

Environmental Monitoring Report

Project Number: 40190-013

January 2019

CAM: GMS Flood and Drought Risk Management and Mitigation Project

(Loan 2970/8262 and Grant 0330)

Fifth Quarterly Environmental Monitoring Report (September to December 2018)

Prepared by: Ministry of Water Resources and Meteorology for the Asian Development Bank.

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Asian Development Bank



**Ministry of Water Resources
and Meteorology**

Fifth Quarterly Environmental Monitoring Report

September to December 2018

**Cambodia: Greater Mekong Sub-Region Flood and Drought Risk
Management and Mitigation Project**

**Project No.: 40190-013, Loan and Grant No: L2970-SF, G0330-SCF,
L8262-SCF**

January 2019

List of Abbreviations

ADB	Asian Development Bank
AP	Affected Person
CO	Carbon Monoxide
CPMU	Central Project Management Unit
DCIS	Damnak Chheukrom Irrigation Scheme
DDCSC	Detailed Design and Construction Supervision Consultant
DO	Dissolved Oxygen
EA	Executing Agency
EMP	Environmental Management Plan
FiA	Fishery Administration
FWUC	Farmers Water Users Communities
GPP	Grievance Point Person
IEE	Initial Environmental Examination
IFReDI	Inland Fishery Research and Development Institute
IMC	Irrigation Management Company
IOL	Inventory of losses
IR	Inception Report
IRC	Inter-ministerial Resettlement Committee
ISF	Irrigation Service Fee
MC	Main Canal
M&E	Monitoring and Evaluation
MOAFF	Ministry of Agriculture, Forestry and Fishery
MOWRAM	Ministry of Water Resources and Meteorology
MPWT	Ministry of Public Works and Transport
MRCFF	Mekong River Commission Flood Forecasting
O&M	Operation and Maintenance
PAP	Project Affected Person
PDWRAM	Provincial Department of Water Resources and Meteorology
PIC	Project Implementation Consultant
PIU	Project Implementation Unit
PPTA	Project Preparatory Technical Assistance
RAP	Resettlement Action Plan
RGC	Royal Government of Cambodia
RP	Resettlement Plan
SC	Secondary Canal
SS	Suspended Solids
TA	Technical Assistance
ToR	Terms of Reference
USD	United States Dollar
TC	Tertiary Canal
TSS	Total Suspended Solid

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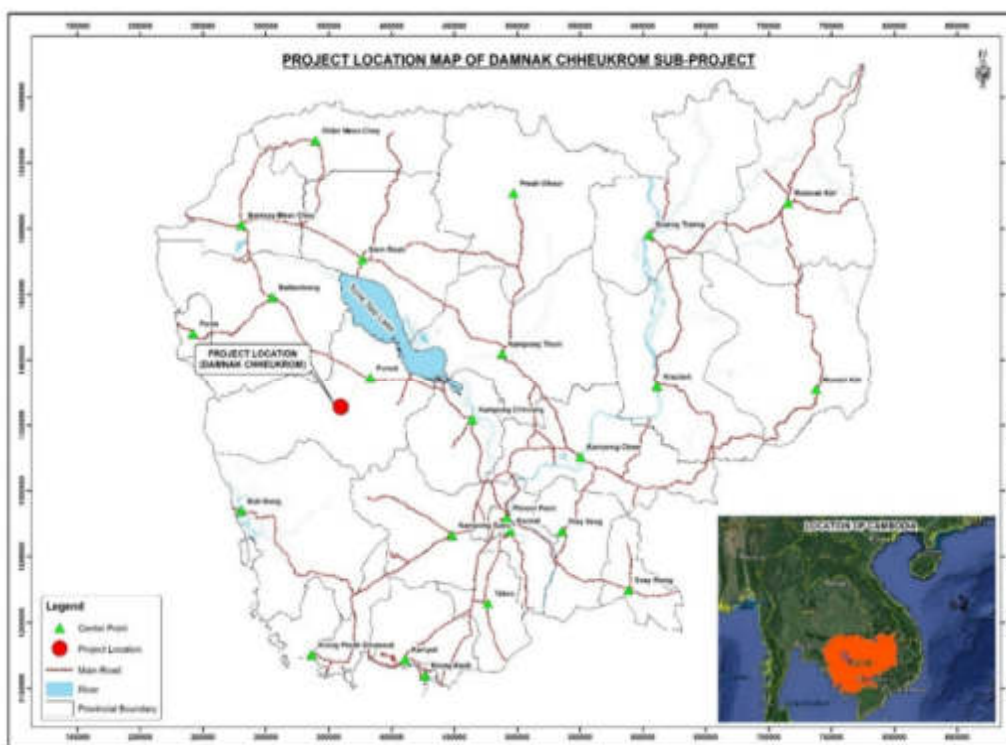
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I. INTRODUCTION

A. Description of the Project

The Damnak Chheukrom Irrigation Subproject (DCIS) of “GMS-Flood and Drought Risk Management and Mitigation Project (GMS-FDRMMP)” is located in the Pursat Province of Cambodia. DCIS covers two districts of the Pursat Province- Phnom Kravanh and Bakan and five communes- three from Phnom Kravanh district (Bak Chenchien, Pteah Rung and Samrong) and two communes from Bakan districts (Ta Lou and Khnar Toteung). There are 65 villages in these five communes with a total cultivated area of little over 36,000 ha, the project targets 16,100 ha of cultivated land in 50 villages in these five communes. The barrage site is approximately 40 km south-west from the Pursat town and will divert 22.4 cubic meter of water (revised from 50 cubic meter in the project document) in a 16.5 km long main canal, which will distribute water in the command area through a network of four secondary canals and 15 tertiary canals. DCIS, once in operation, is expected to introduce double cropping on about 8,000 hectares of previously wet season cropped areas and benefiting the whole command area of 16,100 ha (net) during the wet season. It is also expected to increase the rice yields through improved water management and introduction of superior production technologies. Figure 1 shows the project area in the national map of Cambodia.

Figure 1: DCIS Location Map in Cambodia



In order to facilitate the timely implementation of the project, DCIS is divided into three components type while preparing the Environmental Management Plans (EMPs):

- Construction of a new barrage and appurtenant structures
- Construction of main canal and appurtenant structures
- Construction of secondary and tertiary canals and appurtenant structures

Figure 2 presents the layout map of DCIS with barrage site, main canal, and secondary and tertiary canals.

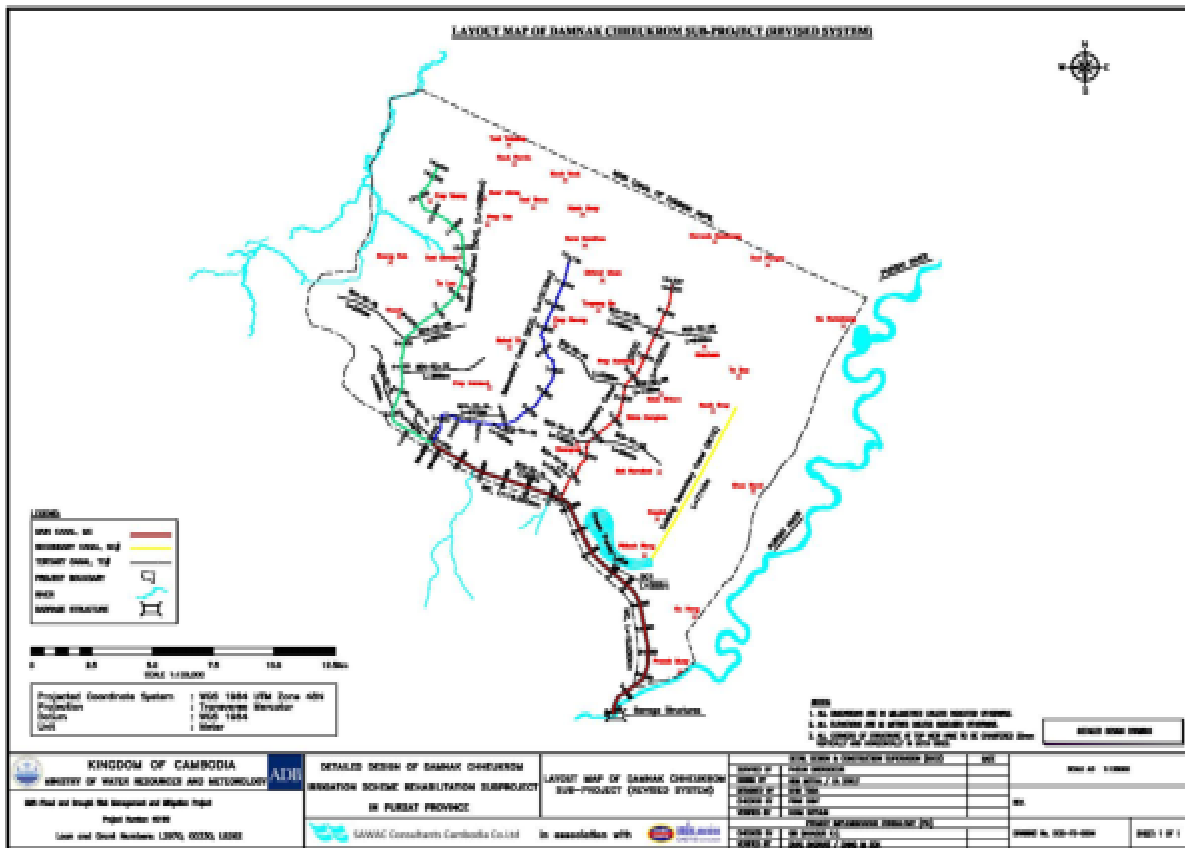


Figure 2: Layout map of DCIS

B. Purpose of Report

The loan covenants require submission of quarterly safeguards monitoring reports. As construction works started in October 2017, this is fifth quarterly environment safeguard monitoring report covers (September- December 2018). The monitoring reports will be submitted every quarter until the completion of the Project.

