

Environmental Monitoring Report

December 2018

Lao People's Democratic Republic: Greater Mekong Subregion Flood and Drought Risk Management and Mitigation Project

Prepared by the Department of Irrigation, Ministry of Agriculture and Forestry and the Asian Development Bank.

This environmental monitoring report is a document of the borrower. The views expressed herein do not necessarily represent those of ADB's Board of Directors, Management, or staff, and may be preliminary in nature.

In preparing any country program or strategy, financing any project, or by making any designation of or reference to a particular territory or geographic area in this document, the Asian Development Bank does not intend to make any judgments as to the legal or other status of any territory or area



Lao People's Democratic Republic
Peace Independence Democracy Unity Prosperity

Ministry of Agriculture and Forestry
Department of Irrigation

ENVIRONMENTAL MONITORING REPORT

(Reporting period: July-December 2018)



**Greater Mekong Sub-region Flood and Drought Risk Management and
Mitigation Project**
Grant No.0316-LAO (SF), Loan No. 2936-LAO (SF)

Vientiane Capital, 10 January 2019

ABBREVIATIONS

ADB	–	Asian Development Bank
DAFO	–	District Agriculture and Forestry Department
DONRE	–	Department of Natural Resources and Environment
DOI	–	Department of Irrigation (Ministry of Agriculture and Forestry)
DPWT	–	Department of Public Works and Transport
EA	–	Executing Agency
EMMP	–	Environment Management and Monitoring Plan
EMU	–	Environmental Management Unit
IA	–	Implementing Agency
IEE	–	Initial Environmental Examination
MAF	–	Ministry of Agriculture and Forestry
MONRE	–	Ministry of Natural Resources and Environment
NREO	–	Natural Resources and Environment Office
PAFO	–	Provincial Agriculture and Forestry Office
NPCO	–	National Project Coordination Office
PIO	–	Project Implementation Office
PPMS	–	Project Performance Monitoring System
PPO	–	Provincial Project Office
PSC	–	Project Steering Committee
SO	–	Safeguards Officer(s)
WUG	–	Water Use Group

TABLE OF CONTENTS

ABBREVIATIONS	ii
1. EXECUTIVE SUMMARY	4
2. PROJECT OVERVIEW, GENERAL SAFEGUARD MATTERS	5
2.1. Project Background	5
2.2. Project Description.....	Error! Bookmark not defined.
2.3. Purpose of Environmental Monitoring Report (EMR)	6
2.4. Report Format and Preparation	7
3. PROJECT PROGRESS	7
3.1. Embankment Subproject	8
3.2. Irrigation Subproject.....	8
3.3. Sluice Gate	9
4. ENVIRONMENTAL PLAN IMPLEMENTATION ARRANGEMENTS	8
4.1. Overall Project Implementation Arrangement.....	9
4.2. Role and Responsibilities for Monitoring of EMP Implementation	9
5. ENVIRONMENTAL PERFORMANCE MONITORING	10
6. ENVIRONMENTAL EFFECT MONITORING	22
6.1. Monitoring Plan.....	23
6.2. Water Quality Monitoring Activities in the Reporting Period	23
6.3. Water Level Measurement.....	24
7. PUBLIC CONSULTATION AND PARTICIPATION	26
8. GRIEVANCE REDRESS MECHANISM	26
9. CONCLUSION	27
9.1. Compliance with EMP Requirements.....	27
9.2. Environmental Quality Impact Monitoring.....	27
9.3. Civil Works Completion.....	27
9.4. Remaining Issues and Concerns.....	28
10. RECOMMENDATIONS	28
APPENDIX A: Third Quarter 2018 Field Monitoring Key Observations.....	30
APPENDIX B: Summary of the 4 th Quarter 2018 Field Findings	30
APPENDIX C: Result the Water Quality Laboratory Analysis	32
PHOTO DOCUMENTATION OF WORK IN PROGRESSE Error! Bookmark not defined.	

1. EXECUTIVE SUMMARY

1. This Semi-Annual Environmental Monitoring Report covering the period of July to December 2018 presents the following key findings on contractors' compliance to EMP and the National Project Coordinating Office (NPCO) accomplishments.
2. Civil works progressed with 95% asphalt surface application in the road-dike embankment, and 80% in the physical construction of the irrigation schemes.
3. All earth excavation and crushing activities including water impounding reservoirs were already completed with the installation of the water pumps.
4. In terms of workers' camps cleanliness, orderliness and sanitation, this is not a major concern any longer because practically, only three (3) camps now remaining in use, out of seven (7). The rest were completely demolished. However, stockpiles of construction materials and solid wastes are left behind on site.
5. Four (4) concerns related to project phase out operations: 1) ground restoration/rehabilitation on both subprojects, 2) construction of peripheral fencing as guard rails in the two box culverts approach on both sides of the road-dike subproject, 3) installation of road lights and colored markers along the pavement, and 4) provision of additional signages and traffic advisory bill boards.
6. The Thai sub-contracting party responsible for the asphalt mixing, handling, and storing partly adhered to the corrective measures prescribed by NPCO.
7. Likewise, farmers whose lands were straddled and affected by the irrigation canal construction complained about the non-restoration of the ground to its normal and desired condition.
8. As regards to public safety, there are no adequate signages and traffic warning device being installed along the road-dike, especially in critically areas, such as school zones, markets and crossings. Exacerbated by the fast moving vehicles in the newly asphalted paved road, this may add risk resulting to road accidents.
9. The November 15 water quality analysis with samples taken from 5 different sites revealed that the values of key parameters (e.g. BOD, COD, conductivity) have slightly improved relative to the July 3 reading. Likewise, collecting data at the nine water level gauging points have been regularly conducted and recorded.
10. In general, there has been greater improvement in the contractors' EMP mitigation measures compliance as compared previously, especially in the road-dike structure.
11. Nevertheless, the Environmental Monitoring Team recommends the completion of all civil works by January 31, 2019 for the road-dike embankment, and February 28 for the irrigation system. After which, the contractor may focus more on ground leveling, and planting grasses on the irrigation canal embankment. Likewise, ground cleaning from construction waste and other spoils should be carried out. Further, additional billboards/signages in critical busy zones and installation of road lights and colored markers along the road-dike should be finished not later than January 31, 2019.
12. Lastly, the Team strongly recommends that failure to comply with all of the above conditions will serve as sanction for project management to withhold the contractor's last payment until such required measures be addressed.

2. PROJECT OVERVIEW, GENERAL SAFEGUARD MATTERS

2.1. Project Background

13. On 6 November 2012, the Asian Development Bank (ADB) approved a loan of Special Drawing Rights (SDR) 15,912,000 (\$24 million equivalent – at the time) and a grant of \$12.5 million from the ADB's Special Fund resources to the Lao PDR to finance L2936/G0316-LAO: GMS Flood and Drought Risk Management and Mitigation Project (the Project). The Financing Agreement was signed on 4 December 2012, and became effective on 22 March 2013 with a closing date of 30 September 2019.
14. The project supports the Government of Lao PDR to undertake structural and non-structural measures to prepare for, and manage disaster risks linked to floods and droughts. The Project's impact is foreseen to be reduced economic and human life losses resulting from flood or drought events. The Project's outcome will be improved preparedness to manage and mitigate the impacts of flood and drought events.
15. The four outputs are the following:
 - a. Strengthening regional coordination for management of flood and drought events: The project will assist the GoL to strengthen its national flood and drought forecasting capacities,
 - b. Upgrading water management infrastructure: It will support the: a) rehabilitation of flood control embankments, associated water control structures, and access roads; b) rehabilitation of drainage canals, including increasing flow capacity and improving water control infrastructure; and c) rehabilitation and extension of canals, water control structures,
 - c. Enhancing capacity for community-based flood and drought management and irrigation distribution networks: Community based disaster risk management (CBDRM) forms an important strategy for enhancing the impact of the structural investments supported by the Project. In each of the communities where the infrastructure development is undertaken, CBDRM actions will be implemented to ensure that communities are able to obtain the full benefit from improved water control infrastructure and flood warnings. Community-driven flood and drought risk reduction measures will be implemented based on participatory local level disaster risk reduction and management plans.
 - d. Effective project implementation: The Project will support the Executing Agencies to undertake overall project oversight and strengthen project planning, implementation and management capacities of implementing agencies.
16. It has a life span of 72 calendar months (April 2013- March 2019) has supported the Government of Lao PDR to undertake structural and non-structural measures to prepare for and manage disaster risks linked to floods and droughts. Project interventions will (i) enhance regional data and knowledge for the management of floods and droughts; (ii) upgrade or develop water management infrastructure; and (iii) prepare communities to manage disasters such as flood and drought and adapt to climate change. The Project will improve flood and drought risk management on over 20,000 ha in Vientiane Capital and reduce the vulnerability to floods of over 61,500 people.
17. The project area covers 3 districts in South of Vientiane Capital: Hadxaifong, Xaythany and Pakngum, and 18 villages, with a population of more than 2,500

