Thol	Trapang Krasang	O Saray			10,315	315	10,315		30.00	0%	0	0%	0							
173	001009	CH1+050-100	ម៉ែម សុវណ្ណារា	Men Sovannara	Trapang Krasang	O Saray	34				275	275		33.00	0%	0	12%	0						
174	001010	CH1+100-150	ម៉ែម សុខាណ	Mom Sokhan	Trapang Krasang	O Saray		36		1,000	600	1,600		60.00	0%	0	4%	0						
175	001011	CH1+150-200	ព្រាង ម៉ែម	Prak Mom	Trapang Krasang	O Saray			10,000	400	10,400		30.00	0%	0	0%	0							
176	001012	CH1+200-250	ព្រាង សុខីម	Nhong Sophy	Trapang Krasang	O Saray			10,000	750	10,750		45.00	0%	0	0%	0							
177	001013	CH1+250-300	ម៉ែម ណាវ៉ុន	Mom Navorn	Trapang Krasang	O Saray		50		5,000	600	5,600		60.00	0%	0	1%	0						
178	002003	CH0+450-500	នាង ចន្ទី	Neang Chanthan	Trapang Krasang	O Saray	40.5		10,000	1,000	11,000		75.00	0%	0	1%	0							
179	002004	CH0+550-600	នាង ចន្ទី	Chhem Chanthan	Trapang Krasang	O Saray			20,625	625	20,625	75.00		0%	0	0%	0							
180	002005	CH0+600-650	អ៊ឹម សុំម	Em Sim	Trapang Krasang	O Saray			7,000	1,000	8,000		75.00	0%	0	1%	0							
181	002006	CH0+650-CH1	ហ៊ុយ ឌីន	Tu Din	Trapang Krasang	O Saray			10,000	600	10,600		45.00	0%	0	0%	0							
182	002007	CH1+650	យ៉ែម យ៉ែន	Yem Yen	Trapang Krasang	O Saray			10,000	2,500	12,500		60.00	0%	0	0%	0							
183	002008	CH1+050-100	សុំ សុំលុយ	Sun Sam Hem	Trapang Krasang	O Saray			5,000	600	5,600	45.00		1%	0	1%	0							
184	002009	CH1+100-150	គុំរ៉េ ពុំ	Phun Touch	Trapang Krasang	O Saray		24		10,000	600	10,600		45.00	0%	0	0%	0						
185	002010	CH1+150-200	ធាតុ ឌីន	Ek Nim	Trapang Krasang	O Saray			5,000	440	5,440		45.00	0%	0	1%	0							
186	002010*	CH1+200-250	ម៉ែម ចន្ទី	Mechh Chanthy	Trapang Krasang	O Saray			10,000	800	10,800		60.00	0%	0	1%	0							
187	002011	CH1+250-300	ពេតម គុំ	Orm Teb	Trapang Krasang	O Saray			7,000	1,750	8,750		105.00	0%	0	1%	0							
188	002012	CH1+300-350	គុំរ៉េ សុខីម	Kung Saroun	Trapang Krasang	O Saray			5,000	500	5,500		30.00	0%	0	1%	0							
189	002013	CH1+350-400	ម៉ែម សុខីម	Pen Socheat	Trapang Krasang	O Saray			250	250	250		30.00	0%	0	12%	0							
190	002014	CH1+400-450	ឌី ឌីន	Or Rlein	Trapang Krasang	O Saray			7,000	220	7,220		15.00	0%	0	0%	0							
191	002015	CH1+450-480	ម៉ែម ពេត	Chupp Ne	Trapang Krasang	O Saray			10,000	280	10,280		21.00	0%	0	0%	0							
192	002016	CH1+480-500	អ៊ឹម ណាវ៉ុន	In Narith	Trapang Krasang	O Saray			15,000	1,000	16,000		60.00	0%	0	0%	0							
193	002017	CH1+500-510	ម៉ែ ណារី	Mom Nery	Trapang Krasang	O Saray			15,000	1,500	16,500		90.00	0%	0	1%	0							
194	002018	CH0+000-350	ព្រាង ណុន	Prak Lom	Trapang Krasang	O Saray			10,000	2,000	12,000		270.00	0%	0	2%	0							
195	002019	CH0+350-450	គុំរ៉េ ណារី	Keat Nav	Trapang Krasang	O Saray			10,000	660	10,660		30.00	0%	0	0%	0							
196	003003	CH0+450-500	នាង ព្រាងសុខីម	Lim Pichdaneh	Trapang Krasang	O Saray			5,000	450	5,450		45.00	0%	0	1%	0							
197	003004	CH0+500-550	ពេតម ឌីន	Em Touch	Trapang Krasang	O Saray			5,000	2,500	7,500	150.00		2%	0	2%	0							
198	003005	CH0+550-600	ពេត សុខីម	Tao Sarath	Trapang Krasang	O Saray			5,000	750	5,750		75.00	0%	0	1%	0							

#	Quarries	CH-00-	Hh Head		Type of Affected			Have		Total	Affected Area		%	No. h/h	%	No. h/h		
			Hh Head kh	Hh Head kh	Type 1	Type 2	Type 3	Rice Land m ²	Resident m ²		Cultivated	Affe. rice land					Aff. residen. land	% loss cult. land
#	Quarries	CH	4	5	6	7	38	39	40	41	42	43	44	45	46	47	48	49
199	003006	CH0-900-350	ព្រៃ ក្រវាត់	ក្រវាត់	ក្រវាត់	O Saray				5,000	750	5,750		45.00	0%	0	1%	0
200	003007	CH0-650-CH1	ក្រវាត់ ក្រវាត់	ក្រវាត់	ក្រវាត់	O Saray				10,000	2,500	12,500		150.00	0%	0	1%	0
201	003008	CH1-000-650	ក្រវាត់ ក្រវាត់	ក្រវាត់	ក្រវាត់	O Saray				5,000	500	5,500		30.00	0%	0	1%	0
202	003009	CH1-650-100	ក្រវាត់ ក្រវាត់	ក្រវាត់	ក្រវាត់	O Saray		32		5,000	1,000	6,000		60.00	0%	0	1%	0
203	003011	CH1-100-150	ក្រវាត់ ក្រវាត់	ក្រវាត់	ក្រវាត់	O Saray		38		4,000	150	4,150		15.00	0%	0	0%	0
204	003012	CH1-150-200	ក្រវាត់ ក្រវាត់	ក្រវាត់	ក្រវាត់	O Saray				10,000	4,000	14,000		150.00	0%	0	1%	0
205	003013	CH1-200-250	ក្រវាត់ ក្រវាត់	ក្រវាត់	ក្រវាត់	O Saray		47.25		10,000	935	10,935		51.00	0%	0	0%	0
206	003014	CH1-250-300	ក្រវាត់ ក្រវាត់	ក្រវាត់	ក្រវាត់	O Saray		42		7,000	2,400	9,400		90.00	0%	0	1%	0
207	004002	CH0-600-650	ក្រវាត់ ក្រវាត់	ក្រវាត់	ក្រវាត់	O Saray		128		7,000	160	7,160		30.00	0%	0	0%	0
208	004003	CH0-650-700	ក្រវាត់ ក្រវាត់	ក្រវាត់	ក្រវាត់	O Saray				10,000	1,200	11,200		120.00	0%	0	1%	0
209	001015	CH0-00-650	ក្រវាត់ ក្រវាត់	ក្រវាត់	ក្រវាត់	Cheang Tong		81		3,500	1,035	4,535		103.50	0%	0	2%	0
210	001016	CH0-00-650	ក្រវាត់ ក្រវាត់	ក្រវាត់	ក្រវាត់	Cheang Tong				10,000	840	10,840		105.00	0%	0	1%	0
211	001017	CH0-00-650	ក្រវាត់ ក្រវាត់	ក្រវាត់	ក្រវាត់	Cheang Tong				5,000	210	5,210		35.00	0%	0	1%	0
212	003021	CH0-00-650	ក្រវាត់ ក្រវាត់	ក្រវាត់	ក្រវាត់	Cheang Tong				6,000	270	6,270		75.00	0%	0	1%	0
213	003022	CH0-050-100	ក្រវាត់ ក្រវាត់	ក្រវាត់	ក្រវាត់	Cheang Tong				5,000	490	5,490		70.00	0%	0	1%	0
214	002015	CH0-050-100	ក្រវាត់ ក្រវាត់	ក្រវាត់	ក្រវាត់	Cheang Tong				5,000	150	5,150	155.00		3%	0	3%	0
215	002016	CH0-100-150	ក្រវាត់ ក្រវាត់	ក្រវាត់	ក្រវាត់	Cheang Tong				10,000	735	10,735	65.00	105.00	1%	0	2%	0
216	001018	CH0-100-150	ក្រវាត់ ក្រវាត់	ក្រវាត់	ក្រវាត់	Cheang Tong				4,000	250	4,250	265.00		6%	0	6%	0
217	001019	CH0-150-200	ក្រវាត់ ក្រវាត់	ក្រវាត់	ក្រវាត់	Cheang Tong				2,500	700	3,200	245.00		8%	0	8%	0
218	002017	CH0-200-250	ក្រវាត់ ក្រវាត់	ក្រវាត់	ក្រវាត់	Cheang Tong				5,000	200	5,200	100.00		2%	0	2%	0
219	003023	CH0-200-250	ក្រវាត់ ក្រវាត់	ក្រវាត់	ក្រវាត់	Cheang Tong				4,300	300	4,600	195.00		4%	0	4%	0
220	003024	CH0-250-300	ក្រវាត់ ក្រវាត់	ក្រវាត់	ក្រវាត់	Cheang Tong				20,000	250	20,250	220.00		1%	0	1%	0
221	003025	CH0-300-350	ក្រវាត់ ក្រវាត់	ក្រវាត់	ក្រវាត់	Cheang Tong				6,000	270	6,270	110.00		2%	0	2%	0
222	001020	CH0-300-350	ក្រវាត់ ក្រវាត់	ក្រវាត់	ក្រវាត់	Cheang Tong				10,000	350	10,350	110.00		1%	0	1%	0
223	001021	CH0-350-400	ក្រវាត់ ក្រវាត់	ក្រវាត់	ក្រវាត់	Cheang Tong				15,000	200	15,200	190.00		1%	0	1%	0
224	003026	CH0-400-450	ក្រវាត់ ក្រវាត់	ក្រវាត់	ក្រវាត់	Cheang Tong				20,000	220	20,220	110.00		1%	0	1%	0
225	002018	CH0-400-450	ក្រវាត់ ក្រវាត់	ក្រវាត់	ក្រវាត់	Cheang Tong				2,000	170	2,170	145.00		7%	0	7%	0
226	003027	CH0-450-500	ក្រវាត់ ក្រវាត់	ក្រវាត់	ក្រវាត់	Cheang Tong				20,000	450	20,450		335.00	0%	0	2%	0