The main purpose of the environmental monitoring report is to ensure that the environmental mitigation plan approved to minimize the impacts of project activities are adequately complied with as per the ADB requirements and also the laws of Royal Government of Cambodia. Further, the environmental monitoring report will also help to identify and address any unanticipated environmental and/or social risks and impacts that may arise during construction, implementation or operation of the Project that were not considered in the IEE, the EMP, and the RP. The report will also inform ADB and all stakeholders of the occurrences of such risks or impacts, with detailed description of the event and proposed corrective action plan.

C. Report Preparation

The initial draft of this report is prepared by the environmental specialist of the Detailed Design and Construction Supervision Consultant (DDCSC) in consultation with the liaison officer of the Provincial Department of Water Resources and Meteorology of Pursat Province (PoDWRM). The International Environmental Specialist of the Project Implementing Consultants (PIC) in consultation with the Team Leader and Deputy Team Leader updated the initial draft and submitted to CPMU (Central Project Management Unit) for review and approval prior to submitting to ADB and Ministry of Environment.

II. PROJECT PROGRESS

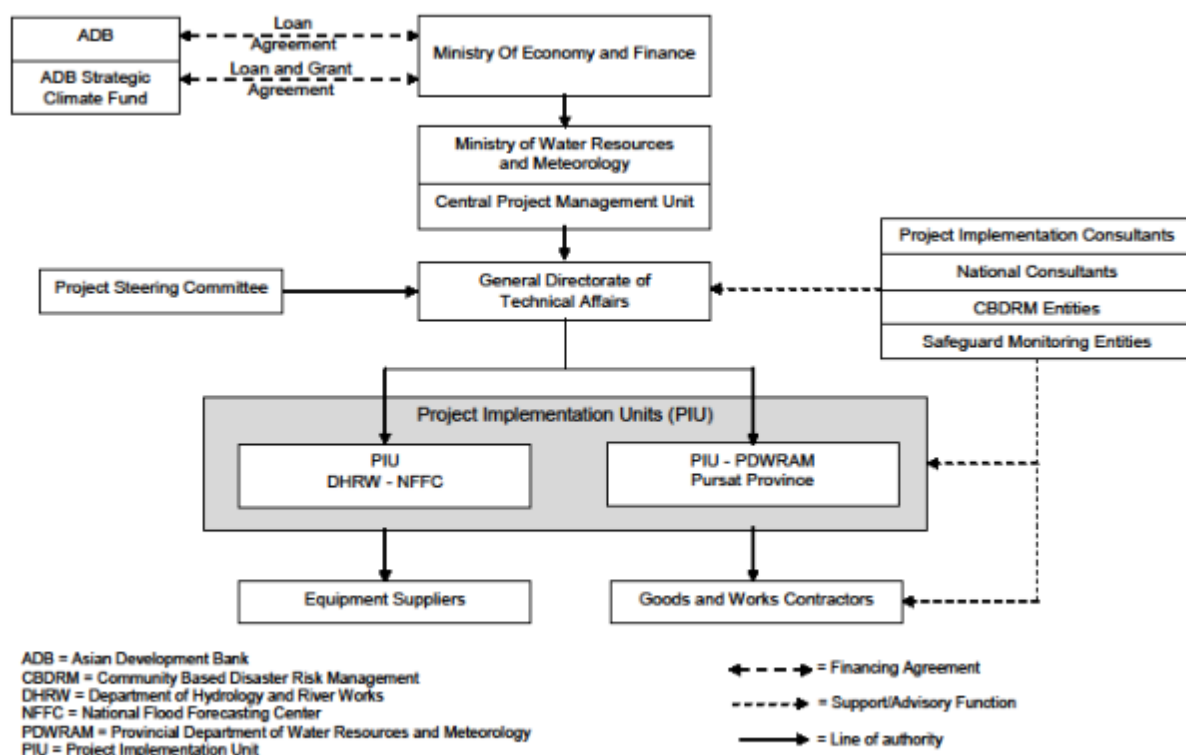
Project Implementation Organization

To ensure effective implementation of the project, the Government will establish a PSC to be chaired by the Minister MOWRAM or his delegate. The PSC will include representatives at an appropriate level from the Ministry of Economy and Finance (MEF), General Directorate of the Ministry of Agriculture, Fisheries and Forestry (MAFF), GDTA, Ministry of Environment, National Committee for Disaster Management (NCDM), and Cambodia National Mekong Committee (CNMC). In addition the Governor of Pursat Province or his representative will be a member of the PSC. The PSC will meet once per year or more frequently as required. Within 2 weeks of each meeting, the PSC will submit a copy of the minutes of the meeting, in English to ADB and in Khmer to relevant project staff and units.

MOWRAM through its GDTA will be the executing agency for the project. The Secretary of State for MOWRAM will be the Project Director. MOWRAM has established a CPMU in Phnom Penh and has appointed a Project Manager and a full complement of staff. The CPMU will be responsible for day to day management of the project with assistance from the PIC to be recruited by the CPMU. The CPMU will be responsible for recruitment of consultants (including consultants for Resettlement Plan updating and implementation), procurement of goods, works and services following ICB and NCB procedures, management and withdrawal of funds, disbursement, and reimbursement. The CPMU will also be responsible for management, coordination and supervision of the project activities of the implementing agencies. The MOWRAM, through CPMU, and the Inter-ministerial Resettlement Committee (IRC), through the Resettlement Department of the Ministry of Economy and Finance (RD-MEF), shall be the overall responsible entities for preparing, updating, implementing and managing the finances for the Resettlement Plan.

The implementing agencies will be DHRW in Phnom Penh and PDWRAM in Pursat province. The DHRW in collaboration with the Department of Meteorology (DOM) will be responsible for implementation of the first component for Strengthening of Regional Cooperation for Management of Climate Extremes. The component is intended to: improve hydro-meteorological services and the strengthening of NFFC; improve hydraulic design standards guidelines for climate resilient design of structures; and improve capacity for cross-border flood management through improved regional cooperation for flood and drought management. The PDWRAM in Pursat will be the implementing agency for the Damnak Chheukrom irrigation rehabilitation and flood control subproject. PDWRAM will establish a PIU to implement and coordinate subproject activities at the provincial and district levels. National consultants will be recruited by the CPMU to assist PDWRAM in the preparation of detailed technical designs of the subproject works as well as assist the PIU in supervision of construction work. The national consultants for detailed design and construction supervision will be located at the PIU of PDWRAM. The project implementation structure is presented in Figure 3.

Figure 3: Project Implementation Structure



Project Implementation Progress

Overall Project Progress

The Output 2 (Upgraded Water Management Infrastructure) involves the “Rehabilitation of Damnak Chheukrom Irrigation System (DCIS)” to support the improved drought management and increased flood protection of Pursat town as well as an irrigation system for 16,100 ha of land. The works include rehabilitation of barrage, head works, main canal, secondary and tertiary canals and appurtenant structures; and laying of new tertiary canals/water courses. As of September 2018, the progress of this output is delayed due to the delay in preparing and approving the resettlement (RPs). The overall progress of this output is estimated at 50%. Detailed design and cost estimate of all civil works packages of the DCIS have been completed. The civil works have been packed into five packages consisting of two International Competitive Bidding packages, the Barrage and the Main Canal, and three National Competitive Bidding (NCB) packages for the four secondary canals and their associated tertiary canals. The contract for the Main Canal and Barrage were signed in June and October 2017 respectively. Civil works of the main canal and the barrage were started late 2017 and early 2018 but suspended by ADB on 16 March 2018 as the DRP 1 covering the main canal and barrage have not been approved and implemented. However, upon request from the EA on 10 May 2018 to ADB for clearance of civil works progress on sites free of involuntary resettlement (IR) impacts, ADB provided no-objection to resume construction on sections free of IR impacts on 8 June 2018. Meanwhile,

during this period, the DRP1 is approved and the affected households are being compensated as per the approved RP. Construction works progress to date is estimated at 45.07% for the main canal and 14.60 % for the barrage.