families. The sub-projects" areas normally endure serious damages caused by floods. The 2008 flood 5 districts in South of Vientiane Capital, affected 163 villages, 69,653 families, livestock, paddy rice 4,423 ha. and 4,680 ha. cultivated areas. The flood existed for 1 month and caused the monetary loss of approximately 70 Billion LAK (US\$ 8.248 million). The projects are required to protect Vientiane Capital city from flood and mitigating drought conditions.

2.2. Project Description

18. The Project has two subproject components:
 - a. Flood Protection Subproject: This is located in the southern part of Vientiane Capital designed to install Flood Protection Dike, Water Control Gate and Pumping Station. It is a 30.2-km long flood embankment construction along the Mekong River between Lao Star Satellite Station and Mak Hiao River.
 - b. Irrigation Development Subproject: This is also in the southern part of Vientiane Capital aimed to set up pumps and canal system for irrigation. The irrigation canals will be constructed for 5 head works of 4 irrigation schemes along the Mak Hiao River with the following specifications:
 - Sang Houabor Irrigation Scheme: The main bottom width of canal 0.8 m, depth of canal 1.05 m, side slope 1:1.5, and length of canal 2.8 km,
 - Dongkhuay Irrigation Scheme: There are 2 head works such as Dongkhuay 1 and Dongkhuay 2. The main bottom width of canal 0.8 m, depth of canal 1.1 m, side slope 1:1.5, and length of both main canals 8.8 km,
 - Nalong-3 Irrigation Scheme: The main bottom width of canal 0.8 m, depth of canal 1.05 m, side slope 1:1.5, and length of canal 2.5 km, and
 - Mak Hiao Irrigation Scheme: The main bottom width of canal 0.8 m, depth of canal 1.0 m, side slope 1:1.5, and length of canal 3.1 km.
19. The irrigation pumps on the other hand will be installed in Mak Hiao River at 4 pump stations with the following number of units for each station and the corresponding hectares to service:
 - a. Sang Houabor Scheme: 4 pumps to irrigate 300 ha lands,
 - b. Donkhuay 1 and Donglhuay 2 Scheme: 6 pumps to irrigate 474 ha land,
 - c. Nalong-3 Scheme: 5 pumps to irrigate 545 ha lands, and
 - d. Mak Hiao Scheme: 3 pumps to irrigate 223 ha lands.

2.3. Purpose of Environmental Monitoring Report (EMR)

20. This Semi-Annual Report of 2018 summarizes the highlights of the 3rd Quarter Environmental Monitoring, 4th quarter Field Monitoring Results. It basically presents the progress status of contractors' EMP safeguard compliance as well as the NPCO milestones in meeting civil works targets for both the embankment and irrigation system subprojects.

2.4. Report Format and Preparation

21. This report is structured and formatted based on ADB's SMR template provided. It has the following sections: progress status on EMP implementation and compliance, public consultation, Grievance Redress Mechanism, environmental issues and concerns, recommendations and future actions. Tables and attachments are appended as support data and documents to substantiate the claims and findings presented in the said report.
22. Preparing the Environmental Management Report (EMR) involves NPCO, PAFO and DOW participation. The monthly environmental issues and concerns are obtained and consolidated by the environmental officers of PIO-PAFO, PIO-DOW, and NPCO.
23. The national and international environmental monitoring specialists join the field inspection in most of the construction sites of the two subprojects: embankment and irrigation with the project environmental officers in quarterly basis. The national environmental monitoring specialist does the most information consolidation for the international specialist to develop the report in accordance with ADB EMR template. Once the EMR is completed, the first draft is submitted to NPCO, PIOs of both PAFO and DOW, and the project environmental management officers for comments prior to submission to ADB.

3. PROJECT PROGRESS

24. In terms of civil works progress, Table 1 present the key project milestones with the extent of accomplishment (see the pictures of civil works progress and activities under photo documentation):

Table 1. Project Overview, Snapshot of Project Progress

Project Number and Title:	Grant No.0316-LAO (SF), Loan No. 2936-LAO (SF) Greater Mekong Sub-region Flood and Drought Risk Management and Mitigation Project	
Safeguards Category	Environment	B
	Indigenous Peoples	B
	Involuntary Resettlement	A
Reporting period:	July-December 2018	
Last report date:	July 16 th 2018	
Key sub-project activities since last report:	<ul style="list-style-type: none"> • Pavement of asphalt hot-mix on embankment subproject (completed 95% under Soukpaseut Construction Company; and 90% under Phongsubthavy Construction Company) • Construction of irrigation canal, completed 80%. • Setting up of water gauging instrument: 100% completed. • Installation of the water pumps in the irrigation system: 100% completed 	
Report prepared by:	Two contracted consultants and NPCO team (Environment)	

3.1. Embankment Subproject

25. Current activities are focused on pavement of asphalt hot-mix. For section under Soukpaseur Construction Co., Ltd, it is 95% completed. The contractor assured the management that the remaining works will be completed not later than 31 December 2018).

26. For section under Phongsubthavy Construction Co., Ltd, it is 90% completed, and the contractor affirmed the management that the remaining activities are to be completed not later than 31 December 2018).
27. The Environmental Monitoring Team noted that the sluices gates along the road-dike embankment can now be in operational use.
28. Further, a portion of the existing old road is now being restored, while the new access route is almost completed with asphalt hot-mix pavement. (Plate 1). All existing access roads are now under rehabilitation, and targeted to be completed not later than January 31, 2019.
29. Table 2 shows the status of the additional works requested during the June 2018 ADB Review Mission with cost estimates

Table 2. Cost estimates of additional works in the road-dike embankment

	Description	Cost Estimates	Target Date	Status
1	Traffic light	US\$ 571,000	30 Dec 2018	2 kms already finished; Still in progress
2	Earth-ditches for 700m	US\$ 22,000	30 Dec 2018	Still in progress

3.2. Irrigation Subproject

30. In general, the physical construction progress is estimated about 91%, completed and is still within the agreed timeframe, or at the latest, not beyond 28 February 2019 for the culmination of all civil works.
31. Details of the progress of the physical construction are:
 - a) Sanghouabor subproject. This subproject covers 300 ha paddy rice fields, 2 main-canal (2,95m), and 12 secondary canals (7,575m). It is 86% completed as of December 23, 2018.
 - b) Dong Khouay 1 and 2 subprojects. This subproject covers 474 ha irrigation paddy rice fields, 3 main canals (8,925m), and 7 secondary canals (5,350m). It is 95% completed as of December 23, 2018.
 - c) Na Long-3 subproject. This subproject includes 545 ha. of paddy rice fields, it exists 2 main-canal (2,500m) and 16 secondary canals (10,600m). It is 87% completed as of December 23, 2018.
 - d) Mak Hiao2 subproject. This subproject covers 223 ha. paddy rice fields. It composes of a main-canal (2,895m) and 9 lines of secondary canals (4,800m). It is 90 % completed as of December 23, 2018.
32. Improvement of the farms roads connecting to the villages, as well as between headworks and the delineation of agriculture areas around VTE Irrigation Area is progressing well and to be completed alongside with the four aforementioned irrigation subprojects.