#	Quarries	CH-00-	Hh Head		Mh Head	Mh Head Name	Village Name	Comm. Type	Type of Affected			Have	Total	Affected Area		%	No. h/h	%	No. h/h
			CH-00-	CH-00-					Type 1	Type 2	Type 3			Area (ha)	% of Total Area				
227	002019	CH0-650-600	ឃុំ កណ្តាល	ភ្នំ ពេជ្រ	ភ្នំ ពេជ្រ	ស្រែ ក្រវាត់	ស្រែ ក្រវាត់	Chuang Tong			3,500	6,500	275.00	4%	0	4%	0	0	
228	0017022	CH0-600-650	ឃុំ រតនគិរី	ភ្នំ ពេជ្រ	ភ្នំ ពេជ្រ	ស្រែ ក្រវាត់	ស្រែ ក្រវាត់	Chuang Tong			4,000	4,200	120.00	3%	0	3%	0	0	
229	003028	CH0-600-650	ស្រែ ក្រវាត់	ភ្នំ ពេជ្រ	ភ្នំ ពេជ្រ	ស្រែ ក្រវាត់	ស្រែ ក្រវាត់	Chuang Tong			7,000	7,519	65.00	1%	0	1%	0	0	
230	003029	CH0-600-650	ស្រែ ក្រវាត់	ភ្នំ ពេជ្រ	ភ្នំ ពេជ្រ	ស្រែ ក្រវាត់	ស្រែ ក្រវាត់	Chuang Tong			5,000	5,300	80.00	2%	0	2%	0	0	
231	003030	CH0-650-700	ស្រែ ក្រវាត់	ភ្នំ ពេជ្រ	ភ្នំ ពេជ្រ	ស្រែ ក្រវាត់	ស្រែ ក្រវាត់	Chuang Tong			4,300	4,500	210.00	5%	0	5%	0	0	
232	0010273	CH0-700-750	ស្រែ ក្រវាត់	ភ្នំ ពេជ្រ	ភ្នំ ពេជ្រ	ស្រែ ក្រវាត់	ស្រែ ក្រវាត់	Chuang Tong			8,000	8,400	325.00	4%	0	4%	0	0	
233	0010274	CH0-750-800	ស្រែ ក្រវាត់	ភ្នំ ពេជ្រ	ភ្នំ ពេជ្រ	ស្រែ ក្រវាត់	ស្រែ ក្រវាត់	Chuang Tong			5,000	5,350	120.00	2%	0	2%	0	0	
234	0020220	CH0-750-800	ស្រែ ក្រវាត់	ភ្នំ ពេជ្រ	ភ្នំ ពេជ្រ	ស្រែ ក្រវាត់	ស្រែ ក្រវាត់	Chuang Tong			6,500	7,250	170.00	2%	0	2%	0	0	
235	0020221	CH0-800-850	ស្រែ ក្រវាត់	ភ្នំ ពេជ្រ	ភ្នំ ពេជ្រ	ស្រែ ក្រវាត់	ស្រែ ក្រវាត់	Chuang Tong			5,000	5,300	220.00	4%	0	4%	0	0	
236	0010225	CH0-800-850	ស្រែ ក្រវាត់	ភ្នំ ពេជ្រ	ភ្នំ ពេជ្រ	ស្រែ ក្រវាត់	ស្រែ ក្រវាត់	Chuang Tong			10,000	10,250	155.00	2%	0	2%	0	0	
237	002031	CH0-850-900	ស្រែ ក្រវាត់	ភ្នំ ពេជ្រ	ភ្នំ ពេជ្រ	ស្រែ ក្រវាត់	ស្រែ ក្រវាត់	Chuang Tong			5,000	5,500	355.00	6%	0	6%	0	0	
238	0010226	CH0-950-1-050	ស្រែ ក្រវាត់	ភ្នំ ពេជ្រ	ភ្នំ ពេជ្រ	ស្រែ ក្រវាត់	ស្រែ ក្រវាត់	Chuang Tong			10,000	10,450	220.00	2%	0	2%	0	0	
239	0010227	CH1-000-050	ស្រែ ក្រវាត់	ភ្នំ ពេជ្រ	ភ្នំ ពេជ្រ	ស្រែ ក្រវាត់	ស្រែ ក្រវាត់	Chuang Tong			10,000	10,320	310.00	3%	0	3%	0	0	
240	0010228	CH1-050-100	ស្រែ ក្រវាត់	ភ្នំ ពេជ្រ	ភ្នំ ពេជ្រ	ស្រែ ក្រវាត់	ស្រែ ក្រវាត់	Chuang Tong			15,000	15,250	275.00	2%	0	2%	0	0	
241	0010222	CH1-150-200	ស្រែ ក្រវាត់	ភ្នំ ពេជ្រ	ភ្នំ ពេជ្រ	ស្រែ ក្រវាត់	ស្រែ ក្រវាត់	Chuang Tong			5,000	5,450	235.00	4%	0	4%	0	0	
242	0010229	CH1-200-250	ស្រែ ក្រវាត់	ភ្នំ ពេជ្រ	ភ្នំ ពេជ្រ	ស្រែ ក្រវាត់	ស្រែ ក្រវាត់	Chuang Tong			6,000	6,250	255.00	4%	0	4%	0	0	
243	0010300	CH1-250-300	ស្រែ ក្រវាត់	ភ្នំ ពេជ្រ	ភ្នំ ពេជ្រ	ស្រែ ក្រវាត់	ស្រែ ក្រវាត់	Chuang Tong			1,000	3,040		0%	0	0%	0	0	
244	002042	CH2-100-150	ស្រែ ក្រវាត់	ភ្នំ ពេជ្រ	ភ្នំ ពេជ្រ	ស្រែ ក្រវាត់	ស្រែ ក្រវាត់	Chuang Tong			1,000	3,040	182.50	0%	0	5%	0	0	
245	002042	CH2-150-200	ស្រែ ក្រវាត់	ភ្នំ ពេជ្រ	ភ្នំ ពេជ្រ	ស្រែ ក្រវាត់	ស្រែ ក្រវាត់	Chuang Tong			50,000	50,650	44.00	0%	0	0%	0	0	
246	002043	CH2-250-300	ស្រែ ក្រវាត់	ភ្នំ ពេជ្រ	ភ្នំ ពេជ្រ	ស្រែ ក្រវាត់	ស្រែ ក្រវាត់	Chuang Tong			5,000	8,488	433.00	5%	0	5%	0	0	
247	0010558	CH2-250-300	ស្រែ ក្រវាត់	ភ្នំ ពេជ្រ	ភ្នំ ពេជ្រ	ស្រែ ក្រវាត់	ស្រែ ក្រវាត់	Chuang Tong			3,000	3,760		0%	0	3%	0	0	
248	002044	CH2-300-350	ស្រែ ក្រវាត់	ភ្នំ ពេជ្រ	ភ្នំ ពេជ្រ	ស្រែ ក្រវាត់	ស្រែ ក្រវាត់	Chuang Tong	30		1,700	2,150		0%	0	3%	0	0	
249	002045	CH2-300-350	ស្រែ ក្រវាត់	ភ្នំ ពេជ្រ	ភ្នំ ពេជ្រ	ស្រែ ក្រវាត់	ស្រែ ក្រវាត់	Chuang Tong			3,000	3,708		0%	0	2%	0	0	
250	0010559	CH2-300-350	ស្រែ ក្រវាត់	ភ្នំ ពេជ្រ	ភ្នំ ពេជ្រ	ស្រែ ក្រវាត់	ស្រែ ក្រវាត់	Chuang Tong			15,000	16,251		0%	0	1%	0	0	
251	002045	CH2-350-400	ស្រែ ក្រវាត់	ភ្នំ ពេជ្រ	ភ្នំ ពេជ្រ	ស្រែ ក្រវាត់	ស្រែ ក្រវាត់	Chuang Tong			4,500	5,519		0%	0	2%	0	0	
252	0010560	CH2-350-400	ស្រែ ក្រវាត់	ភ្នំ ពេជ្រ	ភ្នំ ពេជ្រ	ស្រែ ក្រវាត់	ស្រែ ក្រវាត់	Chuang Tong			3,000	3,692		0%	0	3%	0	0	
253	002046	CH2-400-450	ស្រែ ក្រវាត់	ភ្នំ ពេជ្រ	ភ្នំ ពេជ្រ	ស្រែ ក្រវាត់	ស្រែ ក្រវាត់	Chuang Tong			1,500	2,246		0%	0	4%	0	0	
254	002047	CH2-400-450	ស្រែ ក្រវាត់	ភ្នំ ពេជ្រ	ភ្នំ ពេជ្រ	ស្រែ ក្រវាត់	ស្រែ ក្រវាត់	Chuang Tong			6,000	6,905		0%	0	1%	0	0	