During the next 3 months the construction activities both in Barrage and Main Canal will continue. The other three packages mentioned above will be under contract award processing.

Project Component (Packages) Progress

As DCIS is divided into five packages, the summarized activities for barrage and main canal which are in construction phase is listed below:

Main Barrage:

- Completed site clearance and access road to site,
- Preparation of site camp,
- Excavated diversion channel 0.625km, currently convey water out of the barrage construction site,
- Construction the cofferdam at the upstream and downstream completed,
- Dewatering work from construction site was continuing,
- Excavation of unsuitable soil for structure from the river bed and hauling excavated unsuitable soil is continuing,
- Excavation for sheet piling and concrete casting cut off downstream and up stream,
- Plump concrete installation under base slab of pier.
- Steel bar preparation for concrete casting at stilling basin part.

Main Canal

- Site clearance and cutting trees along the alignment completed from Ch:0+200 to Ch: 16+500,
- Top soil striping completed from Ch:0+800 to Ch: 16+500,
- Canal excavation completed from Ch: 2+100 to Ch: 7+000 and from Ch:14+500 to Ch:16+500,
- Canal Based Excavation completed: Ch:7+000 to Ch:8+000, Ch:0+800 to 1+500,
- Canal Embankment completed from Ch:2+100 to Ch: 7+000, and 14+500 to 16+500,
- Construction of Structure: Under Construction: 20 structures and not implemented structures: 8
- Grass sodding from Ch:2+000 to Ch:7+000
- Laterite Pavement from Ch:2+000 to Ch:6+00

The bid evaluation reports of the three NCB contracts have been submitted to ADB on 9 March 2018. These are expected to be approved after the resettlement plan of the secondary and tertiary canals are approved.

- Contract Package CAM3-NCB-W01: waiting for NOL from ADB after approval of RP2.
- Contract Package CAM4-NCB-W02: waiting for NOL from ADB after approval of RP2
- Contract Package CAM5-NCB-W03: waiting for NOL from ADB after approval of RP2.

Updated Implementation Schedule

As mentioned above, the civil works were suspended from March 16, 2018 due to the delay in the approval of RPs for barrage and also the main canal and because this the progress was delayed as planned. The updated targets for barrage and main canal components are presented in Figure 4 and Figure 5 respectively.

Annex I- B: Physical Progress Curve by December-2018:

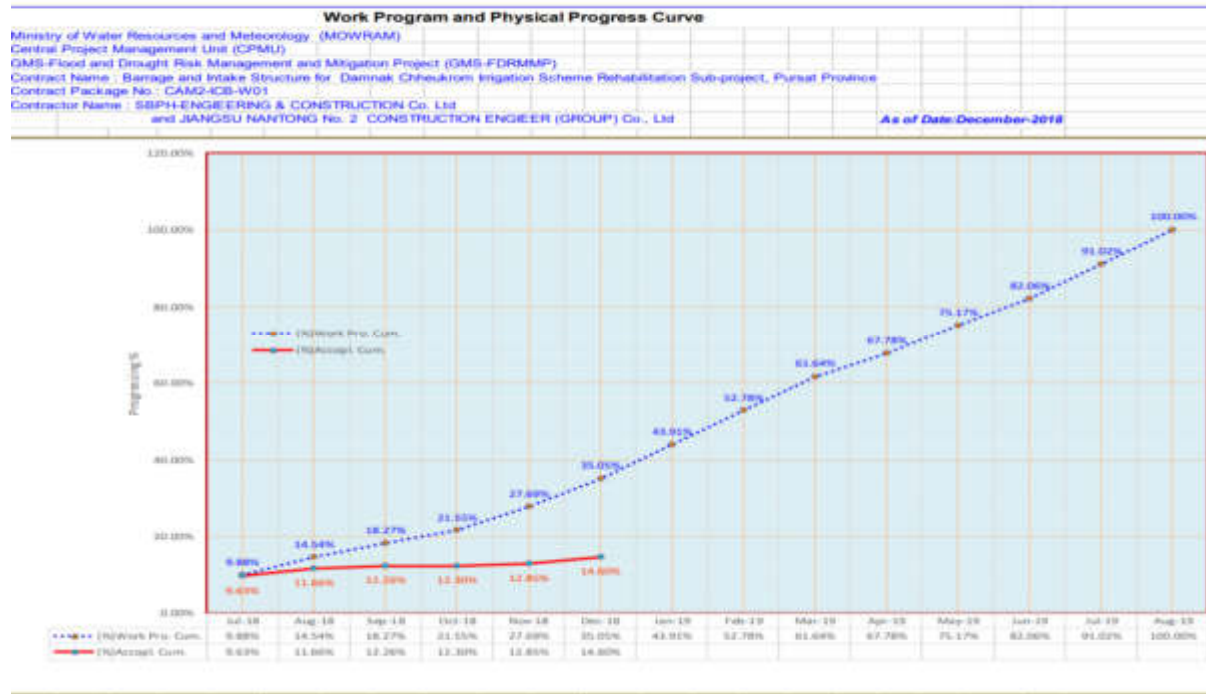


Figure 4: Barrage Work Targets and Progress

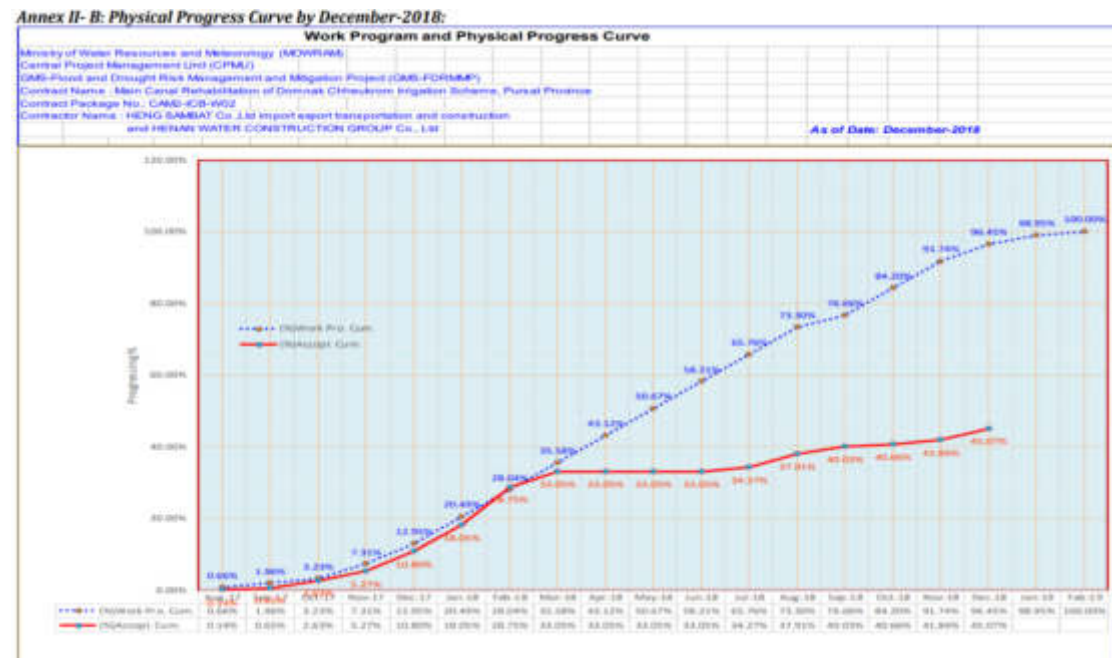


Figure 5: Main Canal Work Programs and Progress

Regarding other three packages high priority is provided for the approval of the RPs and finalize the bidding process.

III. IMPLEMENTATION OF THE EMP AND MONITORING PLAN

A. EMP and Monitoring Plan Objectives

Environmental Management Plans (EMPs) outline the mitigation, monitoring, and institutional measures to be taken during project implementation and operation to avoid, minimize or control adverse environmental and social impacts, and the actions and resources needed to implement these measures. The EMP reflects the commitment to environmental management of DCIS and shall serve as an environmental operation manual for use by management and project staffs, contractors, and regulatory authorities. The environmental monitoring plan shall ensure that the national environmental quality standards for air, water and noise quality are complied with during the construction phase and operation phase of the project.

B. Roles and Responsibilities for EMP and Monitoring Implementation

Ministry of Water Resources and Meteorology (MOWRAM) as the proponent of the Project has the overall responsibility of ensuring the compliance to environmental and social safeguard policies and the implementation of the EMP of all the components of DCIS. MOWRAM has established the Central Project Management Unit (CPMU), which includes the representative from Ministry of Environment. CPMU also has the coordinating role for environmental management. Project Implementation Unit (PIU) of the Provincial Department of MOWRAM is the implementing agency of the DCIS and is assigned with the main responsibility of implementation of EMP during the construction and operation phase of the project. PIU had designated a liaison officer for environmental protection and mitigation for the subproject and ensure compliance with EMP requirements. Detailed Design and Construction Supervision Consultant (DDCSC) has an Environment Management Specialist in the core team to assist PIU in fulfilling their responsibilities. PIC has an International Environmental Specialist in its team of consultants to support the PIU/PMU to ensure compliance with ADB and RGC requirements. The DDCSC Environmental Specialist is working closely under the supervision of the PIC.