3.3. Sluice Gate

The rehabilitation of the two sluices at Houay Dieu and Houay Mak Hiao were already completed. The actual operation and management for both of the water flood control gates by PAFO is underway for full implementation.

4. ENVIRONMENTAL PLAN IMPLEMENTATION ARRANGEMENTS

4.1. Overall Project Implementation Arrangement

33. The executing agency (EA) is the Ministry of Agriculture and Forestry (MAF). MAF is responsible for overall project management and coordination. MAF has delegated day-to-day management of the Project to the Department of Irrigation (DOI), which has established a National Project Coordination Office (NPCO). The implementing agencies (IA) are the (i) Ministry of Natural Resources and Environment (MONRE) - Department of Meteorology and Hydrology (DMH); (ii) Ministry of Public Works and Transport (MPWT) - Department of Waterways (DOW); and (iii) Vientiane Capital Provincial Agriculture and Forestry Office (PAFO).
34. MAF is the executing agency for the Project. MAF has delegated the responsibility for overall project coordination and management to its Department of Irrigation (DOI). MAF has established a NPCO headed by a NPC that is responsible for project coordination and management, including financial management of project accounts, procurement of goods and works, recruitment of consultants, and monitoring and reporting.
35. The Implementing Agency (IA) will be PAFO of Vientiane Capital. The PAFO has been established as the PIO to be responsible for financial management, coordination and management of implementation of irrigation development schemes including community development activities; coordination of resettlement activities; coordination of environment management activities; coordination of indigenous people development activities; coordination of gender action plan activities; and monitoring and reporting on physical progress of implementation (Updated IEE Embankment and Irrigation Documents, February 2016).

4.2. Role and Responsibilities for Monitoring of EMP Implementation

36. An Environmental Management Unit (EMU) should have been set up within the PAFO-PIO, responsible for supervision on environmental management and for environmental monitoring. The major responsibilities of the EMU is to ensure that:
 - a. The mitigation measures and monitoring of these activities are being carried out as agreed in the IEEs and EMMPs.
 - b. The environmental monitoring program, comprising of visual inspections as well as taking samples and analysis is being carried out.
 - c. Reporting is performed in compliance with ADB and GOL requirements, and as specified in this document.
37. EMU Also responsible for Environmental Monitoring during project implementation are the main contractor, the sub-contractors, the Supervision Engineer, and the communities. The EMPs guides the EMU in determining whether the recommended mitigation measures prior to construction, and during construction and operation, are being implemented effectively. Environmental monitoring results are documented and reviewed to ensure that signs of adverse impacts are detected at an early stage and that actions for mitigation are taken. Monitoring results are reported monthly by the EMU and are submitted to the Head of the PAFO-PIO, who in turn submit them to the NPCO for approval. The NPCO submits the monitoring results to the ADB.

5. ENVIRONMENTAL PERFORMANCE MONITORING

38. The contractors have been continually implementing the mitigation measures provided in the EMP, as well as the monitoring its compliance. This second semi-annual environmental monitoring report for 2018 is assumed to be the last report of such kind. What will follow next is the final environmental monitoring report after March 2019 as a component part of the Project Terminal Report.
39. The key findings drawn from the field monitoring exercises on September 11 and December 17, 2018 are shown in Appendix A & B respectively. (It should be noted that most of these findings were mainly pertaining to the progress status of the civil works as well as their concomitant environmental impacts on the immediate villages and working areas).
40. Tables 4 and 5 present the updated result of the periodic assessment and monitoring of contractors' compliance to EMP mitigation measures in both the embankment and irrigation subprojects. There is a slight progress in terms of contractor's compliance from the previous assessment in June 2018 on both subprojects. Some required mitigation activities are already omitted from the table as they do not apply anymore given the extent of progress the project has reached.
41. A quick summary of the said progress includes a) phasing out of 4 workers' camps and 1 contractor's office, b) on-going ground leveling and cleaning of the onetime Bituminous mixing and storing site, c) significant decreased in dust pollution, d) minimized traffic accident and interruption due to the completed concrete drainage and embankment reinforcement, e) concrete rip rapping of the almost washed out approach of the box culvert, f) reduced earth excavation in the irrigation system, and g) fast catching up in the masonry works to meet the civil works deadline of completion.

Table 3. Compliance with EMP Requirements in the Embankment Subproject

Potential Impacts	EMP Requirements	Compliance Status (Yes, No, Partial)	Comment or Reasons for Non-Compliance	Issues for Further Action
1. Environmental and social disruption from construction camps	<ul style="list-style-type: none"> • Hire as many local people as possible and train • Site, construct and manage camps to minimize impacts, e.g. layout, housing provision, sanitary and waste management facilities • Implement malaria control, HIV/AIDS education • Avoid siting in NPAs, provincial or district protected areas, or within 500 m of existing settlements • Plan and carry out post construction site clean-up 	YES		
		YES		
		YES		
		YES		
2. Hunting of wildlife or fishing in the project area	<ul style="list-style-type: none"> • Ban guns and other hunting equipment on site and in construction camps • Dismiss any worker found with guns, hunting equipment or wildlife • Workers not allowed to fish in local streams 	YES		
		YES		

Potential Impacts	EMP Requirements	Compliance Status (Yes, No, Partial)	Comment or Reasons for Non-Compliance	Issues for Further Action
	(unless the worker is local to the area)	YES		
3. Damage to the That Luang Wetlands	<ul style="list-style-type: none"> Avoid siting construction camps, borrow pits, spoil disposal areas, etc. in the That Luang wetlands without approval from the Supervision Engineer as well as MoNRE or the PoNRE 	YES		
4. Deforestation in project area	<ul style="list-style-type: none"> Ban use of green timber cut from forest or fuel wood for heating or cooking Ban use of green timber cut from forest or fuel wood for any means of construction, heating, processing or preparation of any materials on site 	YES YES		
5. Erosion and instability of cut faces, quarries and borrow pits	<ul style="list-style-type: none"> Design/construct cut slopes to minimize instability Minimise major earthworks during the rainy season Install appropriate slope protection works and drainage structures. To the extent feasible avoid disposal on slopes greater than 30%. Rehabilitate spoil disposal areas by terracing and re-vegetate with indigenous species 	YES NO NA NO	Contractor strive to beat the set date for civil work completion No ground restoration and rehabilitation plan made	Require contractor to level and clean the ground prior to turn over Require contractor to do ground rehabilitation prior to exit
6. Erosion of lands downstream of the road receiving concentrated outflow carried by drainage structures	<ul style="list-style-type: none"> Incorporate adequate numbers of drainage structures Site drainage structures so as to avoid cascade effect Where appropriate, line the receiving surface with rip-rap and/concrete Incorporate adequate energy dissipation in drainage structures 	YES NA NA NA		
7. Changes to natural hydrology from erosion and landslides	<ul style="list-style-type: none"> Incorporate soil and slope stabilization strategies in design documentation as in item # 5. 	NO	No soil rehabilitation and slope stabilization plan made	Require contractor to do ground rehabilitation prior to exit
8. Changes to natural hydrology from bridge works, culverts and road run-off drainage	<ul style="list-style-type: none"> Incorporate adequate design of bridges and culverts to ensure that drainage is unimpeded Incorporate design features to ensure that run-off is conveyed into natural drainage lines at controlled velocities 	YES YES		
9. Impacts from extraction of	<ul style="list-style-type: none"> agricultural land Balance cut and fill quantities as far 	YES		