#	Quarries	CH-00-	H/H Head		Village Name	Commune Name	Teacher Member	Vulnerability	Number of Affected Trees													Affected Property																		
			H/H Head In	H/H Head Name					Mango	Coconut	Palm	Bamboo	Cashew	Tamarind	Orange	Banana	Milk tree	Longan	Jackfruit	Other	Toilet	Yield storage	shop	Dug well	Pump well	Pond	concr/ence	concr/ence	Steelence	Culvert	concr. Bridge	wo. bridge	concr. slab	Stupa	wood stair	concr. stair	balcony			
255	002049	CH2-550-550	ផ្លូវ ឃុំស្រែ	Bin Phumvan	Chyapak	Cheang Tomng	4	0	10	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37			
256	001061	CH2-650-600	ផ្លូវ ឃុំស្រែ	Chey Touch	Chyapak	Cheang Tomng	8	0				10	2																											
257	001062	CH2-600-650	ស្រែ ឃុំស្រែ	San Yong	Chyapak	Cheang Tomng	10	0				6																												
258	001053	CH2-650-700	ផ្លូវ ឃុំស្រែ	Chey Touch	Chyapak	Cheang Tomng	0	0				4			2																									
259	003046	CH2-700-750	ផ្លូវ សំណាក់	Tu Sannoang	Chyapak	Cheang Tomng	4	0				10	1	9																										
260	003047	CH2-750-800	ផ្លូវ ឃុំស្រែ	Tu Vannary	Chyapak	Cheang Tomng	4	0						10																										
261	003048	CH2-800-850	ផ្លូវ ស្រែ	Chan Sobhea	Chyapak	Cheang Tomng	6	0	7			6	1		3	2																								
262	001064	CH2-850-900	ផ្លូវ ឃុំស្រែ	Chan Phallavut	Chyapak	Cheang Tomng	5	0	1						3																									
263	003049	CH2-900-950	ផ្លូវ ស្រែ	Chan Sobhea	Chyapak	Cheang Tomng	6	0	7			6			2																									
264	002050	CH2-950-CH3-0	ផ្លូវ ឃុំស្រែ	San Yanda	Chyapak	Cheang Tomng	0	0				5																												
265	001051	CH3-00-050	ផ្លូវ សំណាក់	Ek Som-eun	Chyapak	Cheang Tomng	3	0	3			4																												
266	003050	CH3-050-100	ផ្លូវ ឃុំស្រែ	Kong Cheatha	Chyapak	Cheang Tomng	4	0	1																															
267	001065	CH3-050-100	ផ្លូវ ឃុំស្រែ	Tem Chau	Chyapak	Cheang Tomng	5	1				4																												
268	001066	CH3-100-150	ផ្លូវ ឃុំស្រែ	Ti Vitol	Chyapak	Cheang Tomng	4	0	2			12																												
269	001067	CH3-150-200	ផ្លូវ ស្រែ	Ti Sakvan	Chyapak	Cheang Tomng	3	0	2			2			1																									
270	002052	CH3-150-200	ផ្លូវ ស្រែ	Sor Vortha	Chyapak	Cheang Tomng	4	0	3							1																								
271	002053	CH3-200-250	ផ្លូវ ឃុំស្រែ	Pring Chanthon	Chyapak	Cheang Tomng	7	0	4																															
272	003051	CH3-250-300	ផ្លូវ ឃុំស្រែ	Kem Lok	Ta Mom	Ta Phem	5	0				1																												
273	001068	CH3-250-300	ផ្លូវ ស្រែ	Chab Saeoum	Ta Mom	Ta Phem	6	0																																
274	003052	CH3-300-350	ផ្លូវ ឃុំស្រែ	Om Born	Ta Mom	Ta Phem	4	0																																
275	003053	CH3-300-350	ផ្លូវ ស្រែ	Chab Saeoum	Ta Mom	Ta Phem	0	0																																
276	003054	CH3-350-400	ផ្លូវ ឃុំស្រែ	Duk Nhey	Ta Mom	Ta Phem	5	0				3	1																											
277	003055	CH3-350-400	ផ្លូវ ស្រែ	Yuech Chinda	Ta Mom	Ta Phem	5	0	2			1	7		2																									
278	002054	CH3-350-400	ផ្លូវ ស្រែ	San Nisarin	Ta Mom	Ta Phem	4	0	5			7	3		1																									
279	003056	CH3-450-600	ផ្លូវ ស្រែ	Nek Ny	Ta Mom	Ta Phem	5	0	3			2																												
280	003057	CH3-600-650	ផ្លូវ ស្រែ	Now Kun	Ta Mom	Ta Phem	5	0	5			2																												
281	001069	CH3-650-700	ផ្លូវ ស្រែ	Bot Theoum	Ta Mom	Ta Phem	7	0	1			3	5		1																									
282	003058	CH3-650-700	ផ្លូវ ស្រែ	Ting Nun	Ta Mom	Ta Phem	6	1	10			2			2																									

#	Quantities	CH-00	Hilt Head		Type of Affected			Have		Total	Affected Area		%	No. h/h	%	No. h/h
			CH-00	Hilt Head	Type 1	Type 2	Type 3	Area (sqm)	Percentage of Area		Area (sqm)	Percentage of Area				
255	002049	CH2-650-650	បឹង ពារ៉ាង	Ben Phnom	Chyepak	Chuang Tong				4,000		265.00	0%	0	5%	0
256	001061	CH2-650-650	ជ័យ ទួល	Choy Touch	Chyepak	Chuang Tong		7,700		7,700	270.00		4%	0	4%	0
257	001062	CH2-650-650	សាង ត្រែង	San Yeng	Chyepak	Chuang Tong		2,000		2,000	270.00		14%	1	14%	0
258	001063	CH2-650-700	ជ័យ ទួល	Choy Touch	Chyepak	Chuang Tong		7,700		7,700	365.00		5%	0	5%	0
259	002046	CH2-700-750	ទុយ សំណាង	Tu Samnang	Chyepak	Chuang Tong		19,000	2,000	12,000		250.00	0%	0	2%	0
260	003047	CH2-750-800	ទុយ ត្រែង	Tu Vansary	Chyepak	Chuang Tong		10,000	1,400	11,400		175.00	0%	0	2%	0
261	003048	CH2-800-850	ពាន សុខា	Chan Socha	Chyepak	Chuang Tong		15,000	2,842	17,842		290.00	0%	0	2%	0
262	001064	CH2-850-900	ចន្ទ ព្រៃ	Chan Phnairach	Chyepak	Chuang Tong		7,000	1,645	8,645	140.00		2%	0	4%	0
263	003049	CH2-900-950	ពាន សុខា	Chan Socha	Chyepak	Chuang Tong		15,000	2,475	17,475		275.00	0%	0	2%	0
264	002050	CH3-950-CH3-00	ស៊ុន យ៉ាង ពារ៉ាង	Sen Yanda	Chyepak	Chuang Tong			3,200	3,200		150.00	0%	0	5%	0
265	001065	CH3-00-650	បាត សំរោង	B. Sam-ran	Chyepak	Chuang Tong		4,000	185	4,185		185.00	0%	0	4%	0
266	003050	CH3-050-100	គង ប៊ុន	Kong Chuchha	Chyepak	Chuang Tong			1,750	1,750		175.00	0%	0	10%	0
267	001066	CH3-050-100	ទ័យ ព្រៃ	Tem Orach	Chyepak	Chuang Tong		5,000	1,400	6,400		175.00	0%	0	3%	0
268	001066	CH3-100-150	ទី ត្រែង	Ti Vead	Chyepak	Chuang Tong		2,000	1,300	3,300		130.00	0%	0	4%	0
269	001067	CH3-150-200	ទី សុខា ត្រែង	Ti Sochan	Chyepak	Chuang Tong			800	800		100.00	0%	0	13%	0
270	002052	CH3-150-200	ពេល ព្រៃ	Sei Vercha	Chyepak	Chuang Tong		6,000	1,550	7,550		155.00	0%	0	2%	0
271	002053	CH3-200-250	ត្រែង ពាន ព្រៃ	Phing Chuanbon	Chyepak	Chuang Tong			1,550	1,550		155.00	0%	0	10%	0
272	003051	CH3-250-300	ត្រែង ព្រៃ	Kum Uka	Ta Mom	Ta Phnom		3,000	1,012	4,012		200.00	0%	0	6%	0
273	001068	CH3-250-300	ពេល សាវៀន	Chab Samoum	Ta Mom	Ta Phnom		17,000	300	17,300	105.00		1%	0	1%	0
274	003052	CH3-300-350	អុំ បន	Om Bam	Ta Mom	Ta Phnom		5,000	1,000	6,000	475.00		6%	0	6%	0
275	002054	CH3-300-350	ពេល សាវៀន	Chab Samoum	Ta Mom	Ta Phnom		17,000	300	17,300	105.00		1%	0	1%	0
276	003054	CH3-350-400	ព្រៃ ព្រៃ	Ou Khev	Ta Mom	Ta Phnom		13,500	1,110	14,610		165.00	0%	0	1%	0
277	003055	CH3-350-400	យល់ ព្រៃ	Yueh Chenda	Ta Mom	Ta Phnom		500	2,040	2,540		120.00	0%	0	5%	0
278	002054	CH3-350-400	សាង ព្រៃ ព្រៃ	San Nsarin	Ta Mom	Ta Phnom		10,000	5,145	15,145		245.00	0%	0	2%	0
279	003056	CH3-450-600	ព្រៃ ព្រៃ	Nak Ny	Ta Mom	Ta Phnom		4,000	1,200	5,200		220.00	0%	0	4%	0
280	003057	CH3-600-650	ទ្រី បន	Near Kum	Ta Mom	Ta Phnom		8,710	1,290	10,000		215.00	0%	0	2%	0
281	001069	CH3-650-700	ព្រៃ ព្រៃ	Bat Theoum	Ta Mom	Ta Phnom		8,000	1,200	9,200		200.00	0%	0	2%	0
282	003058	CH3-650-700	ព្រៃ ព្រៃ	Ting Han	Ta Mom	Ta Phnom		8,000	2,050	10,050		205.00	0%	0	2%	0