The National Environmental Specialist and environmental liaison officer of PIU make one or two un-announced visits to the project construction site every month to check the implementation status of EMPs by the contractor. The monthly report of DDCSC includes the monthly activities of the Environmental Specialist which is submitted to PIU and CPMU.

During this reporting period (October-December 2018), Environmental Specialist and Liaison Officer have made a number of visits to the sites and three monthly reports are prepared and submitted.

C. Environmental Mitigation Measures

The compliance status on each of the mitigation measures for all the three components of DCIS- Barrage, Main Canal, and Secondary and Tertiary Canals are presented in Appendix 1-Table III-1, Table III-2, and Table III-3, respectively. Of these three components, the construction activities are ongoing for the main canal component and barrage component and the Detailed Measurement Survey is ongoing for the Secondary and Tertiary Canal components.

The Resettlement Plan for Barrage and Main Canal are approved and the RP for Secondary and Tertiary Canals is being finalized and expected to be submitted for approval in coming quarter. Affected households in the barrage and main canal are now being compensated as per the resettlement plan (DRP1. The other main non-compliance issues which were found in the beginning of the construction works, like some of the workers working without the personal protection equipment, insufficient warning signs on sites, no adequate barriers to avoid risk of fire near the petroleum storage area; leakage of petroleum products and lubricants on soil while carrying out the maintenance works of heavy equipment and machineries; that were found corrected in the previous review period are also in compliance in this period. The training program on EMP implementation to the professionals working with PIU, DDCSC and the contractors focusing on potential environmental impacts and mitigation measures of all the three components has helped to correct the initial non-compliance on health and safety and good practices.

D. Environmental Management and Monitoring Records and Reporting

During this period, surface water quality samples from Pursat river and also downstream to the main canal were taken and analyzed. The sampling locations for the surface water are presented in Table II-1. Monitoring of ambient air and noise quality, surface and ground water qualities in the project influence area included in the previous monitoring period are not repeated here.

Table III-1: Sampling Location for Surface Water Testing, December 24, 2018

Sample	District	Commune	Location	Coordinate
Surface Water – SW-03	Phnom Kravanh	Samrong	Pursat River (upstream of barrage)	UTM 48 P 0359735/1364086
Surface Water – SW-04	Bakan	Talou	Downstream of Main Canal	UTM 48 P 0352071/1374884

i.) Water Quality

The surface water quality of the Pursat River at the barrage site and upstream and downstream of the Barrage Site are presented in Table II-2 and are compared with national standards. .

Table III-22: Surface Water (SW) Quality Data on December 24, 2018

No.	Parameter	Unit	SW-03	SW-04	Standard ¹	Method (LDL)	Reference Method
1	pH	-	-	-	6.5-8.5	4.0	Method pH
2	Total Dissolved Solid (TDS)	mg/L	-	-	NV	0	Method ino-Lab Meter
3	Dissolved Oxygen (DO)	mg/L	-	-	2.0-7.5	0	Method DO Meter

No.	Parameter	Unit	SW-03	SW-04	Standard ¹	Method (LDL)	Reference Method
4	Total Suspended Solid (TSS)	mg/L	19	356	25-100	NV	Method 2540 D
5	Total Hardness (as CaCO ₃)	mg/L	8.04	36	NV	NV	Method 2340 C
6	Biochemical Oxygen Demand (BOD) ₅	mg/L	1.60	2.80	NV	NV	Method 5210 B
7	Chemical Oxygen Demand (COD) Mn	mg/L	2.74	6.97	1.0-8.0	NV	Method JIS K 0102
8	Oil and Grease	mg/L	2.95	4.98	NV	NV	Method 5520 D
9	Nitrate (NO ₃)	mg/L	-	-	NV	0.1	Method 4500-
10	Total Phosphorus (TP)	mg/L	0.02	0.75	0.005-0.05	0.01	Method JIS K 0102 46
11	Arsenic (As)	mg/L	-	-	<0.01	0.0001	Method 3500-As
12	Cadmium (Cd)	mg/L	ND	ND	<0.001	0.0002	Method 3500-
13	Copper (Cu)	mg/L	ND	0.0008	NV	0.0003	Method 3500-
14	Iron (Fe-total)	mg/L	-	-	NV	NV	Method 3500-Fe
15	Lead (Pb)	mg/L	ND	ND	<0.01	0.0002	Method 3500-
16	Mercury (Hg-total)	mg/L	0.0001	0.0002	<0.0005	NV	Method ICP-MS
17	Nickel (Ni)	mg/L	ND	0.0006	NV	0.0004	Method 3500-Ni
18	Zinc (Zn)	mg/L	-	-	NV	0.0004	Method 3500-Zn
19	Salinity (NaCl)	%	-	-	NV	0	Method
20	Detergent (MBAS)	Mg/L	ND	ND	<5.0	-	Method 5540 C
21	Total Coli form	MPN /100 ml	1.5x10 ²	1.6X10 ²	<5000	-	Method NF T90-413

Note:

- 1- Standard: Allowable limits for pollutant substance discharging to protected public water area and public water area and sewer.
- 2- LDL mean Lowest Detection Limit, ND Mean Not Detected(Lower than LDL), NV Mean No Value.

As per the above results, the water quality downstream to the barrage site is polluted as compared to the upstream of the site. It is found that the TSS, and Oil and Grease are high as compared to the national standard. It is the result of the discharges of the construction wastewater as well as operation of the heavy construction equipments in the river bodies. It is recommended to have the sedimentation tank and proper care of heavy equipments.

ii.) Air Quality

There was no air quality monitoring during this period. As there are no stationary sources of air pollution in the construction sites and the mitigation measures recommended for dust control are followed during the construction activities, the air quality was observed good during the field visits.

iii.) Noise

There was no noise quality monitoring during this period. As there are no stationary sources of noise pollution in the construction sites and the mitigation measures recommended for noise

control are followed during the construction activities. Although it is found that some construction activities are done during night time, it is recommended to limit such activities specially in the main canal area where there are residential areas.

E. EMP and Monitoring Implementation Progress

Barrage and Main Canal:

In order to ensure that mitigation measures included in the EMPs are fully complied with, the DDCSC Environmental Specialist and Liaison Officer from PDMOWRAM make the sudden visits every month. In addition, monthly progress report also includes the status on compliance with EMPs and list of corrective actions recommended. During this period compliance with EMPs with the exception of the installation of the sedimentation tank to the batching plant are found satisfactory. Highlights of observation include:

- Construction Environmental Management Plan: It is prepared and implemented. The campsite was selected and each contractor prepared a technical method statement which covered EMP, environmental, health and safety requirements (equivalent to Construction EMP) and was approved by the DDCS/PIU.
- Solid Waste Management: The contractor provides rubbish bin and at campsite and kitchen as well. For recycle waste such as drinking can/bottle are kept for vendor.
- Soil erosion protection: The contractor has applied digging the bank with slope protection
- Hazardous material management: At the site, oil tank and other hazardous material has been kept in the proper storage area with hazardous labeling. Furthermore, used lubricant is reused in construction site after operator changes a new lubricant for machinery.
- Health and Safety: Personnel Protection Equipment (PPE) is provided to workers and staff who are working at construction.
- Resettlement for Barrage and Main Canal: This is approved in this period and affected people are being compensated as per the approved plan.

Corrective Actions identified during Previous Review and Implementation Status:

During monthly visit in this period, whenever the batching plant start working, it was recommended that the sedimentation tank need to be installed to prevent the construction wastewater discharges to the river. It is found that the tanks are not installed yet. It is strongly recommended to the contractor to install sedimentation tank as soon as possible to avoid discharges of wastewater from construction work into the river and pollute the water quality in the Pursat River.

Implementation of Mitigation Measures

During this period, the status on the implementation of the mitigation measures included in the EMPs of both Barrage and Main Canal are mainly complied except the sedimentation tank to prevent construction wastewater polluting the river water quality.

F. Environmental Institutional Capacity Building and Training

The updated IEE report and also the EMP prepared for three components of DCIS has the institutional strengthening and training program to ensure the full compliance with EMPs (Table

III-38). In the training program organized in the first week of December 2017 (training report is included in Appendix 2), in addition to the participants from PDWRAM and DDCSC, engineers of the contractors of Main Canal and Barrage components also participated. The status on training plan and its implementation are presented in Table II-8.