Potential Impacts	EMP Requirements	Compliance Status (Yes, No, Partial)	Comment or Reasons for Non-Compliance	Issues for Further Action
construction materials	<ul style="list-style-type: none"> as possible Obtain fill materials at authorized borrow pit areas only Avoid excavating quarries or borrow pits in NPAs, provincial or district protected areas, rivers or 	<p>YES</p> <p>YES</p>		
10. Damage to river/beds and banks, and stream ecology, from extraction of construction materials	<ul style="list-style-type: none"> Avoid extraction of construction materials from wetlands, rivers/ stream beds and banks 	YES		
11. Erosion/impairment of downstream water quality from disposal of cut spoil	<ul style="list-style-type: none"> Avoid tipping cut spoil directly into gullies or water courses or over the edge of the road. Avoid locating spoil dumps in NPAs, provincial or district protected areas Dispose of spoil on degraded or cleared land, in borrow pits or quarries as approved by local authorities Rehabilitate spoil dumps by terracing and re-vegetate with indigenous species 	<p>YES</p> <p>YES</p> <p>YES</p> <p>NO</p>	No ground restoration and rehabilitation plan made	Require contractor to do ground rehabilitation prior to exit
12. Damage to/loss of vegetation and large or culturally important trees through road embankment widening	<ul style="list-style-type: none"> Design realignments to avoid damage to/ loss of culturally important trees Restrict clearing and grubbing to minimum practical extent Closely monitor any tree cutting required for road widening/ realignment Cut slopes to be designed as far as possible so as not to undercut banks supporting forest vegetation 	<p>NA</p> <p>NA</p> <p>NA</p> <p>NA</p>		
13. Destruction of agricultural land on or adjacent to road right-of-way	<ul style="list-style-type: none"> Avoid destruction of agricultural land, particularly paddy land Avoid siting borrow pits or disposal of cut spoil on agricultural land; if essential, rehabilitate and return to productive use as in item # 9 	<p>YES</p> <p>YES</p>		
14. Damage to irrigation structures from road / embankment works	<ul style="list-style-type: none"> Incorporate adequate design of culverts and berms to ensure continued effective operation of irrigation Rehabilitate any affected irrigation structure 	<p>YES</p> <p>YES</p>		
15. Damage to local Nam Saat water	<ul style="list-style-type: none"> Avoid obtaining construction water from local villages or irrigation 	YES		

Potential Impacts	EMP Requirements	Compliance Status (Yes, No, Partial)	Comment or Reasons for Non-Compliance	Issues for Further Action
supplies from road works	<p>infrastructure. Use approved surface water sources</p> <ul style="list-style-type: none"> As far as possible avoid damage to water systems and replace/repair where not possible 	YES		
16. Ground and water contamination by oil, grease, fuel, bitumen, etc.	<ul style="list-style-type: none"> Collect, store and dispose of materials in accordance with local laws/standard acceptable practice Oil, grease, fuel, and hazardous chemicals, etc. should be stored on a sealed, bunded surface with an oil/ grease trap at the outlet, at least 50m away from rivers and streams Avoid accidental spills and have agreed fire and spill containment/clear up emergency procedures in place 	<p>NA</p> <p>NA</p> <p>NA</p>	<p>Required operation was already finished</p> <p>Required operation was already finished</p> <p>Required operation was already finished</p>	
17. Inappropriate solid waste disposal affecting the vicinity aesthetically or by encouraging vermin	<ul style="list-style-type: none"> Contractors to use best practice with respect to waste management at the facilities, including proper disposal of solid waste at locations approved by local authorities 	YES		
18. Construction/traffic related dust and noise impacts in village areas	<ul style="list-style-type: none"> Limit construction works to between 6 a.m. and 9 p.m. in or near village Avoid use of vehicles with excessive exhaust or noise emissions; install and maintain equipment silencers Regularly water down road surfaces in village areas during dry season, limit speed of vehicles, regularly maintain construction vehicles, cover haulage trucks with tarpaulins to prevent spillage Pave roads through villages as soon as possible Cover all trucks carrying dispersible materials to or from the site. 	<p>YES</p> <p>YES</p> <p>YES</p> <p>YES</p> <p>YES</p>		
19. Excessive emissions from construction vehicles causing local air pollution and adding to greenhouse gas emissions	<ul style="list-style-type: none"> Construction vehicles to meet Euro 2 emission standards. Note: Euro 2 standards control light and heavy duty vehicle emissions, including sulfur. It is in effect in Vietnam and Thailand. 	YES		

Potential Impacts	EMP Requirements	Compliance Status (Yes, No, Partial)	Comment or Reasons for Non-Compliance	Issues for Further Action
20. Creation of stagnant pools suitable for mosquito breeding	<ul style="list-style-type: none"> Ensure adequate drainage and fill methodology for work areas at all times Contractors to manage wastewater discharges at construction camps. Siting camps in appropriate site so as to avoid impacts to surface and groundwater 	<p>YES</p> <p>YES</p>		
21. Damage to known/ previously unidentified cultural heritage, archaeological or historical sites	<ul style="list-style-type: none"> If any objects of possible interest discovered during works, stop work and report finds to engineer/Ministry of Culture and Information For culturally important trees, see item # 14 	<p>YES</p> <p>YES</p>		
Additional Measures to be Discussed at Construction Contract Negotiation				
Impact to traffic flows during construction	<ul style="list-style-type: none"> Contractor to devise and submit to DOI-MAF and DOW-MPWT an effective traffic control system that will allow continued use of the road during construction, including access to the road. Approved traffic control system implemented 	<p>YES</p> <p>YES</p>		
Potentially major impacts to local land uses due to location of embankment which will not protect numerous riverside properties, schools, and temples, including two villages. The project embankment may make flooding worse in the unprotected Villages	<ul style="list-style-type: none"> Consider design of additional local dikes (polders) to protect villages and other identified sensitive sites along the river-side of the road 5. This would be similar to the extra dike provided between Km 4 and 6 just past the Friendship Bridge. 	NA	The issue has already been addressed	
Potentially major impacts to fish migration during dry season from gates limiting fish passage from the Mekong into the local tributaries	<ul style="list-style-type: none"> Carry out study of fish migration in the Mak Haio River and other minor streams flowing to the Mekong in the project area. Based on this, design gates or their operation to facilitate fish passage, as needed. 	NA		
Potential minor and temporary negative health impacts from reduced access to health facilities.	<ul style="list-style-type: none"> Contractors to provide adequate access to health facilities at all times. 	YES		
Potentially significant impacts from work-place accidents to workers, local community, or vehicles	<ul style="list-style-type: none"> Training and awareness-raising for workers on occupational health & safety, including the proper use of Personal Protective Equipment such as helmets, steel-toed boots, gloves, eye protection, etc. Adequate signage and 	YES	Traffic is not that busy and problematic	Require additional signages and traffic early warning signals

Potential Impacts	EMP Requirements	Compliance Status (Yes, No, Partial)	Comment or Reasons for Non-Compliance	Issues for Further Action
	control of construction sites. Contractor to implement an effective Traffic Control Plan.	IN PROGRESS		
Potential for temporary impacts to local residents due to contractors' use of land	<ul style="list-style-type: none"> • Contractor to pay rent for temporary use of land. • Only vacant land to be used • Used land will not disturb businesses • Land temporarily used will be restored to pre-project condition 	<p>NA</p> <p>NA</p> <p>NA</p> <p>NA</p>		