#	Quarries	CH-00-	Hit Head		Type of Affected			Have		Total	Affected Area		%	No. Inh	%	No. Inh
			Hit Head (m)	Hit Head (ft)	Type 1	Type 2	Type 3	Non Lead (m)	Lead (m)		Area (sq. m)	Area (sq. ft)				
283	001070	CH-600-850	ចាក់ រ៉ែន	ចាក់ រ៉ែន	Ta Mom	Ta Phom		3,000	2,100	5,100		270.00	0%	0	5%	0
284	002055	CH-650-900	ប្រាក់ ច្រវាក់	ប្រាក់ ច្រវាក់	Ta Mom	Ta Phom		8,000	1,400	9,400		140.00	0%	0	1%	0
285	002056	CH-650-900	ស្រូវ ក្រវាត់	ស្រូវ ក្រវាត់	Ta Mom	Ta Phom		2,000	1,750	3,750		175.00	0%	0	5%	0
286	002057	CH-600-950	ក្រប ក្រវាត់	ក្រប ក្រវាត់	Ta Mom	Ta Phom		5,000	225	5,225	275.00		5%	0	5%	0
287	001071	CH-650-4-000	ទឹក ក្រវាត់	ទឹក ក្រវាត់	Ta Mom	Ta Phom		6,000	500	6,500	230.00		4%	0	4%	0
288	002058	CH-600-950	ប្រាក់ ក្រវាត់	ប្រាក់ ក្រវាត់	Ta Mom	Ta Phom		8,000	2,275	10,275		227.50	0%	0	2%	0
289	001072	CH-650-100	បាក់ ប្រាក់	បាក់ ប្រាក់	Ta Mom	Ta Phom		8,000	820	8,820		115.00	0%	0	1%	0
290	002059	CH-650-100	ក្រវាត់ ទឹក	ក្រវាត់ ទឹក	Ta Mom	Ta Phom		5,000	1,110	6,110		100.00	0%	0	2%	0
291	001073	CH-100-150	ប្រាក់ ច្រវាក់	ប្រាក់ ច្រវាក់	Ta Mom	Ta Phom		1,600	500	2,100	95.00		5%	0	5%	0
292	003056	CH-150-200	ល្អិត ម៉ែន	ល្អិត ម៉ែន	Ta Mom	Ta Phom		4,000	600	4,600	325.00		7%	0	7%	0
293	001074	CH-150-200	ស្រូវ ក្រវាត់	ស្រូវ ក្រវាត់	Ta Mom	Ta Phom		6,000	500	6,500	412.50		6%	0	6%	0
294	001075	CH-200-350	ប្រាក់ ក្រវាត់	ប្រាក់ ក្រវាត់	Ta Mom	Ta Phom		2,500	700	3,200	66.00		2%	0	2%	0
295	001076	CH-250-350	ប្រាក់ ក្រវាត់	ប្រាក់ ក្រវាត់	Ta Mom	Ta Phom		3,500	750	4,250	375.00		9%	0	9%	0
296	002060	CH-350-400	ក្រប ក្រវាត់	ក្រប ក្រវាត់	Ta Mom	Ta Phom		10,000	1,200	11,200	370.00		3%	0	3%	0
297	002061	CH-400-500	ក្រប ក្រវាត់	ក្រប ក្រវាត់	Ta Mom	Ta Phom		10,000	500	10,500	170.00		2%	0	2%	0
298	001077	CH-450-500	ប្រាក់ ក្រវាត់	ប្រាក់ ក្រវាត់	Ta Mom	Ta Phom		7,000	1,000	8,000	265.00		3%	0	3%	0
299	001078	CH-500-550	ក្រប ក្រវាត់	ក្រប ក្រវាត់	Ta Mom	Ta Phom		10,000	644	10,644		115.00	0%	0	1%	0
300	002062	CH-600-550	ក្រប ក្រវាត់	ក្រប ក្រវាត់	Ta Mom	Ta Phom		5,000	1,100	6,100		110.00	0%	0	2%	0
301	003059	CH-650-600	ប្រាក់ ក្រវាត់	ប្រាក់ ក្រវាត់	Ta Mom	Ta Phom		5,000	1,280	6,280		160.00	0%	0	3%	0
302	002063	CH-600-650	ក្រប ក្រវាត់	ក្រប ក្រវាត់	Mum	Ta Phom		3,600	400	4,000		100.00	0%	0	3%	0
303	002064	CH-650-700	ស្រូវ ក្រវាត់	ស្រូវ ក្រវាត់	Mum	Ta Phom		10,000	2,000	12,000		100.00	0%	0	1%	0
304	002065	CH-650-700	ក្រប ក្រវាត់	ក្រប ក្រវាត់	Mum	Ta Phom		1,800	1,080	2,880		135.00	0%	0	5%	0
305	002066	CH-700-750	ទឹក ក្រវាត់	ទឹក ក្រវាត់	Mum	Ta Phom		2,600	2,900	5,500		200.00	0%	0	4%	0
306	002067	CH-750-800	ក្រប ក្រវាត់	ក្រប ក្រវាត់	Mum	Ta Phom		6,000	3,240	9,240		270.00	0%	0	3%	0
307	001079	CH-800-900	ក្រប ក្រវាត់	ក្រប ក្រវាត់	Mum	Ta Phom		5,100	1,980	7,080	180.00		3%	0	6%	0
308	001080	CH-850-900	ក្រប ក្រវាត់	ក្រប ក្រវាត់	Mum	Ta Phom		5,100	785	5,885		85.00	0%	0	1%	0
309	001081	CH-900-950	ក្រប ក្រវាត់	ក្រប ក្រវាត់	Mum	Ta Phom		3,500	522	4,022		87.00	0%	0	2%	0
310	001082	CH-950-CH-050	ក្រប ក្រវាត់	ក្រប ក្រវាត់	Mum	Ta Phom		3,500	2,500	6,000		300.00	0%	0	7%	0

#	Quarries	Ch100	Hh Head	Type of Affected			Have		Total	Affected Area		%	No. h/h	%	No. h/h
				Type 1	Type 2	Type 3	Area Land (ha)	Volume (m³)		Area (ha)	Volume (m³)				
311	002068	CH4-600-960	ស្រែ ភ្នំប្រីង	១៩			3,000	489	3,489		81.50	0%	0	2%	0
312	001082	CH4-600-960	ឃុំ ១០				1,500	125	1,625		41.50	0%	0	3%	0
313	003060	CH5-000-100	ស្រែ ភ្នំស្រី				6,000	3,500	9,500	260.00		3%	0	3%	0
314	002069	CH5-100-150	ស្រែ ត្រពាំង				5,000	650	5,650	255.00		5%	0	5%	0
315	003061	CH5-250-300	ស្រែ ត្រពាំង				4,000	2,500	6,500	310.00		5%	0	5%	0
316	003062	CH5-200-250	ភ្នំ ០១				5,000	2,500	7,500	116.50		2%	0	2%	0
317	002070	CH5-300-350	ស្រែ ត្រពាំង				3,600	880	4,480		110.00	0%	0	2%	0
318	002071	CH5-350-450	ស្រែ ត្រពាំង				5,000	1,650	6,650	345.00		5%	0	5%	0
319	001084	CH5-450-500	ស្រែ ត្រពាំង				2,150	2,500	4,650		215.00	0%	0	5%	0
320	002072	CH5-500-550	ស្រែ ត្រពាំង				2,401	2,500	4,901	245.00		5%	0	5%	0
321	002073	CH5-550-600	ស្រែ ត្រពាំង	72			2,491	2,750	5,151		275.00	0%	0	5%	0
322	002073	CH5-550-600	ស្រែ ត្រពាំង				1,226	2,000	3,226	160.00		5%	0	7%	0
323	001085	CH5-650-700	ស្រែ ត្រពាំង					2,500	2,500		210.00	0%	0	8%	0
324	002075	CH5-700-750	ស្រែ ត្រពាំង	192			7,000	880	7,880		300.00	0%	0	4%	0
325	003063	CH5-700-750	ស្រែ ត្រពាំង					1,500	1,500		110.00	0%	0	7%	0
326	002076	CH5-800-850	ស្រែ ត្រពាំង				10,000	1,980	11,980		165.00	0%	0	1%	0
327	002077	CH5-750-800	ស្រែ ត្រពាំង				2,280	300	2,580	190.00		7%	0	7%	0
328	002078	CH5-750-800	ស្រែ ត្រពាំង					1,680	1,680	140.00		8%	0	8%	0
329	002079	CH5-300-350	ស្រែ ត្រពាំង				12,000	2,500	14,500	145.00		1%	0	1%	0
330	002080	CH4-600-650	ស្រែ ត្រពាំង				10,000	250	10,250	120.00		1%	0	1%	0
331	002081	CH5-150-200	ស្រែ ត្រពាំង				7,000	2,250	9,250	115.00		1%	0	1%	0
332	002082	CH5-150-200	ស្រែ ត្រពាំង				10,000	350	10,350	340.00		3%	0	3%	0
333	003064	CH5-650-900	ស្រែ ត្រពាំង				7,000	1,400	8,400		175.00	0%	0	2%	0
334	003065	CH5-650-900	ស្រែ ត្រពាំង				6,500	520	7,020	52.00		0%	0	1%	0
335	002087	CH5-650-900	ស្រែ ត្រពាំង				10,000	484	10,484	110.00		0%	0	1%	0
336	003066	CH5-00-500	ស្រែ ត្រពាំង	105			5,000	600	5,600	75.00		0%	0	1%	0
337	002078	CH5-00-500	ស្រែ ត្រពាំង	69			2,300	220	2,520		55.00	0%	0	2%	0
338	001086	CH5-00-500	ស្រែ ត្រពាំង				5,000	1,400	6,400	175.00		0%	0	3%	0

No.	Quarries	CH-00	Hill Head		Type of Affected				Have		Total	Affected Area		%	No. Mh	%	No. Mh
			Area (m ²)	Volume (m ³)	Type 1	Type 2	Type 3	Open Level (m)	Height (m)	Subtotal		Area (m ²)	Volume (m ³)				
329	003067	CH-650-180	ភ្នំ ព្រី	Od Gro					10,000	1,320	11,320		165.00	0%	0	1%	0
340	002079	CH-150-200	ស្រះ ក្រ	Hak Ky		30			5,000	1,340	6,340		167.50	0%	0	3%	0
341	003068	CH-150-200	ស្រះ ក្រ	Hak Choa		77.7			15,000	1,328	16,328		1,475.00	0%	0	9%	0
342	001067	CH-200-250	ស្រះ ក្រ	Long Kambak		50			4,000	200	4,200		50.00	0%	0	1%	0
343	001068	CH-200-250	ស្រះ ក្រ	Thon Ron		44			1,300	198	1,498		49.00	0%	0	3%	0
344	001069	CH-200-250	ស្រះ ក្រ	Nao Saveth					5,000	535	5,535		76.00	0%	0	1%	0
345	003069	CH-250-300	ស្រះ ក្រ	Som Phasout					5,000	1,770	6,770		295.00	0%	0	4%	0
346	003070	CH-300-350	ស្រះ ក្រ	Som Phasout					15,000		15,000	250.00		2%	0	2%	0
347	002080	CH-350-400	ស្រះ ក្រ	Ngot Yom					2,352		2,352	245.00		10%	1	10%	0
348	002081	CH-400-450	ស្រះ ក្រ	Ton Soa					6,000	2,500	8,500		250.00	0%	0	3%	0
349	002082	CH-450-500	ស្រះ ក្រ	Ea Pichat					2,500	2,000	4,500	125.00		3%	0	3%	0
350	001090	CH-450-500	ស្រះ ក្រ	Tai Vassna					5,000		5,000	135.00		3%	0	3%	0
351	003071	CH-500-550	ស្រះ ក្រ	Och Sotha					12,000	2,226	14,226		210.00	0%	0	1%	0
352	001091	CH-500-550	ស្រះ ក្រ	Khom Hat					3,000	1,400	4,400		140.00	0%	0	3%	0
353	003072	CH-500-550	ស្រះ ក្រ	Koul Ngom					5,300	1,780	7,080		176.00	0%	0	2%	0
354	001092	CH-550-600	ស្រះ ក្រ	Phem Ten					8,000	2,240	10,240		260.00	0%	0	3%	0
355	001093	CH-600-650	ស្រះ ក្រ	Long Kambak					4,000	460	4,460		150.00	0%	0	4%	0
356	002083	CH-650-700	ស្រះ ក្រ	Koul Py					2,899	2,000	4,899		265.00	0%	0	6%	0
357	001094	CH-700-800	ស្រះ ក្រ	Koul Cheung					2,000	1,800	3,800		300.00	0%	0	8%	0
358	001095	CH-750-800	ស្រះ ក្រ	Duang Sam-on					3,000	2,405	5,405		185.00	0%	0	3%	0
359	001096	CH-600-650	ស្រះ ក្រ	Sak Vareth					6,000	1,160	7,160		145.00	0%	0	2%	0
360	002084	CH-600-650	ស្រះ ក្រ	Lom Loun					5,000	1,550	6,550		155.00	0%	0	2%	0
361	002085	CH-600-650	ស្រះ ក្រ	Sem Lem					3,000	1,500	4,500		150.00	0%	0	3%	0
362	003073	CH-650-CH-700	ស្រះ ក្រ	Phom Nit					20,000	2,030	22,030		145.00	0%	0	1%	0
363	001097	CH-650-700	ស្រះ ក្រ	Cheng Khon					5,000	1,125	6,125	50.00		1%	0	1%	0
364	002086	CH-700-750	ស្រះ ក្រ	Cheng Khon					5,000	1,125	6,125		112.50	0%	0	2%	0
365	001098	CH-350-400	ស្រះ ក្រ	Bun Bona					5,000	300	5,300	250.00		5%	0	5%	0
366	001099	CH-550-650	ស្រះ ក្រ	Cheng Vanna					5,000	250	5,250	340.00		6%	0	6%	0