Table III-3: Institutional Strengthening and Training Program

Strengthening Activity	Position (Responsibilities)	Strengthening Program		Schedule	Status
Monitoring Impact on Fish Migration	MOWRAM, FiA, IFRaDI	Strengthening national capacity on monitoring of fish migration and effectiveness of fish passes		2018 to 2020	
Mitigation of Impact of River Hydrology	MOWRAM, and MoAFF	Strengthening national capacity in the conservation of water resources including capacity of communities		2018-2020	
Training Activity	Participants	Course	Content	Schedule	Status
EMP Implementation	PDWRAM Officers, DDCSC Engineers (10 participants)	Environmental Management Plan of Barrage Construction	<ul style="list-style-type: none"> Impact Identification Impact Assessment Mitigation Measures Environmental Monitoring 	December 2017 (one day)	complied
EMP Implementation	Farmers (40 participants)	Training on Aquatic Weeds Management	<ul style="list-style-type: none"> Problem of Aquatic Weeds Preventive measures Control measures 	1 st Quarter 2018 (2 days)	Postponed for 2 nd quarter, 2019
EMP Implementation	Farmers (40 participants)	Proper Utilization of Chemical Fertilizers and Pesticides	<ul style="list-style-type: none"> Legal system in Cambodia Health and Environmental Risks Safety measures in storing and use Managing wastes 	2 nd Quarter 2018 (2 days)	Postponed for 2 nd quarter, 2019
EMP Implementation	MOWRAM and Provincial Department of MOWRAM officers (10 participants)	Training on Mitigation of GHG Emissions in Rice Fields	<ul style="list-style-type: none"> GHG emissions from rice fields Mitigation measures to reduce GHG emissions 	3 rd Quarter 2018 (3 day program)	Postponed for 2 nd quarter, 2019
EMP Implementation	Farmers (40 participants)	Good Practices in Minimization of GHG emissions in rice fields	<ul style="list-style-type: none"> Proper drainage system Alternative fertilizers Composting and bio-slurry 	4 th Quarter, 2018 (two day program)	Postponed for 2 nd quarter, 2019

MOWRAM: Ministry of Water Resources and Meteorology; DDCSC: Detailed Design and FiA: Fishery Administration; IFRaDI: Inland Fishery Research and Development Institute; MoAFF: Ministry of Agriculture, Forestry and Fishery.

G. Implementation of Environmental Monitoring Plan

During this period, in addition to the sudden visits to project construction sites frequently to ensure the compliance with the proposed mitigation measures, water samples from the Pursat river upstream and downstream of the barrage construction site are taken and analyzed. It is found that the construction activities on the river body in the barrage site has some effect on the water quality particularly in increased level of TSS and Oil and Grease. Works on secondary and tertiary canals are yet to be initiated, the monitoring of ground water will also be done once the works of secondary and tertiary canals is initiated. Because of the delay in the construction works on secondary and tertiary canals, the training programs planned for the period are also not carried out.

H. Institutional Requirements

As per the Loan Agreement, Project Executing Agency shall ensure that the preparation, design, construction, implementation, operation and decommissioning of the project and all project facilities comply with (a) all applicable laws and regulations of the Borrower relating to environment, health and safety; (b) the Environmental Safeguards; and (C) all measures and requirements set forth in the IEE, the EMP, and any corrective or preventive actions set forth in the Environmental Monitoring Report. If there is any discrepancy between the Borrower's relevant laws and regulations and the requirements of ADB Safeguard Policy Statement (2009), ADB's policy shall apply.

As the project was classified as Category B project, the IEE report was prepared which was updated later with separate Environmental Management Plans for Barrage, Main Canal and Secondary and Tertiary canals. EMPs are made part of the bidding documents and to ensure the full compliance, the EMPs include institutional arrangements (Heading III/B).

I. Implementation Progress

The implementation of the recommended mitigation measures and also the corrective actions recommended in the previous reviews have been found complied with in this period with the exception of not fixing the sedimentation tank while operating the batching plant.

J. Public Consultation and Disclosure

The public consultation was carried out in 2010 during in the process of Initial Environmental Examination and later in June 2016 during the preparation of EMPs. In addition to these, many individual meetings were held with affected village chiefs for updating EMPs and IEE report. During the mid-term review mission of ADB in March 2018, ADB requested that consultation is carried out with affected persons to inform the IEE, as previous consultation was with village and commune chiefs and at district/provincial level and the PIB with detail of environmental grievance redress mechanism has been developed. On June 26-27, 2018, three public consultation meeting with the affected households were organized in three communes. A total of 206 participants attended the consultation meetings of which 97 were women. In these consultation meetings, H.E. Vice Governor of Pursat Province, H.E. Director General of MORWAM, Project Manager, Advisor to MEF, Director GDR, Team Leader, Deputy Team Leader, Consultants, and Provincial/Commune/Village authorities were among the key participants. Booklet on Flood Risk Management and Mitigation Project with focus on Environmental Safeguards of DCIS is published and distributed to the affected households. It is also being placed on public places to inform the general public about the project and also about the GRM.

K. Project Grievance Records and Resolution

To receive and facilitate resolution of affected persons (AP's) concerns and grievances regarding the project's environmental performance, a well-defined grievance redress and resolution mechanism was established to address AP's grievances and complaints in a timely and satisfactory manner. All APs will be made fully aware of their rights, and the detailed grievance redress procedures will be publicized through an effective public information brochure. There are multiple entry points to the GRM, via the Contractor, PIU, PMU, village and commune council and accessible without cost or retribution. The grievance redress mechanism process is described as below:

- ✚ **Step 1:** Affected People can lodge complaints directly to the Contractors during construction (*The contact person information: Mr. Noun Rith, Construction Site Manager. Tel: 096 880 3554*). The contractor shall document and assess the complaint immediately. If assessment validates the complaint as within the scope of the GRM/eligible, the contractor shall act on the complaint within **three (03) days** from receipt of complaint.
- ✚ **Step 2:** If the complaint is not relevant to environmental performance, the AP should be directed to Commune Council, PIU and PMU. The receiving agent will be obliged to provide immediate written confirmation of receiving the complaint (an proposed GRM Complaint Form is in Appendix 3) and the contractor/operator shall immediately implement the agreed actions or resolution within **three (03) days**. In case of dissatisfaction, the case will send to District level.
- ✚ **Step 3:** Implementing the agreed resolution. (a) If complaint is minor, i.e., not requiring further investigation and would be easy to resolve, the contractor/operator shall immediately implement agreed on action/resolution; (b) If further investigation and/or procurement of supplies/parts would be necessary, the contractor/operator shall:
 - Immediately provide the most suitable interim measure to reduce the magnitude of the impact;
 - Start work on the final measure within **15 days** from the day the complaint is lodged.
- ✚ **Step 4:** When dissatisfied (or in the event the issue/impact persists despite actions undertaken), APs can appeal for assistance from the district in the elevation of his/her complaint to the provincial authority. The provincial authority shall call all parties concerned to review the history of the grievance and resolution process taken and assess the validity of the appeal.
- ✚ **Step 5:** Appeal. The provincial authority and the parties discuss and agree on the quick resolution of the issue. The CPMU/EA requires the contractor and operator to implement the agreed resolution. Should the issue continue to persist despite the second action, or the AP remain dissatisfied, the following steps will be taken:
 - **Special Mission or Judicial System:** the CPMU/EA will inform ADB to convene a special mission to attempt a resolution prior to use of the Cambodian judicial system;
 - **Accountability Mechanism of the ADB.** In addition, affected people may always contact the Complaints Receiving Officer of the ADB through ADB Cambodia Residential Mission; 29 Suramarit Blvd. (St.268), Sangkat Chatomuk, Khan Daun Penh, Phnom Penh, Cambodia; (+855) 23 215 805; (+855) 23 215 807; www.adb.org/cambodia

Further contact:

Ministry of Water Resources and Meteorology
Mr. Pin Rady, Environment Safeguard Officer, CPMU
Environment Officer/CPMU, #47 Norodom Blvd;
Tel/fax: +855-023-99-22-74

Project Implementation Unit, Provincial Department of Water Resources and Meteorology (PDOWRAM), Pursat

During this period, no complaints are made from the communities. Affected people are yet to receive the compensation as per the resettlement plan for Barrage and Main Canal component while the RP for secondary and tertiary canals is yet to be finalized.

As recommended by ADB Review Mission on September 2018, the Mission stressed the importance of reporting on project issues and complaints in safeguard monitoring reports. Reporting and resolution of complaints at a project level should be seen as “positive” as it demonstrates effective project implementation and reduces risks of issues being elevated to a higher level which would result in costly delays, investigations and potentially negative publicity.

I. CONCLUSION AND RECOMMENDATIONS

1.1 Compliance with EMP Requirements

1.1.1 EMP Implementation

DCIS which includes three separate EMPs for Barrage, Main Canal and the Secondary and Tertiary canals, only the two components are currently in the construction stage. The overall status on the implementation of the mitigation measures and also the occupation health and safety requirements are now complied with satisfactorily except with the need to install the sedimentation tank for preventing direct discharge of construction wastewater to river body. Resettlement Plan on Barrage and Main Canal is approved in this period and the affected people are being compensated as per the plan. Booklets on Environmental Safeguards is being distributed to the affected people and also it is placed in some public places for easy access to general public. The details on the status of the implementation of the EMPs for barrage and main canal are presented in Appendix 1. It is recommended to install the sedimentation tank to avoid discharges of construction waste water directly into Pursat river.