Table 4. Compliance with EMP Requirements in the Irrigation Subproject

Potential Impacts/ Environmental Concerns	EMP Requirements	Compliance Status (Yes, No, Partial)	Comment or Reasons for Non-Compliance	Issues for Further Action
Pre-Construction				
- Land acquisition requirements	<ul style="list-style-type: none"> • Prepare resettlement plan (RP) based on an agreed resettlement and compensation framework & implement accordingly 	PARTIAL. (Implementation is in progress)	Implementing Agency needs concurrence or unified stand with the other key government institutions on the issue of giving compensation	Compensation mechanics still being under studied and negotiation is on going at the village level
- Changing land values	<ul style="list-style-type: none"> • Proper design for river bank protection 	N.A.		
- Public roads/existing traces	<ul style="list-style-type: none"> • Consultation with villagers regarding to the use of public or private roads/ existing traces for construction 	YES		
During Construction				
1. Physical / Chemical Environment				
Air Quality				
<ul style="list-style-type: none"> - Dust - Odour - Noise 	<ul style="list-style-type: none"> • Regular watering of expose areas; • Covers all trucks carrying dispersible materials to/from the sites • Ensure all construction vehicles and equipment are well-maintained • Construction activities which can make noise should carry out at day time • Inform local community about schedule and 	<p>YES</p> <p>YES</p> <p>YES</p> <p>YES</p> <p>YES</p>		

Potential Impacts/ Environmental Concerns	EMP Requirements	Compliance Status (Yes, No, Partial)	Comment or Reasons for Non- Compliance	Issues for Further Action
	duration of construction works <ul style="list-style-type: none"> Regarding to other materials for construction such as sand, stone, Contractor shall choose legal service providers 	YES		
Water Resource and Quality				
- Degeneration or contamination of surface water	<ul style="list-style-type: none"> Sanitation Temporary disposal system for solid & hazardous waste. Diversion drains & bunds, temporary silt traps, ponds Stockpiling of soils in flat areas & far from drainage routes Adequate temporary toilet facilities with adequate water supply & strict enforcement of proper 	YES YES YES YES		
- Contamination/pollutants of groundwater and surveillance water	<ul style="list-style-type: none"> To be considered the monitoring groundwater and surveillance water; Diversion drains & bunds, temporary silt traps ponds before the water down way to groundwater; Stockpiling of spoils in flat areas & far from drainage routes; Temporary disposal system for solid & hazardous waste. 	NA NA NA NA		
- Contamination/pollutants of groundwater and surveillance water	<ul style="list-style-type: none"> To be considered the monitoring groundwater and surveillance water; Diversion drains & bunds, temporary silt traps ponds before the water down way to groundwater; Stockpiling of spoils in flat areas & far from 	NA NA NA NA		

Potential Impacts/ Environmental Concerns	EMP Requirements	Compliance Status (Yes, No, Partial)	Comment or Reasons for Non- Compliance	Issues for Further Action
	<ul style="list-style-type: none"> drainage routes; Temporary disposal system for solid & hazardous waste. 			
- Generation of sewage/ wastewater	<ul style="list-style-type: none"> Adequate water supply to meet construction needs & setting up of rain catchment tanks Adequate temporary toilet facilities with adequate water supply & strict enforcement of proper sanitation 	<p>YES</p> <p>YES</p>		
- Generation of solid wastes	<ul style="list-style-type: none"> Adequate temporary toilet facilities with adequate water supply & strict enforcement of proper sanitation; Discussing with residents to choose the suitable waste dumping site when workers build camps Collect solid wastes and temporary store at a safety place before transporting to disposal sites Establish regulations on ensuring sanitation, stipulated dumping yard and waste treatment methods and disseminate those regulations to workers 	<p>YES</p> <p>YES</p> <p>YES</p> <p>YES</p>		
- Siltation/erosion	<ul style="list-style-type: none"> Minimize major earthworks during the rainy season Install appropriate slope protection works and drainage system Re-contour walls of borrow pits, reduce depth or fill in if required, spread with topsoil and re-vegetate with indigenous 	<p>NA</p> <p>NA</p> <p>NO</p>	<p>Required operation was already finished</p> <p>Required operation was already finished</p> <p>No ground restoration and protective fencing as preventive measures being</p>	<p>Require contractor to plant grass cover or any vegetation prior to turn over</p>

Potential Impacts/ Environmental Concerns	EMP Requirements	Compliance Status (Yes, No, Partial)	Comment or Reasons for Non- Compliance	Issues for Further Action
	species or return to productive use; alternatively pits may be reshaped and left flooded for water		planned as safeguard for accident	
2. Biological Environment				
- Impairment of Sensitive Vegetation/other natural habitats (affect to fish moving): only for construction of intake irrigation pumps	<ul style="list-style-type: none"> Setting temporary drainage ditches for diversion 	YES		
- Impairment of aquatic flora & fauna downstream (degradation of water quality due to increase of turbidity)	<ul style="list-style-type: none"> Adequate temporary toilet facilities with adequate water supply and strict enforcement of proper sanitation Temporary disposal system for solid and hazardous waste 	YES YES		
3. Socioeconomic Environment				
- Traffic congestion on the Construction of irrigation system and headwork for 4 schemes	<ul style="list-style-type: none"> Strict enforcement of traffic rules & regulations Installation of traffic aides on critical routes on public main roads Using flagman to control traffic on public main roads Installation of traffic and safety precaution elsewhere construction 	NA NA NA		
- Public inconveniences. - Disruption of utility services	<ul style="list-style-type: none"> Traffic mitigation measures (as above) Temporary access to temporarily affected residences & institutions Close coordination with relevant utility companies/institutions (water, power, etc.) 	NA NA		
- Changed drainage/irrigation affecting farmers (due to	<ul style="list-style-type: none"> Contractor should coordinate with PIO and cultivation households in 	NA		

Potential Impacts/ Environmental Concerns	EMP Requirements	Compliance Status (Yes, No, Partial)	Comment or Reasons for Non- Compliance	Issues for Further Action
block flow for construction of headwork)	water supply area to understand due to block of flow and clearly reach agreement on water supply in case of the construction dose not completed in due time • PIO or relevant authorities should soon inform the households and contractor about water supply schedule so that they can make plan of their own initiative	NA		
- Disruption on fishery (Only existing pond/marsh at Sang Hau bor will be developed for reservoir 22.7ha)	• PIO or relevant authorities should soon inform the villagers concerns the development of existing marsh, and notice on stop fishery during development until completion • PIO and/or relevant authorities shall have regulations on using and fishing in reservoir and disseminate to all villagers	NA NA		
- Health hazard	• Malaria control for workers • Malaria control for nearby resident area • Dust control measures (as above) • Use of practicable available technologies that emit least noise & pollutants & adjusting of operational procedures to reduce noise & pollutants • Adequate temporary toilet	YES YES YES NA YES YES YES		

Potential Impacts/ Environmental Concerns	EMP Requirements	Compliance Status (Yes, No, Partial)	Comment or Reasons for Non- Compliance	Issues for Further Action
	<ul style="list-style-type: none"> facilities with adequate water supply • Strict enforcement of proper sanitation • Temporary disposal system for solid & hazardous wastes 			
- Accidents & safety hazard	<ul style="list-style-type: none"> • Disposing of unwanted spoils as soon as possible • Temporary disposal system for solid & hazardous wastes • Traffic mitigation measures (as above) • Provisions for adequate lighting in construction sites when required for night working • Efficient emergency/ contingency plans, adequate facilities & equipment & trained staff for handling emergencies 	<p>NA</p> <p>NA</p> <p>NA</p> <p>NA</p> <p>YES</p>		
Operation and Maintenance				
Long term impact on aesthetics/ modification of landscape	<ul style="list-style-type: none"> • Proper maintenance of landscape 	NO	No ground restoration and rehabilitation plan submitted	Ground restoration and rehab prior to contractor's exit
- Loss of fish delivery's place	<ul style="list-style-type: none"> • Aquaculture development due to sustainable water supply 	NA		
- Biodiversity impacts to the That Luang wetlands	<ul style="list-style-type: none"> • Maintain normal water balance in That Luang Wetlands so as not to affect the existing ecosystem by appropriate operation of the irrigation schemes, including the reservoir of the Sang Hua Bor scheme • Local authorities and DOI to 	<p>NO</p> <p>YES</p> <p>YES</p>	No intentional intervention designed specifically to address the long standing issue of domestic sewage and industrial waste water flowing into the That Luang wetlands	<ul style="list-style-type: none"> • Need for interagency partnership (MAF, MONRE, Vientiane Capital Government, etc) • Coordinating body has to formed to initiate the first meeting

need to completely clear the area from asphalt residual waste and other toxic substances prior to project turn over.