#	Quarantines	CH-00	HN Head		Type of Affected			Have		Total	Affected/Free		%	No. hn	%	No. hn	
			HN Head In	HN Head Name	Type 1	Type 2	Type 3	HN Head In	HN Head Name		HN Head In	HN Head Name					
367	001/100	CH7-450-550	អ្នកជំងឺ	Vann Sihan	Pray Chhroual Leu	Ang Ta Saom		15,000	325	15,325	315.50		2%	0	2%	0	
368	001/101	CH6-950-CH7-050	ស្រី	San Son	Pray Chhroual Leu	Ang Ta Saom		10,500	2,700	13,200		450.00	0%	0	3%	0	
369	001/002	CH7-800-900	ស្រី	Ruot Koy	Pray Chhroual Leu	Ang Ta Saom		10,000	1,000	11,000	415.00		4%	0	4%	0	
370	001/103	CH7-650-600	ស្រី	Hok Cheng	Pray Chhroual Leu	Ang Ta Saom		15,000	345	15,345	155.00		1%	0	1%	0	
371	001/104	CH7-900-950	ស្រី	Mam Phanna	Pray Chhroual Leu	Ang Ta Saom		18,000	500	18,500	245.00		1%	0	1%	0	
372	002/087	CH7-050-100	ស្រី	Nhem Than	Pray Chhroual Leu	Ang Ta Saom		18,000	2,025	20,025	308.00		2%	0	2%	0	
373	001/105	CH7-700-800	ស្រី	Chheng Ser	Pray Chhroual Leu	Ang Ta Saom		18,000	3,150	21,150		315.00	0%	0	2%	0	
374	002/088	CH7-350-450	ស្រី	Srey Sok	Pray Chhroual Leu	Ang Ta Saom		25,000	4,000	29,000	285.00		1%	0	1%	0	
375	003/074	CH7-950-CH8-000	ស្រី	Vong Phasia	Pray Chhroual Leu	Ang Ta Saom		15,000	1,000	16,000	325.00		2%	0	2%	0	
376	002/089	CH7-450-500	ស្រី	Ku Khien	Pray Chhroual Leu	Ang Ta Saom		5,000	800	5,800	230.00		4%	0	4%	0	
377	002/090	CH7-150-250	ស្រី	Nhem Than	Pray Chhroual Leu	Ang Ta Saom		8,100	2,025	10,125	405.00		4%	0	4%	0	
378	002/091	CH7-100-150	ស្រី	Chor Ly	Pray Chhroual Leu	Ang Ta Saom		15,000	2,750	17,750		275.00	0%	0	2%	0	
379	003/075	CH7-750-800	ស្រី	Prak Kanyon	Pray Chhroual Leu	Ang Ta Saom		22,850	500	23,350	265.00		1%	0	1%	0	
380	002/092	CH7-650-700	ស្រី	Chheng Pros	Pray Chhroual Leu	Ang Ta Saom		4,500	1,500	6,000		197.50	0%	0	3%	0	
381	002/093	CH6-900-CH7-000	ស្រី	Nhem Sannom	Pray Chhroual Leu	Ang Ta Saom		10,000	2,650	12,650	265.00		0%	0	2%	0	
382	002/094	CH7-250-300	ស្រី	Bun Sophea	Pray Chhroual Leu	Ang Ta Saom		15,000	1,150	16,150		115.00	0%	0	1%	0	
383	003/076	CH7-300-350	ស្រី	Bun Bunyann	Pray Chhroual Leu	Ang Ta Saom		11,000	300	11,300	145.00		1%	0	1%	0	
384	001/106	CH8-100-150	ស្រី	Man Namom	Pray Chhroual Kraam	Ang Ta Saom		18,000	2,500	20,500	60.00		0%	0	0%	0	
385	003/076	CH8-250-300	ស្រី	Eun Em	Pray Chhroual Kraam	Ang Ta Saom		1,200	1,560	2,760	60.00		2%	0	2%	0	
386	003/077	CH8-150-200	ស្រី	Heng Porlek	Pray Chhroual Kraam	Ang Ta Saom		6,000	200	6,200	300.00		5%	0	5%	0	
387	003/078	CH8-300-350	ស្រី	Eun Mary	Pray Chhroual Kraam	Ang Ta Saom		1,200	230	1,430	60.00		4%	0	4%	0	
388	003/079	CH8-050-100	ស្រី	Nhem Rasmey	Pray Chhroual Kraam	Ang Ta Saom		4,000	2,550	6,550		255.00	0%	0	4%	0	
389	003/080	CH8-300-350	ស្រី	Eun Ruha	Pray Chhroual Kraam	Ang Ta Saom		1,300	3,000	4,300	65.00		2%	0	2%	0	
390	003/081	CH8-150-200	ស្រី	Heng Porley	Pray Chhroual Kraam	Ang Ta Saom		4,000	2,500	6,500	200.00		3%	0	3%	0	
391	003/082	CH8-050-100	ស្រី	Song Kemsong	Pray Chhroual Kraam	Ang Ta Saom		15,000	200	15,200	65.00		1%	0	1%	0	
392	003/083	CH8-100-200	ស្រី	Saa Sophong	Pray Chhroual Kraam	Ang Ta Saom		20,000	250	20,250	405.00		2%	0	2%	0	
											41,545	31,545					
											123,716	4,597,531	4,721,247				

Appendix 4

Results of IOL Survey of Tumnup Lok Reservoir

#	Communes		Hh Head		Number of										Type of Affected			Have		Total		Affected Area		%		No. h/h		No. h/h
	#	Communes Name	Name HH h/h	Name HH head	Village Name	Commune Name	Teacher number	Vulnerable Iby	Mango	Cocunut	Palm	Tamatch	Banana	Jackfruit	House 1	House 2	rice Land	Residen	Total Curbstard	Rice	Residential	less cultivate	loss culti. Land> 10%	total land loss = 100%	total land loss >50%			
1	2		3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26		
27	003019	ព្រៃប្រាសាទ	ស្រីសុខ	Sam Chay	Phlov Lok	Trepsang Krahnoung	7	0									25,000	750	25,000	15,000		60%	1	58%	0	1		
28	002005	ស្រីសុខ	ច័ន្ទ យ៉ុន	Chhin Yuen	Phlov Lok	Trepsang Krahnoung	5	2									18,000	1,000	18,000	3,000		17%	1	16%	0	0		
29	003020	ស្រីសុខ	ឈី ម៉េ	Em Me	Phlov Lok	Trepsang Krahnoung	3	0	2								1,500	1,250	1,500	1,000		67%	1	33%	0	0		
30	003021	ព្រៃប្រាសាទ	ព្រៃប្រាសាទ	Pha Boeun	Phlov Lok	Trepsang Krahnoung	4	1									20,000	1,000	20,000	10,000		50%	1	48%	0	0		
31	003022	ព្រៃប្រាសាទ	ព្រៃប្រាសាទ	Ang Sophal	Phlov Lok	Trepsang Krahnoung	14	0									1,600	2,000	1,600	1,600		100%	1	44%	0	0		
32	003023	ស្រីសុខ	ស្រីសុខ	Ngel Rom	Phlov Lok	Trepsang Krahnoung	4	0									16,000	1,500	16,000	6,000		38%	1	34%	0	0		
33	002006	ស្រីសុខ	ស្រីសុខ	Ngien Song	Phlov Lok	Trepsang Krahnoung	9	0									20,000	1,000	20,000	2,500		13%	1	12%	0	0		
34	003024	ព្រៃប្រាសាទ	ព្រៃប្រាសាទ	Bin Lom	Phlov Lok	Trepsang Krahnoung	7	0									20,000	1,200	20,000	5,000		25%	1	24%	0	0		
35	003025	ព្រៃប្រាសាទ	ព្រៃប្រាសាទ	Ek Mab	Phlov Lok	Trepsang Krahnoung	2	0									22,000	1,000	22,000	2,000		9%	0	9%	0	0		
36	003026	ស្រីសុខ	ស្រីសុខ	Bin Ravun	Phlov Lok	Trepsang Krahnoung	2	0									14,000	1,000	14,000	4,000		29%	1	27%	0	0		
37	003027	ស្រីសុខ	ស្រីសុខ	Chav Yim	Phlov Lok	Trepsang Krahnoung	4	2									5,000	600	5,000	5,000		100%	1	66%	0	1		
38	003028	ស្រីសុខ	ស្រីសុខ	Touch Dal	Phlov Lok	Trepsang Krahnoung	2	0									1,000	1,000	1,000	1,000		100%	1	50%	0	FALSE		
39	003029	ស្រីសុខ	ស្រីសុខ	Morm Sav	Phlov Lok	Trepsang Krahnoung	7	0									20,000	4,000	20,000	15,000		75%	1	63%	0	1		
40	003030	ស្រីសុខ	ស្រីសុខ	Kim Som	Phlov Lok	Trepsang Krahnoung	5	0									18,000	1,000	18,000	10,000		56%	1	53%	0	1		
41	003031	ស្រីសុខ	ស្រីសុខ	Chhin Lom	Phlov Lok	Trepsang Krahnoung	3	0	3								10,000	600	10,000	4,000		40%	1	36%	0	0		
42	003032	ស្រីសុខ	ស្រីសុខ	Mek Kun	Phlov Lok	Trepsang Krahnoung	6	2									9,000	2,500	9,000	4,000		44%	1	35%	0	0		
43	003033	ស្រីសុខ	ស្រីសុខ	Nhant Sokea	Phlov Lok	Trepsang Krahnoung	0	0									8,000	300	8,000	3,000		38%	1	36%	0	0		
44	003034	ស្រីសុខ	ស្រីសុខ	Nhant Sreykhouch	Phlov Lok	Trepsang Krahnoung	3	1									5,500	2,200	5,500	5,000		91%	1	66%	0	1		
45	003035	ស្រីសុខ	ស្រីសុខ	Ket Pheun	Phlov Lok	Trepsang Krahnoung	8	0									10,400	1,000	10,400	10,200		98%	1	89%	0	1		
46	003036	ស្រីសុខ	ស្រីសុខ	Touch Rih	Phlov Lok	Trepsang Krahnoung	4	0									16,500	1,600	16,500	10,000		61%	1	55%	0	1		
47	003037	ស្រីសុខ	ស្រីសុខ	Sok Touch	Phlov Lok	Trepsang Krahnoung	5	0									5,600	400	5,600	2,500		43%	1	40%	0	0		
48	003038	ស្រីសុខ	ស្រីសុខ	Ngel Siv	Phlov Lok	Trepsang Krahnoung	2	2									18,000	2,400	18,000	8,000		44%	1	38%	0	0		
49	003039	ស្រីសុខ	ស្រីសុខ	Obay Khun	Phlov Lok	Trepsang Krahnoung	5	0									33,000	1,200	33,000	23,000		70%	1	67%	0	1		
50	003040	ស្រីសុខ	ស្រីសុខ	Chab Thy	Phlov Lok	Trepsang Krahnoung	5	0									22,400	4,000	22,400	20,000		89%	1	76%	0	1		