1.1.2 Training and Capacity Building

The training program identified for the team to be involved during the construction phase regarding the EMP implementation is completed. The training programs planned for farmers are yet to be completed as the works on secondary and tertiary canals is yet to be initiated and they are now planned in the second quarter of 2019.

1.2 Corrective Actions

1.2.1 Required Corrective Actions

It is recommended to continue the good practices that are followed in the construction activities to ensure compliance with the requirements. It is strongly recommended to have the sedimentation tank to avoid direct discharges of construction wastewater to river water. Training programs planned for farmers need to be planned and executed. There is the need to continue the surface water quality monitoring at Pursat river more frequently as works on the river is ongoing.

APPENDIX I: STATUS OF EMP COMPLIANCE

Table 0-1: Environmental Impacts, Mitigation Measures and Compliance Status, Barrage

Project Stage	Project Activity	Environmental Impacts	Mitigation Measures	Compliance Status	Corrective Actions
Pre-Construction Phase	Physical Environment				
	Access road, administrative complex, workforce camps construction	Land use change: 2,000 m ² of forest/shrub land and 12,500 m ² of grass land	<ul style="list-style-type: none"> Use the main canal (MC) right of way as the access road instead of separate access road. Alternatively, use the existing private road as access road until the MC portion is completed. 		
		Air and noise quality: slight increase in dust and noise level (site specific)	<ul style="list-style-type: none"> Use the MC spoil in land levelling/upgrading Water spray in dusty areas 	Complied	
		Waste management and sanitation: chances of soil contamination and bad odors (site specific, short term)	<ul style="list-style-type: none"> Include composting site in the site plan and develop the facility Construct the adequate numbers of toilets with sufficient water 	Complied	
	Biological Environment				
	Cutting of trees and shrubs	Loss of forest cover: 2,000 m ² of forest land (not in protected forest category)	<ul style="list-style-type: none"> Provide revenue from sell of forest products to "Reforestation and National Forestry Development Fund" to promote reforestation Ensure a minimum of 2,000 m² of degraded forest land in the area is reforested. 		Plan to discuss with community to promote reforestation.
		Loss of Biodiversity: minimum impact as species are common	<ul style="list-style-type: none"> Above reforestation measure will compensate the loss of species 		-
	Socio-Economic Environment				
	Land acquisition for access road	Part of 12,500 m ² will be in access road belonging to one household	<ul style="list-style-type: none"> Compensation as per the Resettlement Plan (RP) including for loss of trees 	AP are being compensated as per approved RP	

Project Stage	Project Activity	Environmental Impacts	Mitigation Measures	Compliance Status	Corrective Actions
	Land acquisition for office/camps	12,500 m ² of grass land belonging to one household	<ul style="list-style-type: none"> Compensation as per the Resettlement Plan including for loss of plantation 	RP approved and compensation process initiated.	
Construction phase	Physical Environment				
	Cutting of trees on river banks	Land use change: 17,000 m ² of forest land on both side of river banks cleared	Convert a minimum of 17,000 m ² degraded land in the Pursat River banks into forest land as compensation		Recommend ed to plan and implement
	Barrage and intake structure construction (coffer dam, earth works, diversion structures including mechanical components)	<p>Air quality: slight increase of dust at the barrage site (site specific short term)</p> <p>Noise quality: Slight increase of noise in barrage construction site (site specific, short term)</p> <p>Soil quality: possibility of soil contamination due to construction waste and leakage from machineries/equipment (site specific short term)</p> <p>Water Quality: High turbidity downstream of river, and contamination with oil/grease and chemicals</p> <p>Solid and hazardous waste management: Hazardous construction waste can lead to water and soil contamination</p>	<ul style="list-style-type: none"> Train the workforce on the good practices in the construction site management Use water spray in dusty area to reduce dust pollution Ensure that all m/c and equipment are properly maintained and comply with emission standards and noise standards Ensure workers use mask and ear muffs at sites Collect the construction waste water, reuse it and discharge the remains only after treatment Ensure m/c and equipment are not leaking Proper storage for hazardous construction waste materials with labels Handover the hazardous waste only to authorized company Provide latrines at the work site 	Safety measures complied	Regular checking of equipment to prevent spill of oil in water. Sedimentation tank need to be installed.

Project Stage	Project Activity	Environmental Impacts	Mitigation Measures	Compliance Status	Corrective Actions
	Spoil Management	<p><i>Land requirement:</i> require additional land for disposal in proper way</p> <p><i>Dust pollution:</i> generates dusts during loading, unloading, transfer and disposal (short term, localized in the area)</p> <p><i>Water Quality:</i> dumping in riverside increase turbidity and siltation problem</p> <p><i>Noise quality:</i> use of heavy equipment and loaders generates noise</p>	<ul style="list-style-type: none"> Reuse spoil in the private land to upgrade the land in addition to the use at construction site Dispose some portion into the degraded areas along the access road Reuse some portion on degraded land near the bridge (0.8 km from barrage site) Do not dump in the river banks Allow use of equipment and trucks that are properly managed and maintained in compliance with national standards 	Complied. Spoil land is closed to the construction site (<30 m away).	
	Management of workforce camps	<p><i>Hygiene and Sanitation and Solid waste management:</i></p>	<ul style="list-style-type: none"> Ensure the supply of clean drinking water, adequate numbers of toilets with water supply Waste segregation- degradable and recyclable Construction of composting plant 	Complied. Campsite is built for operator and other workers./.	
Biological Environment					
	Construction activities on the river bed	<p><i>Forest cover:</i> 17,000 m² of forested area permanently cleared</p> <p><i>Biodiversity:</i> minimum impact on biodiversity loss as the species</p>	<ul style="list-style-type: none"> Provide revenue from sell of forest products to “Reforestation and National Forestry Development Fund” to promote reforestation 		

Project Stage	Project Activity	Environmental Impacts	Mitigation Measures	Compliance Status	Corrective Actions
		are common species in the river banks	<ul style="list-style-type: none"> Ensure a minimum of 17,000 m² of degraded forestland in the area is reforested. 		
		<i>Aquatic ecosystem:</i> may restrict the movement of fish upstream, and illegal activities may result in loss of fish population	<ul style="list-style-type: none"> Strictly restrict the use of explosives and electrical wire by the workforces 		
	Socio-Economic Environment				
	<ul style="list-style-type: none"> Construction Activities Movement of equipment and vehicles Spoil disposal 	<i>Community health:</i> High level of Particulates (TSP, PM10) will result in air borne disease in the communities and also sleep disturbance due to high noise	<ul style="list-style-type: none"> Regular monitoring of the implementation of the recommended measures to control air and noise pollution Organize health check-up camps once in every six month 	Complied. Inspection by residential engineer and monthly inspection from ES/DDCS.	
		<i>Community Safety:</i> Risk of accidents due to low visibility because of resuspension of dusts	<ul style="list-style-type: none"> Implementation of recommended dust control measures Movement of vehicles only after water spray in the dusty road 	Complied. Water spraying was applied as needed.	
		<i>Damage to property and crops:</i> high dust will result in damage to soil structures, loss of vegetable and crops <i>Pressure on Community Facilities:</i> Existing health Centre will have load due to pollution related diseases and increased population in the area.	<ul style="list-style-type: none"> Spray water in the dusty roads Organization of the medical camps once in a month in coordination with the health center 	Complied. Water spraying was applied as needed. Not done	
	Physical Environment				
	Operation and Maintenance Diversion of river	<i>Land use:</i> Around 200,000 m ² of riverine forest land will be flooded in wet season	<ul style="list-style-type: none"> Compensate the loss of the forested area by converting the degraded land into forest land by mobilizing local communities 		

Project Stage	Project Activity	Environmental Impacts	Mitigation Measures	Compliance Status	Corrective Actions
		<i>River hydrology:</i> possibility of complete drying out of the river downstream	<ul style="list-style-type: none"> Maintain the environmental flow of 2.17 cubic meter per second Design and implement project on promoting reforestation and conservation of forest resources in the Pursat River basin 		
	Biological Environment				
	Diversion of Water	<i>Aquatic Ecosystem:</i> <ul style="list-style-type: none"> Restrict the movement of migratory fishes upstream No aquatic life in the complete drying out situation 	<ul style="list-style-type: none"> Construction of the fish ladder or fish pass (included in design) Monitoring of the fish passes effectiveness CCTV cameras and no fishing zone (100 meter up and down stream MOWRAM to design and construct appropriate fish passes in all cross-river obstacles downstream (planned already in Damnakk Ampil) 		
		<i>Forest and biodiversity:</i> Around 200,000 m ² of forestry will be in flooded condition with minimal impact on biodiversity as the species are common in the area	<ul style="list-style-type: none"> Compensate the loss of the forested area by converting the degraded land into forest land mobilizing local communities 		
	Socio-Economic Environment				
	Diversion of water	<i>Water use:</i>	<ul style="list-style-type: none"> less water for irrigation downstream during dry season No water for drinking in case of complete drying out situation 		
		<i>Impact on Fishing Business:</i> loss of business to household downstream of the barrage	<ul style="list-style-type: none"> Provincial Department of MOWRAM to coordinate with Farmers Water Users Communities for allocation of water during dry season Maintain the environmental flow of 2.17 cubic meter per second Develop a separate project on fish hatchery with possible funding from climate change fund 		

MOWRAM: Ministry of Water Resources and Meteorology; DCIS: Damnak Chheukrom Irrigation Scheme, DDCSC: Detailed Design and Construction Supervision Consultant; MOE: Ministry of Environment, PIC: Project Implementation Consultant, PIU: Project Implementation Unit; FWUC: Farmers Water Users Community; FIA: Fishery Administration; IFReDI: Inland Fishery Research and Development Institute.