- f) The irrigation canals are almost finished.(Plate 5). Likewise the water pumps are already installed in the five irrigation schemes. (Plate 6).
- g) In general, there are two remaining major tasks the contractors have to satisfactorily accomplished prior to project turn over: 1) ground restoration, i.e. leveling, clearing, cleaning (Plate 7), and 2) introduction of soil vegetative cover, to include planting of grasses on the slopes of both road-dike and irrigation canals' embankment as erosion control measure (Plate 8).

43. The Environmental Monitoring Team recommends to the contractors the completion of all ground restoration and rehabilitation activities on both subprojects not later than February 28, 2019. This includes the Bituminous mixing and storage site restoration as well as well as complete cleanliness in all workers' camps and work places already abandoned.

44. Table 6 presents the previous issues and the current status resulting from the contractor's response attendant to the identified environmental concerns.

Table 5. Previous Issues and Status of Compliance

Issue	Required Action	Responsibility	Status
1. Washed out section of the bridge approach at the embankment	Immediate concrete rip-raping and slope stabilization measure	Contractor	Satisfactorily accomplished
2. Haphazard handling, storing and disposal of asphalt waste	Contractor to formulate corrective measures and implement them the soonest	Contractor	Partially complied. But the asphalt mixing and preparation site needs to be completely cleaned
3. Absence of early warning traffic signs and cordon of plastic light reflectors as protective fencing for workers constructing the drainage system along the embankment busy sections	Contractor to provide adequate traffic signages and early warning devices with plastic light reflectors at the working area of the busy section along the road-dike	Contractor	Satisfactorily complied after the matter was brought to the attention of the contractor
4. Slow pace of earth digging, excavation and moving works for the water impounding structure which causes tremendous soil erosion and sedimentation during the rainy days	Contractor to have a catch up plan meet the deadline for all civil works completion	Contractor	No catch up plan submitted but the pace of work was accelerated as the closing date for all civil works to cease is nearing.
5. Huge soil pilings and mini earth mounds resulting from ground excavation at the irrigation subproject area is an eye sore as well as causing sedimentation in nearby water body	Ground restoration and levelling and if possible with vegetative cover of exposed soil should be carried out..	Contractor	Partially complied. But contractor still needs to completely restore and clean the affected areas prior to project turn over

45. For the road-dike decommissioning phase, there is not much to be done in ground restoration and cleaning except the Bituminous mixing and storing site,

46. However, completion of the on-going tasks that include road lights' installation, setting up of guard rails in the culvert's approach on both ends and additional signages to be put in place along busy crossings, school zones and market place should be achieved not later than 31 January 2019.

47. Table 7 presents the remaining concerns that need to be addressed by the contractor prior to project turn over

Table 7: Remaining Concerns Prior to Project Turn Over

Subproject	Required Measures To Accomplish	Responsibility	Completion Target Date
Road-Dike Embankment	1. Complete ground restoration and cleaning of the campsites	Contractor	Not later than January 31, 2019
	2. Bitumen Mixing Plant Corrective Measure complete compliance	Contractor	Not later than January 31, 2019
	3. Road lights and colored lines complete installation	Contractor	Not later than January 31, 2019
	4. Culverts approach guard rails completion with slope stabilization	Contractor	Not later than January 31, 2019
	5. Set up additional signages and early warning signals in critical locations	Contractor	Not later than January 31, 2019
Irrigation System	1. Complete ground restoration and cleaning of the campsites	Contractor	Not later than February 28, 2019
	2. Ground levelling of affected areas caused by canal and water reservoir excavation	Contractor	Not later than February 28, 2019
	3. Planting of grass or trees in soil erosion prone sections of the canal embankment	Contractor	Not later than February 28, 2019

48. For the irrigation system, two (2) remaining main tasks to be done: 1) ground restoration and clearing, and 2) planting of vegetative cover along the slopes of the canal embankments as soil erosion control measure.

6. ENVIRONMENTAL EFFECT MONITORING

6.1. Water Quality Monitoring Activities in the Reporting Period

49. Tables 8 and 9 show the result of water quality analyses conducted on July 3 and November 15, 2018 respectively.

Table 6. Results of Water Quality Monitoring conducted on July 3, 2018

Parameters	Unit	SW-01	SW-02	SW-03	SW-04	SW-05
Ph		7.12	7.35	7.28	7.11	7.45
Conductivity	mS/m	40.6	45.7	37.0	32.9	31.5
Alkalinity	mg/L	76.5	85.3	78.2	65.0	69.4
BOD5	mg/L	29.8	16.5	19.3	16.9	11.3
COD	mg/L	48.0	37.0	46.0	33.0	24.0
Temperature	°C	30.8	31.3	32.3	31.7	33.2

Legend:01=Thatluang Bridge,02=Chomsky Village Bridge,03=Head Work, 04=Houay Mak Hiew, 05=Houay Deu

Table 7. Results of water quality analysis conducted on November 15, 2018

Parameters	Unit	SW-01	SW-02	SW-03	SW-04	SW-05
Ph		7.43	7.66	7.45	7.37	7.79
Conductivity	mS/m	50.70	83.80	80.90	67.5	31.7
Alkalinity	mg/L	123.9	129.1	97.5	80.2	109.2
BOD5	mg/L	28.6	13.6	15.8	9.6	5.4
COD	mg/L	43.0	34.0	31.0	24.0	12.0
Temperature	°C	32.1	29.2	34.5	28.7	27.6

Legend:01=Thatluang Bridge,02=Chomsky Village Bridge,03=Head Work, 04=Houay Mak Hiew, 05=Houay Deu

50. The latest water analysis on November 13 gives the following results and implication:
- a. **pH:** The result ranges from 7.37 to 7.79 which is slightly increased relative to the July 3 reading. The value is still within a tolerable range suitable for rice farming.
 - b. **Conductivity:** It has a value ranges from 31.7 to 83.80, which increased tremendously with reference to July 3 reading. Though different crops grow at varied conductivity it is important however to constantly monitor it because it measures the nutrient level. Some plants have retarded growth due to root burn brought on by too high nutrient level, or death by natural causes, from not receiving the vital elements they need for growing.
 - c. **Alkalinity:** It ranges from 80.2 to 129.1 mg/L, which increased significantly with reference to the July 3 reading. There are some plants that thrive more in alkaline soil, while others in acidic medium.
 - d. **Biological Oxygen Dissolved (BOD):** It ranges from 5.4 – 28.6 mg/L which is classified as slightly polluted water, containing lesser oxygen. Good water quality has BOD of about 6.9 mg/L, while the highly polluted water is over 100 mg/L. However, with reference to the July 3 analysis, it can be said that there is slight improvement in water quality because of the significant decreased in BOD value.
 - e. **Chemical Oxygen Demand (COD):** It ranges from 12.0 to 43.0 mg/L, which is below the threshold value, i.e., 50 mg/L for river system. It is considered within the acceptable range in terms of degree of chemical solution load. There is also a significant decreased in COD with reference to the July 3 reading, an indication of improving water quality
 - f. **Temperature:** It ranges from 27.6 to 34.5 °C, which slight decline relative to the July 3 reading. The acceptable range is 25- 31 °C. With this, living creatures and plants in the water body can still tolerate such temperature level but with certain negative effect on their growth pace, depending on the life forms and species.
51. There is significant decrease in the values of key parameters i.e., BOD, COD conductivity, and temperature, relative to the July 3, 2018 analysis which implies improvement in water quality overtime. This can still be further enhanced with proper waste water and sewage management flowing into Thatluang wetlands.
52. From the standpoint of health and sanitation, there is an urgency to pursue an integrated approach in safeguarding the water quality flowing into it Mak Hiao River through an inter-agency collaboration, public participation, as well as the coming in of private sector's investment.
53. This issue may be something the project management can consider during the extension phase, considering the seriousness of the matter in terms of ensuring a safe and better quality water draining into Mak Hiao River for irrigation and fishery.