#	Qunaires	HH Head		Vulnerability	Number of										Type of Affected	Have	Total	Affected Area		No. hh	%	No. hh	%	No. hh	total land loss >50%
		Name HH th	Name HH head		Village Name	Commune Name	Traction source	Mango	Coconut	Palm	Tamarin	Banana	Jackfruit	House 1				House 2	rice Land							Residen	Rice	Residential	loss cultiva	loss cultiva >10%	total land loss = 100%
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
51	0030041	តែង ត្បែង	They Shien	Phray Lok	Trapaing Kraeboung	6	0									7,000	660	7,000	2,000		29%	1	26%	0	0
52	0030042	ស៊ី វីត	Shou Rei	Phray Lok	Trapaing Kraeboung	13	0									12,000	1,500	12,000	4,000		33%	1	30%	0	0
53	0030043	គន់ ធីត	Kot Te	Phray Lok	Trapaing Kraeboung	6	0									10,000	450	10,000	5,000		50%	1	48%	0	0
54	0030044	ត្បែង ត្បែង	Neang Soboung	Phray Lok	Trapaing Kraeboung	4	0									5,000	1,000	5,000	5,000		100%	1	83%	0	1
55	0030045	ហ៊ុន ហ៊ុន	Huon Hou	Phray Lok	Trapaing Kraeboung	8	0									13,000	1,200	13,000	5,000		38%	1	35%	0	0
56	0030047	ជិន លុន	Chin Chhem	Phray Lok	Trapaing Kraeboung	10	0									11,000	600	11,000	5,000		45%	1	42%	0	0
57	0030048	យ៉ុយ យ៉ុយ	Yoy Khoeun	Phray Lok	Trapaing Kraeboung	4	0									10,000	1,300	10,000	10,000		100%	1	68%	0	1
58	0030049	ធីត ហ៊ុន	Chab Lu	Phray Lok	Trapaing Kraeboung	3	1									500	300	500	500		100%	1	63%	0	1
59	0020007	វិយ លេង	Oy Seng	Phray Lok	Trapaing Kraeboung	5	0									10,000	200	10,000	5,000		50%	1	49%	0	0
60	0020008	វិស វិស	Uon Im	Phray Lok	Trapaing Kraeboung	5	0									2,000	20,000	2,000	10,000		500%	1	45%	0	0
61	0030001	ធីត ធីត	Bach Phan	Dambok Krpours	Phong	5	1									20,000	2,275	20,000	5,000		25%	1	22%	0	0
62	0010001	ត្បែង ត្បែង	Em Lung	Dambok Krpours	Phong	8	2									40,000	1,500	40,000	15,000		38%	1	36%	0	0
63	0030002	លុន ធីត	Lung Chandy	Dambok Krpours	Phong	7	0									20,000	3,500	20,000	18,000		90%	1	77%	0	1
64	0030003	លុន យ៉ុន	Lung Yuang	Dambok Krpours	Phong	5	0									21,000	1,300	21,000	11,000		52%	1	49%	0	0
65	0030004	លុន លុន	Lung Non	Dambok Krpours	Phong	6	0									5,000	2,300	5,000	5,000		100%	1	68%	0	1
66	0020001	ព្រាត លុន	Prat Lom	Dambok Krpours	Phong	4	1									8,000	675	8,000	5,000		63%	1	56%	0	1
67	0030005	ព្រាត វិស	Ksak Ran	Dambok Krpours	Phong	4	1									9,000	500	9,000	4,000		44%	1	42%	0	0
68	0030006	ធីត វិស	Touch Rum	Dambok Krpours	Phong	10	0									16,000	1,500	16,000	6,000		38%	1	34%	0	0
69	0020002	ត្បែង វិស	Kesh Isakara	Dambok Krpours	Phong	3	0									5,000	800	5,000	500		10%	FALSE	9%	0	0
70	0010002	ព្រាត ធីត	Neang Chuanan	Dambok Krpours	Phong	7	0									17,000	676	17,000	17,000		100%	1	95%	0	1
71	0010003	ធីត វិស	Touch Rin	Dambok Krpours	Phong	7	0									25,000	5,000	25,000	5,000		20%	1	17%	0	0
72	0010004	ធីត វិស	Chea Chhem	Dambok Krpours	Phong	5	0									5,000	2,500	5,000	5,000		100%	1	67%	0	1
73	0030007	ត្បែង ធីត	Neel Nhem	Dambok Krpours	Phong	10	0									17,000	3,000	17,000	4,375	300,00	26%	1	23%	0	0
74	0010005	ព្រាត ត្បែង	Kesh Keat	Dambok Krpours	Phong	7	2									5,000	1,200	5,000	2,000		40%	1	32%	0	0
75	0010006	ព្រាត ត្បែង	Kesh Sochean	Dambok Krpours	Phong	7	0									10,000	300	10,000	100		1%	0	1%	0	0

#	Quarries	Hh Head		Number of													Type of Affected		Have	Total	Affected Area		%	No. h/h	%	No. h/h	total land loss >50%
		Name Hh/h	Name Hh/h head	Village Name	Commune Name	Traces meter	Withstand ability	Mango	Coconut	Palm	Tamarind	Banana	Jackfruit	House 1	House 2	Rice Land	Rice Land	Residential			loss cultivate	loss cult. land > 10%						total land loss = 100%
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26		
76	03/008	តូប ឃី	តូប ឃី	Dambok Kpoups	Phong	8	0									10,000	200	10,000	5,000		50%	1	49%	0	0		
77	03/003	ចាន រ៉ា	ចាន រ៉ា	Dambok Kpoups	Phong	5	0									10,000	2,100	10,000	1,800	2,100.00	18%	1	32%	0	0		
78	03/009	ស្រែក រៀន	ស្រែក រៀន	Dambok Kpoups	Phong	4	0									5,000	150	5,000	1,300		26%	1	25%	0	0		
79	03/010	ស្រែ រៀន	ស្រែ រៀន	Dambok Kpoups	Phong	3	2									5,000	300	5,000	5,000		100%	1	94%	0	1		
80	03/004	ស្រែក រៀន	ស្រែក រៀន	Dambok Kpoups	Phong	3	0		30							5,000	3,100	5,000	5,000	2,100.00	100%	1	88%	0	1		
81	03/011	ស្រែក រៀន	ស្រែក រៀន	Dambok Kpoups	Phong	5	0									8,000	2,000	8,000	5,000		63%	1	50%	0	FALSE		
82	03/012	ស្រែក រៀន	ស្រែក រៀន	Dambok Kpoups	Phong	5	0									4,000	200	4,000	4,000		100%	1	95%	0	1		
83	03/013	ស្រែក រៀន	ស្រែក រៀន	Dambok Kpoups	Phong	6	0									20,000	1,550	20,000	10,000		50%	1	46%	0	0		
84	03/014	ស្រែក រៀន	ស្រែក រៀន	Dambok Kpoups	Phong	2	0		2							15,000	1,345	15,000	10,000		67%	1	61%	0	1		
85	03/015	ស្រែក រៀន	ស្រែក រៀន	Dambok Kpoups	Phong	9	0									8,000	300	8,000	8,000		100%	1	96%	0	1		
86	03/016	ស្រែក រៀន	ស្រែក រៀន	Dambok Kpoups	Phong	13	0							20		7,000	5,000	7,000	7,000		100%	1	58%	0	1		
87	03/007	ស្រែក រៀន	ស្រែក រៀន	Dambok Kpoups	Phong	3	0									10,000	500	10,000	5,000		50%	1	48%	0	0		
88	03/017	ស្រែក រៀន	ស្រែក រៀន	Dambok Kpoups	Phong	4	0									4,000	200	4,000	700		18%	1	17%	0	0		
89	03/008	ស្រែក រៀន	ស្រែក រៀន	Dambok Kpoups	Phong	4	0									10,000	2,500	10,000	10,000	2,500.00	100%	1	100%	1	1		
90	03/009	ស្រែក រៀន	ស្រែក រៀន	Dambok Kpoups	Phong	2	1									10,000	3,500	10,000	5,000		50%	1	37%	0	0		
91	03/005	ស្រែក រៀន	ស្រែក រៀន	Dambok Kpoups	Phong	4	0	5								10,000	950	10,000	7,000		70%	1	64%	0	1		
92	03/006	ស្រែក រៀន	ស្រែក រៀន	Dambok Kpoups	Phong	8	0									30,000	2,500	30,000	15,000		50%	1	46%	0	0		
93	03/006	ស្រែក រៀន	ស្រែក រៀន	Dambok Kpoups	Phong	7	1									25,000	1,750	25,000	15,000		60%	1	56%	0	1		
94	03/007	ស្រែក រៀន	ស្រែក រៀន	Dambok Kpoups	Phong	6	0									15,000	1,350	15,000	10,000		67%	1	61%	0	1		
95	03/008	ស្រែក រៀន	ស្រែក រៀន	Dambok Kpoups	Phong	4	0									20,000	1,800	20,000	5,000		25%	1	23%	0	0		
96	03/009	ស្រែក រៀន	ស្រែក រៀន	Dambok Kpoups	Phong	4	0									25,000	50	25,000	10,000		40%	1	40%	0	0		
97	03/009	ស្រែក រៀន	ស្រែក រៀន	Dambok Kpoups	Phong	4	2									10,000	500	10,000	10,000		100%	1	95%	0	1		
98	03/010	ស្រែក រៀន	ស្រែក រៀន	Dambok Kpoups	Phong	5	1									10,000	359	10,000	10,000		100%	1	96%	0	1		
99	03/011	ស្រែក រៀន	ស្រែក រៀន	Dambok Kpoups	Phong	8	0									5,000	7,000	5,000	7,000.00		100%	1	100%	1	1		
100	03/012	ស្រែក រៀន	ស្រែក រៀន	Dambok Kpoups	Phong	2	1									10,000	500	10,000	10,000		100%	1	95%	0	1		