Table 0-2: Environmental Impacts, Mitigation Measures and Compliance Status, Main Canal

Project Stage	Project Activity	Environmental Impacts	Mitigation Measures	Compliance Status	Corrective Actions
Pre-Construction Phase	Socio-Economic Environment				
	Land acquisition for main canal	<ul style="list-style-type: none"> 208 households will lose 14.15 ha of agriculture land Loss of 63 houses and 19 secondary structures and one shop Loss of 2588 private trees (2188 fruit trees) loss of about 12.5 ha of rice and 50 ha of orchard area 	<ul style="list-style-type: none"> Compensation as per the Resettlement Plan (RP) including for loss of trees (yet to be approved) 	RP approved and compensation process initiated.	
	Physical Environment				
Construction phase	Land clearance - cutting of trees and removal of house and other structures	Land use change: Permanently convert 116 ha of public and private land into the canal, road structure and right of the way to the main canal. Of this total land, 102 ha is the existing old canal currently with grass and shrubs, about 4.0 ha is the public forest/shrub land, and about 14.15 ha is the private agricultural land.	Spoil disposal area to be converted into forest area involving FWUC	Spoil is reused till now, complied	
	Construction of main canal and appurtenant structures	<p><i>Air quality:</i> slight increase of dust along main canal (site specific short term)</p> <p><i>Noise quality:</i> Slight increase of noise in MC construction site (site specific, short term)</p> <p><i>Soil and ground water quality:</i> possibility of soil contamination due to construction waste and leakage from machineries/equipments (site specific short term) and</p>	<ul style="list-style-type: none"> Train the workforce on the good practices in the construction site management Use water spray in dusty area to reduce dust pollution Ensure that all m/c and equipment are properly maintained and comply with emission standards and noise standards Ensure workers use mask and ear muffs at sites 	<p>Majority of workers seen using the personal protection equipment (PPE);</p> <p>Water spraying in dusty area complied;</p> <p>Storage facilities for hazardous waste provided;</p>	<p>Continue to make mandatory the use of PPE;</p> <p>Strictly follow the maintenance works only after cover to soil,</p>

Project Stage	Project Activity	Environmental Impacts	Mitigation Measures	Compliance Status	Corrective Actions
		<p>possibility of ground water pollution.</p> <p><i>Solid and hazardous waste management:</i> Hazardous construction waste can lead to ground water and soil contamination</p>	<ul style="list-style-type: none"> • Collect the construction waste water, reuse it and discharge the remains only after treatment • Ensure m/c and equipment are not leaking • Proper storage for hazardous construction waste materials with labels • Handover the hazardous waste only to authorized company • Provide latrines at the work site 	Need collection of construction waste water and reuse it.	
	Spoil Management	<p><i>Land requirement:</i> require additional land for disposal in proper way</p> <p><i>Dust pollution:</i> generates dusts during loading, unloading, transfer and disposal (short term, localized in the area)</p> <p><i>Noise quality:</i> use of heavy equipment and loaders generates noise</p>	<ul style="list-style-type: none"> • Use spoil in the right of the way of the main canal, some in nearby schools and pagoda and some portion on upgrading the rural roads along the canal • Use some portion in making Dike embankment to protect from floods • Upgrade the degraded land at 0.6 km from barrage and also 1.8 km from main canal • Allow use of equipment and trucks that are properly maintained and comply national standards 	Spoil used in right of way of main canal, complied with	
	Management of workforce camps	<i>Hygiene and Sanitation and Solid waste management:</i>	<ul style="list-style-type: none"> • Ensure the supply of clean drinking water, adequate numbers of toilets with water supply along the MC 	Toilet was arranged in each sub-campsite via	

Project Stage	Project Activity	Environmental Impacts	Mitigation Measures	Compliance Status	Corrective Actions
	Biological Environment				
	Land clearance - cutting of trees and removal of house and other structures	<ul style="list-style-type: none"> Loss of about 7,200 trees for public land of different species Loss of 2588 private trees (2188 fruit trees), loss of about 12.5 ha of rice and 50 ha of orchard area 	<ul style="list-style-type: none"> Waste segregation- degradable and recyclable Dumping on organic component in lands with soil cover Mobile latrine 	rental local people toilet.	
		<ul style="list-style-type: none"> Provide revenue from sell of forest products to "Reforestation and National Forestry Development Fund" to promote reforestation Ensure a minimum of 10,000 trees of local species are replanted involving FWUC in the spoil disposal sites 	Works only ongoing in existing canal area, not clearance of trees yet.		
	Socio-Economic Environment				
	<ul style="list-style-type: none"> Construction of main canal and appurtenant structures Movement of equipment and vehicles Spoil disposal 	<p><i>Community health and Safety:</i> High level of Particulates (TSP, PM10) will result in air borne disease, sleep disturbance due to high noise, and risk accidents due to low visibility</p> <p><i>Damage to Public Infrastructures:</i> Obstruction in NH55 and 8 village roads</p>	<ul style="list-style-type: none"> Regular monitoring of the implementation of the recommended measures to control air and noise pollution Organize health check-up camps once in six months Movement of vehicles only after water spray in the dusty road Diversion road in NH55 and undercover road including right of way Construction of 5 road crossings and 3 foot bridges Compliance with Occupational Health and Safety Guidelines First Aid facilities at the construction sites 	Water spraying in dusty work area complied with	
		<p><i>Occupational Health and Safety</i></p>		Work yet to start near the highway	Continue encouraging workers and make mandatory for PPE;

Project Stage	Project Activity	Environmental Impacts	Mitigation Measures	Compliance Status	Corrective Actions
Operation and Maintenance Phase	Physical Environment				
	Operation of Main Canal	<i>Water Quality:</i> deterioration of water quality due to use of chemicals and pesticides, aquatic weeds	<ul style="list-style-type: none"> • Minimum use of chemical fertilizers and pesticides • Training to farmers on risk of toxicity of pesticides and chemicals • Composting of aquatic weeds and regular cleaning of weeds 		
		<i>Soil Degradation:</i> due to pollution of water resulting in soil degradation	<ul style="list-style-type: none"> • Check water quality to understand if it is polluted due to drainage resulting in soil degradation 		
		<i>Water Logging:</i> increased water table may cause waterlogging	<ul style="list-style-type: none"> • provide water for leaching as special operation to address the problem if occurs 		
	Biological Environment				
	Operation of Main Canal	<i>Aquatic Weeds:</i> <ul style="list-style-type: none"> • mosquito growth and diseases like malaria • foul smells and unpleasant for public • quality of water degraded • slows the flow of water in canals, loss of water , and water logging • impact on fishery 	<ul style="list-style-type: none"> • Checking weeds seeds through irrigation water • Mechanical control of aquatic weeds • Manual cleaning • Cutting • Dredging • Use of animal feed and composting • Training to farmers on the prevention of aquatic weeds • R&D on chemical methods of weed control 		
	Socio-Economic Environment				
	Operation of the main canal	<i>Public Health:</i> <ul style="list-style-type: none"> • Ecological changes may create new or more favorable habitats for disease vectors. • Aquatic weeds and disease vectors, and bad smells 	<ul style="list-style-type: none"> • Clearance of aquatic weeds is crucial in reducing health risks • Farmers receive trainings on regular basis in the best utilization of the chemical fertilizers and pesticides • Regular monitoring of the ground water 		

Project Stage	Project Activity	Environmental Impacts	Mitigation Measures	Compliance Status	Corrective Actions
		<ul style="list-style-type: none"> Pesticide residues, a long-term environmental and health risk, may also lead to a rapid induction of resistance in disease vectors, Contamination of ground water may trigger the chances of water borne diseases as well. 	<ul style="list-style-type: none"> Use of water for drinking and sanitation will reduce the risk of water-borne diseases dramatically. 		