6.2. Water Level Measurement

54. Water level measurement in That Luang Marsh Lands ang Pakngum District perimeters was taken in nine (9) locations. In this reporting period, seven (7) readings were made.
55. Table 10 shows the water level reading from the nine (9) stations in July 2018.

Table 8. Water Level Reading in July 2018

No	Location of Stuff Gauge	Water Level 0.00 m (above sea level)	Date of water data collection	
Thatluang Marshland			24/7/2018 (m)	31/7/2018 (m)
1	Dongkhamxang Box culvert	163.00	2.00	1.96
2	Thatluang Bridge	163.20	0.58	0.95
3	Xamkhe Bridge	163.70	0.40	1.30
4	Nakhouay Bridge	162.50	1.10	1.85
5	450 Year-Road Bridge	162.50	1.40	2.56
6	Houay Makhieo (1) Sluice Gate	158.62	2.50	2.90
7	Houay Deua Sluice Gate (outward)	162.10	2.90	3.00
In Pakngum District Perimeter				
8	Houaysiad Sluice Gate	156.85	3.95	4.40
9	Houaythanongkhan Sluice Gate	151.55	3.85	4.48

Remarks: Warning sign of flood risks is at 165.00 m and the flood level is at 165.52 m

56. Table 11 shows the water level reading in September 2018.

Table 11: Water Level Reading in September 2018

No	Location of Stuff Gauge	Water Level 0.00 m (above sea level)	Date of Water Data Collection	
Thatluang Marshland			21/9/2018 (m)	28/9/2018 (m)
1	Dongkhamxang Box culvert	163.00	1.82	1.72
2	Thatluang Bridge	163.20	0.56	0.10
3	Xamkhe Bridge	163.70	1.00	0.22
4	Nakhouay Bridge	162.50	1.80	0.22
5	450 Year-Road Bridge	162.50	2.12	0.49
6	Houay Makhieo (1) Sluice Gate	158.62	2.70	1.80
7	Houay Deua Sluice Gate (outward)	162.10	2.30	1.72
In Pakngum District Perimeter				
8	Houaysiad Sluice Gate	156.85	4.06	1.40
9	Houaythanongkhan Sluice Gate	151.55	3.85	1.61

57. Table 12 present the water level reading during the last quarter of 2018, from October to December. There was just one observation made for each month.

Table 12: Water level reading during the last Quarter of 2018

No.	Location of Stuff Gauge	Water Level 0.00m asl	Period of Water Data Collection		
Thatluang Marshland			October (m)	November (m)	December(m)
1	Dongkhamxang Box culvert	163.00	1.58	1.59	1.58
2	Thatluang Bridge	163.20	0.35	0.48	0.34
3	Xamkhe Bridge	163.70	0.40	0.50	0.57
4	Nakhouay Bridge	162.50	No data	No data	No data
5	450 Year-Road Bridge	162.50	0.60	0.68	0.62
6	Houay Makhieo (1) Sluice Gate	158.62	1.90	1.00	0.90
7	Houay Deua Sluice Gate (outward)	162.10	0.0	0.00	0.00
In Pakngum District Perimeter					
8	Houaysiad Sluice Gate	156.85	0.0	0.00	0.00
9	Houaythanongkhan Sluice Gate	151.55	0.0	0.00	0.00

58. Summing the results of Tables 10, 11 and 12, it clearly indicates a declining trend in water level reading, as the season moves toward the year ending. July is seemingly the peak of the rainy season, while the dry spell begins in late September, and getting drier in the months of October, November, December, until March.

7. PUBLIC CONSULTATION AND PARTICIPATION

59. The stakeholder consultation during project preparation embodied the principles of meaningful engagement, transparency, participation, and inclusiveness. This is to ensure that affected and marginalized groups such as women and the poor were given equal opportunities to participate in project designing (ADB's Safeguard Policy Statement 2009). Stakeholder consultation regarding project negative effects on the environment is built upon the parallel social impact assessment of the various subprojects.
60. As far as the implementation of the EMMP is concerned, there have been constant consultations with the village head and the local council regarding noise, dust and traffic impacts of the on-going road-dike construction. The resulting feedback from the local residents were in turn translated into mitigation measures that comprise the "public safety and welfare" component of the Environmental Monitoring Reports.
61. However, the findings of the Social Safeguard team in the September 2018 field interview revealed that there is insufficient community consultation made as regards to the final date for civil works in the irrigation subproject to stop. Villagers want to know the sincerity of the contractor to comply to what he has promised of cleaning and restoring the disfigured ground with earth mounds resulting from the canals' construction.

8. GRIEVANCE REDRESS MECHANISM

62. All grievance/complaints should be posted in the Bulletin Boards of each village assembly meeting place for public disclosure/information. The functioning of the grievance redress mechanism will be regularly monitored and evaluated by the NPCO through its Environmental Monitoring Team during project implementation.
63. So far, there has been no major complaint being hurled by the villagers to project management concerning any negative environmental impacts related to either embankment or irrigation subprojects.
64. However, one recurring minor complain by most farming households with lands affected by the irrigation canal excavations has to do with how and when will the Contractor restore the disfigured grounds, to include cleaning the working areas from construction wastes and spoils that were left behind on-site. The NPCO assured the complainants that prior to project turn over in March 2019, the contractor will be compelled to clean and restore the ground as condition for the release of the final payment.
65. Previous grievance related to compensation for affected lands by the irrigation road canal is now being addressed. This holds true as well for the village leaders' complaints in Ban Dongkhouay and Mak Hiao regarding the old roads leading to their rice fields being destroyed due to the irrigation canal construction. Likewise, the issue concerning the damaged school gate in Pak Peng village has been resolved

9. CONCLUSION

9.1. Contractors' Compliance to EMP Requirements

66. Contractors' compliance to the EMP overtime has improved progressively in terms of meeting the basic requirements in ensuring their workers' well-being, health, safety and providing good physical working condition.
67. Likewise, public safety all throughout the construction phase of the road-dike structure in the four (4) villages along the Mekong River has well been maintained with no significant environmental impacts. Except for dust pollution during summer at the height of the ground preparation and the haphazard preparation, storage and waste disposal of Bituminous substance, all the other negative impacts are well contained and managed.
68. There was no recorded incidence of death, major ailments or accidents due to work related activities that occur inside the workers' camps, working areas or along the roadway while under construction.
69. All previous recommendations made by NPCO, in particular to the improvement of workers' living condition in the camps, as well as ensuring quality standards of civil works related to the box culvert construction, etc., were all satisfactorily addressed,
70. However, as part of project decommissioning and post-construction phase operation, the contractors is compelled to restore, clean and rehabilitate all disfigured and affected grounds caused by earth diggings and instant mounds.

9.2. Environmental Quality Impact Monitoring

71. Water quality monitoring from the five (5) sample collecting sites for the past two (2) successive observation periods in July and November 2018 reveals an improving values of key parameters, such as conductivity, BOD and COD.
72. However, this is not a sufficient basis to conclude of a possible trending but could be attributed by the changing water regime, i.e., from dry season to wet season.
73. Thus, there is a need to monitor regularly the water quality overtime, even beyond the FDM project life span.
74. In so far as the environmental impacts related to civil works are concerns (e.g., soil erosion, dust and noise pollution, biodiversity disturbance, etc.), these have been well mitigated, besides their being so insignificant in terms of affecting the immediate environment.