#	Quarries		HH Head		Number of										Type of Affected		Have		Total	Affected Area		%	No. hh	loss culti. land > 10%	%	No. hh	total land loss = 100%	No. hh	total land loss > 50%
	Name	HH Id	Name HH head	Village Name	Commune Name	Taxi number	Vulnerability	Mango	Coconut	Palm	Tamarind	Banana	Jackfruit	House 1	House 2	rice Land	Residence	Rice		Residential	loss cultivate									loss culti. land > 10%	total land loss > 50%
1	001001	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26				
101	0010013	៣ ៧	Chen Ry	Dambok Kbpours	Phong	2	1									30,000	875	30,000	875.00	67%	1	88%	0	1					
102	0010014	ជីយ ឃុំ	Chen Non	Dambok Kbpours	Phong	0	0		8							25,000	1,200	25,000		25%	1	27%	0	0					
103	0030018	ព្រាត សុំ	Prak Sen	Dambok Kbpours	Phong	6	1									20,000	200	20,000		100%	1	99%	0	1					
104	0010014	ឃុំន សុំភ្នំ	Ngoun Sopok	Dambok Kbpours	Phong	3	0									5,000	200	5,000	100	2%	0	2%	0	0					
105	0030018	សុំភ្នំ ភ្នំ	Suth Koesun	Dambok Kbpours	Phong	7	0									10,000	2,800	10,000	10,000	100%	1	78%	0	1					
106	0030019	ឃុំ មេត	Bou Meth	Dambok Kbpours	Phong	9	1									10,000	300	10,000	5,000	50%	1	49%	0	0					
107	0030020	យុយ ឃុំន	Khuy Thein	Dambok Kbpours	Phong	7	0									20,000	200	20,000	10,000	50%	1	50%	0	0					
108	0030021	ឃុំ ឃុំន	Khem Pern	Dambok Kbpours	Phong	9	0									10,000	400	10,000	5,000	50%	1	48%	0	0					
109	0010014	គឹម ឃុំន	Kem Man	Dambok Kbpours	Phong	5	0									15,000	500	15,000	10,000	67%	1	65%	0	1					
110	0010015	សុំភ្នំ ឃុំន	Suth Mak	Dambok Kbpours	Phong	3	1									15,000	670	15,000	5,000	33%	1	32%	0	0					
111	0010016	ឃុំន ឃុំន	Kam Buncheun	Dambok Kbpours	Phong	3	0									15,000	600	15,000	15,000	100%	1	96%	0	1					
112	0010017	ឃុំ ឃុំ	Phou Thea	Dambok Kbpours	Phong	4	0									10,000	500	10,000	500	5%	0	5%	0	0					
113	0010018	ឃុំ ឃុំ	Par Kun	Dambok Kbpours	Phong	2	1									6,000	1,350	6,000	6,000	100%	1	82%	0	1					
114	0010019	ឃុំ ឃុំន	Bou Seoun	Dambok Kbpours	Phong	4	0									15,000	500	15,000	5,000	33%	1	32%	0	0					
115	0020022	ឃុំ ឃុំ	Neang Tha	Dambok Kbpours	Phong	4	1									20,300	2,500	20,300	10,000	49%	1	44%	0	0					
116	0020010	ឃុំន ឃុំន	Bin Has	Dambok Kbpours	Phong	5	0									25,000	2,000	25,000	15,000	60%	1	56%	0	1					
117	0030011	ឃុំន ឃុំន	Cham Phat	Dambok Kbpours	Phong	7	0									15,000	100	15,000	3,600	24%	1	24%	0	0					
118	0030023	ឃុំន ឃុំន	Khun Sena	Dambok Kbpours	Phong	9	0									20,000	2,250	20,000	20,000	100%	1	90%	0	1					
119	0020013	ឃុំ ឃុំ	Srey Sam	Dambok Kbpours	Phong	2	1									5,000	1,000	5,000	500	10%	FALSE	0	0						
120	0010020	ឃុំ ឃុំ	Chen Yav	Dambok Kbpours	Phong	6	0									13,000	500	13,000	5,000	38%	1	37%	0	0					
121	0030024	ឃុំ ឃុំ	Sam Song	Dambok Kbpours	Phong	3	0									22,000	1,200	22,000	22,000	100%	1	95%	0	1					
122	0020014	ឃុំ ឃុំ	Seu Than	Dambok Kbpours	Phong	3	0									8,000	2,000	8,000	2,000	25%	1	20%	0	0					
123	0010021	ឃុំ ឃុំ	Chen Rin	Dambok Kbpours	Phong	7	1									10,000	500	10,000	10,000	100%	1	95%	0	1					
124	0020015	ឃុំ ឃុំ	Du Yun	Dambok Kbpours	Phong	5	1									9,000	2,000	9,000	9,000	100%	1	82%	0	1					
125	0010022	ឃុំ ឃុំ	Meoung Mon	Dambok Kbpours	Phong	8	1	30			29					15,000	389	15,000	10,000	67%	1	65%	0	1					

#	Quarries		HH Head		Number of										Type of Affected			Have		Total	Affected Area		%	No. hh	loss culti. land-10%	No. hh	total land loss =100%	No. hh	total land loss >50%
	#	Quarries	Name HH th	Name HH head	Village Name	Commune Name	Total member	Vulnerability	Mango	Coconut	Palm	Tamaris	Banana	Jackfruit	House 1	House 2	rice Land	Residen	Total Cultivated		Rize	Residential								loss cultivis	total land lossse
1	2		3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26			
126	003025	ស្រី វ៉ាន់	ស្រី វ៉ាន់	Sea Vann	Dambok Khpours	Phong	0	0									11,650	700	11,650	10,000		66%	1	81%	0	1			
127	003026	កង វ៉ាន់	កង វ៉ាន់	Kung On	Dambok Khpours	Phong	7	0	1	5	2			3			13,000	400	13,000	5,000		38%	1	37%	0	0			
128	002016	ឧប ស៊ីម ឡុក	Touch Karmath	Touch Karmath	Dambok Khpours	Phong	5	0									15,000	250	15,000	1,500		10%	FALSE	0	0				
129	002017	ព្រហ្ម វ៉ាន់	Nay Phom	Nay Phom	Dambok Khpours	Phong	8	2									15,000	1,600	15,000	15,000	1,600.00	100%	1	100%	1	1			
130	002018	វ៉ាន់ វ៉ាន់	Wan Pun	Wan Pun	Dambok Khpours	Phong	4	0	8					1			10,000	600	10,000	300	600.00	3%	0	6%	0	0			
131	002019	វ៉ាន់ វ៉ាន់	Wan Man	Wan Man	Dambok Khpours	Phong	4	1									20,000	160	20,000	5,000		25%	1	25%	0	0			
132	003027	ស៊ីម វ៉ាន់	Sok Kern	Sok Kern	Dambok Khpours	Phong	2	1	10								15,000	700	15,000	15,000		100%	1	96%	0	1			
133	003028	ស៊ីម វ៉ាន់	Soa Som	Soa Som	Dambok Khpours	Phong	6	1									10,000	500	10,000	5,000		50%	1	48%	0	0			
134	003029	វ៉ាន់ វ៉ាន់	Wan En	Wan En	Dambok Khpours	Phong	3	1									5,000	200	5,000	5,000		100%	1	96%	0	1			
135	003030	ស៊ីម វ៉ាន់	Som Men	Som Men	Dambok Khpours	Phong	2	2									8,000	3,000	8,000	5,000		63%	1	45%	0	0			
136	003031	ស៊ីម វ៉ាន់	Som Chet	Som Chet	Dambok Khpours	Phong	6	0									10,000	200	10,000	4,000		40%	1	39%	0	0			
137	003032	វ៉ាន់ វ៉ាន់	Chay Pich	Chay Pich	Dambok Khpours	Phong	5	0	2				9				10,000	460	10,000	4,000		40%	1	38%	0	0			
138	003033	ស៊ីម វ៉ាន់	Suy Korb	Suy Korb	Dambok Khpours	Phong	3	1									15,000	300	15,000	15,000		100%	1	98%	0	1			
139	003034	វ៉ាន់ វ៉ាន់	En Ra	En Ra	Dambok Khpours	Phong	5	0									15,000	1,710	15,000	15,000		100%	1	90%	0	1			
140	003035	វ៉ាន់ វ៉ាន់	Chea Koeun	Chea Koeun	Dambok Khpours	Phong	6	0		3							20,000	500	20,000	10,000	1,200.00	50%	1	55%	0	1			
141	002020	វ៉ាន់ វ៉ាន់	Yeung Dom	Yeung Dom	Dambok Khpours	Phong	4	0	10	5							10,000	3,000	10,000	2,800	3,000.00	28%	1	45%	0	0			
142	002021	វ៉ាន់ វ៉ាន់	Yn Channeun	Yn Channeun	Dambok Khpours	Phong	8	0									20,000	7,200	20,000	5,000		25%	1	18%	0	0			
143	003036	វ៉ាន់ វ៉ាន់	Yn Yon	Yn Yon	Dambok Khpours	Phong	10	0									20,000	1,000	20,000	10,000		50%	1	48%	0	0			
144	001023	វ៉ាន់ វ៉ាន់	Chea Young	Chea Young	Dambok Khpours	Phong	3	1									20,000	300	20,000	7,000		35%	1	34%	0	0			
145	001024	វ៉ាន់ វ៉ាន់	Mok Yin	Mok Yin	Dambok Khpours	Phong	4	0									5,000	600	5,000	3,000		60%	1	52%	0	1			
146	001025	វ៉ាន់ វ៉ាន់	Mou Yang	Mou Yang	Dambok Khpours	Phong	3	1									10,000	500	10,000	10,000		100%	1	95%	0	1			
147	001026	វ៉ាន់ វ៉ាន់	Chea Thea	Chea Thea	Dambok Khpours	Phong	6	0									2,500	300	2,500	50		2%	0	2%	0	0			
148	001027	វ៉ាន់ វ៉ាន់	Chea Chey	Chea Chey	Dambok Khpours	Phong	6	0									10,000	700	10,000	7,000		70%	1	66%	0	1			
149	001028	វ៉ាន់ វ៉ាន់	Touch Ther	Touch Ther	Dambok Khpours	Phong	2	1	5	9							10,000	4,000	10,000	7,000	4,000.00	70%	1	75%	0	1			
150	001029	វ៉ាន់ វ៉ាន់	Houng Saveth	Houng Saveth	Dambok Khpours	Phong	9	0									20,000	200	20,000	7,000		35%	1	35%	0	0			