MOWRAM: Ministry of Water Resources and Meteorology; PDWRAM: Provincial Department of Water Resources and Meteorology; DCIS: Damnak Chheukrom Irrigation Scheme, DDCSC: Detailed Design and Construction Supervision Consultant; MOE: Ministry of Environment, PIC: Project Implementation Consultant, PIU: Project Implementation Unit; FWUC: Farmers Water Users Community; FIA: Fishery Administration;

Table 0-3: Environmental Impacts, Mitigation Measures and Compliance Status, Secondary and Tertiary Canals

Project Stage	Project Activity	Environmental Impacts	Mitigation Measures	Compliance Status	Corrective Actions
Pre-Construction	Socio-Economic Environment				
	Land acquisition for secondary canals and tertiary canals	<ul style="list-style-type: none"> Number of households will lose 260 ha of agriculture lands Number of households will lose 53 structures Crops in 260 ha of land fruit trees belonging to some households 	<ul style="list-style-type: none"> Provide compensation as per the Resettlement Plan (RP) including loss of crops and fruit trees. 	RP are being finalized.	High priority needed to facilitate the construction works to start.
Construction phase	Physical Environment				
	Construction of Secondary and Tertiary Canals and appurtenant structures	<p><i>Land use change:</i> A total of 227 ha of agriculture land will be permanently converted to canal and road structures</p> <p><i>Air quality:</i> slight increase of dust along SCs and TCs (site specific short term)</p> <p><i>Noise quality:</i> increase of noise in SC TC construction site (site specific, short term)</p> <p><i>Soil and ground water quality:</i> possibility of soil and ground water contamination due to construction waste and leakage</p> <p><i>Solid and hazardous waste management:</i> Hazardous construction waste can lead to ground water and soil contamination</p>	<ul style="list-style-type: none"> Provide training to labors on the good practices during construction Use water spray in dusty area Ensure that all m/c and equipment are properly maintained, no leaking Ensure workers use mask and ear muffs Collect the construction waste water, reuse it in the planned roads Proper storage for hazardous construction waste materials with labels Handover the hazardous waste only to authorized company Provide latrines at the work site (mobile) 		
	Transport of soil, laterite and other construction materials	<i>Air Quality:</i> High level of TSP, PM10, and PM2.5 along the dusty village roads due to resuspension of dusts	<ul style="list-style-type: none"> Regularly spray water in the dusty village roads 		

Project Stage	Project Activity	Environmental Impacts	Mitigation Measures	Compliance Status	Corrective Actions
		<p><i>Visibility:</i> resuspension of dust will result in poor visibility in the dusty road area</p> <p><i>Noise Quality:</i> Slight increase in noise level due to movement of heavy vehicles</p>	<ul style="list-style-type: none"> Limit vehicle speed below 20 km per hour Ensure vehicles used are properly maintained and comply with national standard No use of pressure horns in the residential areas 		
	Management of workforce camps	Solid waste management and hygiene and sanitation problems	<ul style="list-style-type: none"> Ensure the supply of clean drinking water, adequate numbers of toilets with water supply in the camps and also in construction sites (mobile toilets) Waste segregation- degradable and recyclable Dumping of organic component in lands with soil cover 		
	Burrow Pit Operation	<p><i>Air Quality:</i> high level of dust due to excavation works, loading of trucks</p> <p><i>Noise Quality:</i> Increased noise level in the area due to operation equipment of movement of trucks</p> <p><i>Ground Water Quality:</i> possibility of ground water contamination from water ponding in the borrow pits</p>	<ul style="list-style-type: none"> Use of the soil from secondary canals in the alignment of the SC and TC Regular water spray in the dusty areas and cover of trucks Proper maintenance of equipment and trucks Levelling of the area to prevent from water ponding 		
	Biological Environment				
	<ul style="list-style-type: none"> Movement of heavy equipment and trucks 	<p><i>Bird Habitat in the Reservoir:</i> Possibility of migration of birds from the habitat due to high noise and construction activities in the area; and also illegal hunting by workers</p>	<ul style="list-style-type: none"> No labor camps near the habitat Avoid movement of vehicles from the habitat area, use alternative way Strict instruction to workers to prevent hunting (illegal) 		
Socio-Economic Environment					
		<p><i>Damage to Crops and Public Infrastructures:</i> Damage to</p>	<ul style="list-style-type: none"> Compensate the loss to farmers 		

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Project Stage	Project Activity	Environmental Impacts	Mitigation Measures	Compliance Status	Corrective Actions
Operation and Maintenance Phase	<ul style="list-style-type: none"> Construction of secondary and tertiary canals and appurtenant structures 	<p>crops on both sides of Secondary and Tertiary canals due to construction activities. Obstruction on existing village roads due to SC and TC construction</p>	<ul style="list-style-type: none"> Priority on immediate construction of roads or crosses as planned Movement of vehicles only after water spray in the dusty road Regular water spray in the construction sites 		
	<ul style="list-style-type: none"> Movement of equipment and vehicles 	<p><i>Community health and Safety:</i> High level of Particulates (TSP, PM10) will result in air borne disease, sleep disturbance due to high noise, and risk accidents due to low visibility</p>	<ul style="list-style-type: none"> Regularly monitor the implementation of air and noise pollution control recommendations Health check-up camps in the villages during constructions time (one in each commune every six months- 20 camps in two years) 		
	<ul style="list-style-type: none"> Borrow Pit 	<p><i>Occupational Health and Safety</i></p>	<ul style="list-style-type: none"> Compliance with Occupational Health and Safety Guidelines First Aid facilities at the construction sites 		
	Physical Environment				
Operation and Maintenance Phase	Operation of Secondary and Tertiary Canals	<p><i>Water Quality:</i> deterioration of water quality due to use of chemicals and pesticides, aquatic weeds</p>	<ul style="list-style-type: none"> Minimum use of chemical fertilizers and pesticides Training to farmers on risk of toxicity of pesticides and chemicals Composting of aquatic weeds and regular cleaning of weeds 		
		<p><i>Soil Degradation, Salinity:</i> due to pollution of water resulting in soil degradation</p>	<ul style="list-style-type: none"> Monitoring of ground water quality 		
		<p><i>Water Logging:</i> increased water table may cause waterlogging</p>	<ul style="list-style-type: none"> Add sufficient drainage structures if found necessary Removal of aquatic weeds provide water for leaching as special operation to address the problem if occurs 		

Project Stage	Project Activity	Environmental Impacts	Mitigation Measures	Compliance Status	Corrective Actions
		Green House Gases	<ul style="list-style-type: none"> Organize training programs to farmers on good practices as outlined in national strategies (SNC) 		
	Biological Environment				
	Operation of Secondary and Tertiary Canals	<p>Aquatic Weeds:</p> <ul style="list-style-type: none"> mosquito growth and diseases like malaria foul smells and unpleasant for public quality of water degraded slows the flow of water in canals, loss of water, and water logging impact on fishery 	<ul style="list-style-type: none"> Checking weeds seeds through irrigation water Mechanical control of aquatic weeds Manual cleaning Cutting Dredging Use of animal feed and composting Training to farmers on the prevention of aquatic weeds 		
	Socio-Economic Environment				
	Operation of the secondary and tertiary canals	<p>Public Health:</p> <ul style="list-style-type: none"> Inappropriate use of chemical fertilizers, insecticides and pesticides and poisoning to farmers Aquatic weeds and disease vectors, and bad smells Pesticide residues in ground water and agriculture products 	<ul style="list-style-type: none"> Clearance of aquatic weeds Provide trainings on regular basis in the best utilization of the chemical fertilizers and pesticides Regular monitoring of the ground water Facilities for storage and transport of packaging of pesticides, insecticides 		

MOWRAM: Ministry of Water Resources and Meteorology; PDWRAM: Provincial Department of Water Resources and Meteorology; DCIS: Damnak Chheukrom Irrigation Scheme, DDCSC: Detailed Design and Construction Supervision Consultant; MOE: Ministry of Environment, PIC: Project Implementation Consultant, PIU: Project Implementation Unit; FWUC: Farmers Water Users Community; FIA: Fishery Administration.

APPENDIX 2: SUPPORTING INFORMATION

- A. Environmental Inspection Report**
- B. Construction Method Statement**
 - B.1. Contract Package Main Barrage**
 - B.2. Contract Package Main Canal**
- C. Corrective Action Report on Impact to Private Land Properties**
- D. Project Information Booklet – PIB**

APPENDIX 3: APPENDIX 3: GRM COMPLIANT FORM

PIU Staff Responsible: (name and role)	
Date: (of this record)	
Date of Complaint:	
Date Resolution Required by (15 days from initial complaint):	
Complaint Made by: (Name & Contact Details)	
Method of Complaint: (direct to PMU, via Contractor, Via Commune People's Council)	
Details of Complaint: (issues, actions taken so far, when did it start – all details needed)	
PMU Actions: (Next steps for PMU to resolve the issue or to move complaint to next level)	
Follow Up Actions Needed and Date: (PMU to follow up on resolution if needed, e.g. check contractor actions)	