#	Quarries		HH Head		Commune Name	Teacher center	Vulnerable City	Number of										Type of Affected			Have		Total Cultivated	Affected Area		loss cultivable land > 10%	No. hh	total land loss = 100%	No. hh	total land loss > 50%
	#	Quarries	Name HH	HH head				Village Name	Mango	Coconut	Palm	Tamarin	Banana	Jackfruit	House 1	House 2	Rice Land	Residen	Rice	Residual	%	%								
1	2		3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	28			
151	001030	ហ៊ុន ធី	អ៊ិន ធី	ឈូក ឈូក	Phong	11	0	60	20				5		20		17,800	1,600	17,800	7,800	1,600.00	44%	1	48%	0	0				
152	001031	គឹម ឃីន	គឹម ឃីន	ឈូក ឈូក	Phong	3	0										3,000	500	3,000	3,000		100%	1	86%	0	1				
153	001032	ស៊ុន ធី	ស៊ុន ធី	ឈូក ឈូក	Phong	2	1										2,000	500	2,000	2,000		100%	1	80%	0	1				
154	001033	គឹម ឃីន	គឹម ឃីន	ឈូក ឈូក	Phong	3	1										3,000	200	3,000	1,829		61%	1	57%	0	1				
155	003037	គឹម សុភា	គឹម សុភា	ឈូក ឈូក	Phong	3	1										10,000	300	10,000	4,000		40%	1	39%	0	0				
156	003038	គឹម ឃីន	គឹម ឃីន	ឈូក ឈូក	Phong	4	0										5,000	400	5,000	5,000		100%	1	93%	0	1				
157	003039	ស៊ុន សុភា	ស៊ុន សុភា	ឈូក ឈូក	Phong	5	0										10,000	300	10,000	5,000		50%	1	49%	0	0				
158	002022	គឹម សុភា	គឹម សុភា	ឈូក ឈូក	Phong	3	0										15,000	4,000	15,000	10,000		67%	1	53%	0	1				
159	001034	គឹម ឃីន	គឹម ឃីន	ឈូក ឈូក	Phong	6	0										15,000	500	15,000	5,000		33%	1	32%	0	0				
160	002023	គឹម ឃីន	គឹម ឃីន	ឈូក ឈូក	Phong	5	0										30,000	2,500	30,000	15,000		50%	1	45%	0	0				
161	002024	គឹម ឃីន	គឹម ឃីន	ឈូក ឈូក	Phong	7	0										30,000	400	30,000	10,000		33%	1	33%	0	0				
162	001034	គឹម សុភា	គឹម សុភា	ឈូក ឈូក	Phong	6	0	5	6					2			30,000	1,000	30,000	15,000		50%	1	48%	0	0				
163	001040	គឹម ឃីន	គឹម ឃីន	ឈូក ឈូក	Phong	7	0										22,000	600	22,000	10,000		45%	1	44%	0	0				
164	003041	គឹម សុភា	គឹម សុភា	ឈូក ឈូក	Phong	8	0										20,000	1,050	20,000	5,000		25%	1	24%	0	0				
165	003042	គឹម សុភា	គឹម សុភា	ឈូក ឈូក	Phong	6	0										25,000	800	25,000	10,000		40%	1	39%	0	0				
166	001035	គឹម សុភា	គឹម សុភា	ឈូក ឈូក	Phong	4	0										15,000	1,000	15,000	10,000		67%	1	63%	0	1				
167	001036	គឹម សុភា	គឹម សុភា	ឈូក ឈូក	Phong	8	0										15,000	1,200	15,000	5,000		33%	1	31%	0	0				
168	002025	គឹម សុភា	គឹម សុភា	ឈូក ឈូក	Phong	6	0										6,000	2,500	6,000	1,000		17%	1	12%	0	0				
169	002026	គឹម សុភា	គឹម សុភា	ឈូក ឈូក	Phong	3	0										10,000	300	10,000	6,000		60%	1	56%	0	1				
170	002027	គឹម សុភា	គឹម សុភា	ឈូក ឈូក	Phong	8	0										800	750	800	800		100%	1	52%	0	1				
171	002028	គឹម សុភា	គឹម សុភា	ឈូក ឈូក	Phong	3	0										10,000	1,200	10,000	800		8%	0	7%	0	0				
172	002029	គឹម សុភា	គឹម សុភា	ឈូក ឈូក	Phong	5	0										20,000	1,000	20,000	10,000		50%	1	48%	0	0				
173	002030	គឹម សុភា	គឹម សុភា	ឈូក ឈូក	Phong	7	1										10,000	1,000	10,000	8,000		80%	1	73%	0	1				
174	003043	គឹម សុភា	គឹម សុភា	ឈូក ឈូក	Phong	3	1										5,000	600	5,000	2,800		56%	1	50%	0	0				
175	003044	គឹម សុភា	គឹម សុភា	ឈូក ឈូក	Phong	2	0										10,000	1,000	10,000	5,000		50%	1	45%	0	0				
176	003045	គឹម សុភា	គឹម សុភា	ឈូក ឈូក	Phong	7	0										7,000	1,200	7,000	2,500		36%	1	30%	0	0				

#	Quarries	Hh Head		Commune Name	Total Hh member	Vulnerable Hh	Number of										Type of Affected		Have		Total		Affected Area		%	No. hh	%	No. hh	total land loss = 100%	No. hh	total land loss >50%
		Name Hh kh	Name Hh head				Village Name	Mango	Coconut	Palm	Tamarin	Banana	Jackfruit	House 1	House 2	rice Land	Residen	Rice	Residential	loss cultivate	loss culti. land= 10%	total land loss									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30		
177	03/046	ធន លៀ	Chan Seou	Dambok Kpours	Phong	10	0									20,000	1,300	20,000	15,000		75%	1	70%	0	1						
178	03/047	ទឹម ធឿន	Teb Men	Dambok Kpours	Phong	3	0									30,000	1,100	30,000	20,000		67%	1	64%	0	1						
179	03/048	ម៉ែន ធឿ	Mans Try	Dambok Kpours	Phong	14	0							30		12,000	300	12,000	1,500		13%	1	12%	0	0						
180	03/049	ហ៊ែន សុភី	Hem Sophy	Dambok Kpours	Phong	5	0									10,000	1,200	10,000	5,000		50%	1	45%	0	0						
181	03/050	ម៉ែន លី	Mam Ly	Dambok Kpours	Phong	4	0									15,000	1,000	15,000	5,000		33%	1	31%	0	0						
182	03/051	ទូ លែន	Nou Sen	Dambok Kpours	Phong	7	0									15,000	800	15,000	5,000		33%	1	32%	0	0						
183	03/052	លឿន ធឿន	Chheun Phon	Dambok Kpours	Phong	6	0									20,000	1,000	20,000	19,500		98%	1	93%	0	1						
184	03/053	ម៉ែន ពៅ	Mam Pov	Dambok Kpours	Phong	7	0									15,000	1,200	15,000	5,000		33%	1	31%	0	0						
185	02/031	ល្អិត ធឿន	Nhel Choun	Dambok Kpours	Phong	4	0									15,000	1,600	15,000	500		3%	0	3%	0	0						
186	02/032	បូ ធឿន	Bou Thom	Dambok Kpours	Phong	6	0									15,000	100	15,000	6,000		40%	1	40%	0	0						
187	03/054	បូ ព្រលា	Bou Kun	Dambok Kpours	Phong	4	0									5,000	1,200	5,000	5,000		100%	1	81%	0	1						
188	03/055	ម៉ែន ធឿន	Ben Men	Dambok Kpours	Phong	6	0									12,550	1,000	12,550	2,000		16%	1	15%	0	0						
189	03/056	ស្រី ធឿន	Sek Ren	Dambok Kpours	Phong	4	0		1	4						10,900	1,200	10,900	10,000	150,000	92%	1	84%	0	1						
190	03/057	ម៉ែន វី	Mak Vy	Dambok Kpours	Phong	5	0									21,300	1,000	21,300	19,800		93%	1	89%	0	1						
191	02/033	បូ ធឿន	Phou Noun	Dambok Kpours	Phong	4	0									5,000	600	5,000	4,000		80%	1	71%	0	1						
192	03/058	លឿន ប្រលា	Chhen Pros	Dambok Kpours	Phong	5	0									65,600	600	65,600	2,560		4%	0	4%	0	0						
193	03/059	បូ លឿន	Bou Seoum	Dambok Kpours	Phong	0	0									10,000	900	10,000	10,000		100%	1	92%	0	1						
194	03/060	ស៊ី ធឿន	Sou Meach	Dambok Kpours	Phong	8	2							6		15,000	300	15,000	5,000		33%	1	33%	0	0						
195	03/061	ហ៊ែន ស្រីពៅ	Hh Steyrov	Dambok Kpours	Phong	6	0									30,000	1,000	30,000	20,000		67%	1	65%	0	1						
196	01/037	ពៅ ធឿន	Phok La	Dambok Kpours	Phong	6	0	2								23,000	1,000	23,000	8,000		35%	1	33%	0	0						
197	01/038	ម៉ែន លឿន	Khem Mach	Dambok Kpours	Phong	8	0									5,000	460	5,000	5,000		100%	1	91%	0	1						
Total				193		1056	58	118	57	111	32	14	6	32	50	2,760,800	261,644	2,760,800	1,470,314	27,025		185		3	84						

Appendix 5

Minute of Public Consultation With APs