9.3. Civil Works Completion

75. At the start of the year 2018, there seemed to be a slow pace in all civil works. But towards the last quarter, the momentum of work in both subprojects gained a double speed, in particular, the road-dike embankment construction.

76. The road-dike embankment is 91% completed, while the irrigation system is 80% done. It is expected that all civil works must be completed not later than January 31, 2019 for the road-dike and February 29, 2019 for the irrigation system. This is to include ground restoration, cleaning and application of soil conservation measures in both subprojects.

9.4. Remaining Issues and Concerns

While there is evident improvement in the Contractors' EMP mitigation measures compliance, the following conditions however, stand out as the remaining issues and concerns to be addressed prior to project turn over:

- a. **Ground cleaning and restoration:** There is still so much work to be done by the contractors in terms of restoring and cleaning the campsites and the onetime workplaces, in particular, the irrigation subproject. Of special attention, the Bituminous mixing and storage site must be completely cleaned and restored to its normal condition, following strictly the corrective plan prescribed.
- b. **Soil Protection:** Although, this concern may not be included in the initial cost lay out of the contractors, the need to provide a vegetative soil cover, especially as slope stabilization measure for both road-dike and irrigational canal embankments is deemed necessary.
- c. **Public safety:** Although there is no reported vehicular commotion or accidents incurred yet, along the paved road-dike, the chances that they happen from time to time is high in the absence of adequate traffic early warning signs, advisory information and other safety measures. The speed limit caution is highly needed in busy sections of the roadway, such as in crossings, school zones, markets, and highly populated areas.
- d. **Road greening measures:** After having improved the road-dike as main connecting highway that ensures commuters' and drivers' greater mobility, the planting of ornamental trees for aesthetics and shade along the roadside would be a good community project that can be initiated by PAFO and DoW.
- e. **Thatluang wetlands water quality:** Although for now, improving the Thatluang wetlands water quality is beyond the scope of the FDM project, however, the increasing health nuisance resulting from unmanaged domestic and industrial waste disposal system within the whole area will continue to affect the ecological condition of the entire Mak Hiao River. Consequently, this will affect the water quality flowing in the Mak Hiao River for irrigation and fishery in the long-run.

10. RECOMMENDATIONS

77. Based on the above findings, the following remedial measures and adjustments are recommended:

- a. There is the urgent need for the contractor to install additional signages, early warning signals and billboards as part of the traffic safety measures, especially in crossings, school zones and other busy spots in highly populated areas along the road-dike subproject not later than January 31, 2019.
- b. Speed limit signs in the just completed asphalt road-dike should be in placed by the contractor in busy intersections, blind crossings and school zones not later than January 31, 2019,
- c. Metal sheets serving as guard rails should be installed by the contractor at both approaches of the 2 box culverts with reflectors or strong colors to prevent vehicular accidents not later than January 31, 2019,
- d. The road lights installation should be completed not later than January 31, 2019 in the about 2-kilometer remaining section by the contractor to prevent vehicular accident during night time,
- e. Ground cleaning and restoration of the asphalt-mixing and processing area should strictly be complied by the contractor not later than January 31, 2019 as condition for project turn over,
- f. For the irrigation subproject, all of the 5 schemes should carry out complete ground restoration, clearing and rehabilitation by the contractor not later than February 28 prior to project turn over in March 2019,
- g. The canal exposed top and wall sidings should be planted with grass cover to prevent soil erosion during rainy season. The contractor should come into partnership with the water-users group for cost-sharing arrangement on this. The contractor may provide the grasses or tree seedlings. On the other hand, the water-users' group render free labor. This soil erosion control measure should be completed not later than February 28, 2019 and
- h. The Environmental Monitoring Team strongly recommends that NPCO should withhold the last payment of the contractors if they fail to comply with all the above measures.

Chief of Technical and Planning

Mr. Khansawanh SISOPHA

**International
Environmental Monitoring Specialist**

PAULO N. PASICOLAN Ph.D.

**National
Environmental Monitoring Specialist**

Mr. Sae SENPATY

National Project Coordinator

APPENDIX A: Third Quarter 2018 Field Monitoring Key Observations

COMPONENT	PRESSING CONCERNS/ISSUES	OBSERVATIONS
Road-Dike Embankment	DBST processing and storage	<ul style="list-style-type: none"> • One time scrambled and wantonly exposed waste disposal area of asphalt waste now leveled, cleaned and partly covered with soil and gravel. The camp was almost freed from asphalt waste. • The open pit that contains asphalt residual is still there but content is gradually emptied as more villagers come and draw the bituminous to construct and improve their farm to market road segments.
	Workers & public safety along the side road drainage under construction	<ul style="list-style-type: none"> • Reduced danger from road accident because drainage construction is almost finished
	Rill and gully erosion	<ul style="list-style-type: none"> • Concrete rep rapping of bridge side approach and embankment to prevent gully erosion
	Status of road pavement	<ul style="list-style-type: none"> • About 24kms road-dike were already asphalted and only less than 2km is being still completed. • Safe, smooth and reduced time of travel along the road-dike bringing convenience to the commuting motorists and villagers in transporting their products and goods both to and from the city proper.
	Absence of needed signages and billboards	<ul style="list-style-type: none"> • No additional new signages introduced yet along the road-dike under construction
Irrigation System	Status of reservoir and main canal construction	<ul style="list-style-type: none"> • Water reservoir and irrigation main canals construction are still progress. Inside surface Construction is still in progress. Target completion by the end of December 2018.
	Slope stabilization measures along the interior sidings of the reservoirs	<ul style="list-style-type: none"> • Earth siding of the reservoir has no soil cover yet. No visible ground cover or greening measures being done
	Soil erosion: sheet and rill	<ul style="list-style-type: none"> • Visible sheet and rill erosion in all earth diggings and secondary canals' tops and sidings
	Soil pilings and earth mounds	<ul style="list-style-type: none"> • Grounds of working area need to be levelled and cleaned up from debris and other foreign matter

APPENDIX B: Summary of the 4th Quarter 2018 Field Findings

A. Road-Dike Subproject:

CONTRACTOR	EXTENT OF ACCOMPLISHMENT	REMARKS
1. Soukpaseur Construction Co. Ltd	100% completed: asphalt application and installation of road lights is in progress.	Approaches of the box culvert on both ends need side fencing. Likewise, additional signages and bill boards as traffic early warning advisory measures have to be put in place, especially in busy crossings and school zone. This is besides completing the road lights installation. Both contractors are bound to put pressure on the Thai sub-contracted company in-charge of the asphalt preparation to clean the entire cooking and mixing area prior to project turn-over and phase out.
2. Phongsubthavy Construction Co. Ltd	100% completed: asphalt application. Earth ditches 100 % completed	

B. Irrigation Subproject:

IRRIGATION SCHEME	EXTENT OF ACCOMPLISHMENT	REMARKS
1. Dong Khouay 1	95% completed: but ground restoration not yet started. Target completion date on or before December 31, 2018	Water extraction and distribution are in operation. Canal exposed sidings on both sides still requires grass cover to prevent soil erosion during the rainy season. Further ground levelling and cleaning is necessary. Contractor should comply to this requirement before turn over
2. Dong Khouay 2	87% completed: but ground restoration not yet started. Target completion date on or before December 31, 2018	Water extraction and distribution are in operation. Canal exposed sidings on both sides still requires grass cover to prevent soil erosion during the rainy season. Further ground levelling and cleaning is necessary. Contractor should comply to this requirement before turn over.
3. Na Long-3	87% completed: but ground restoration not yet started. Target completion date on or before December 31, 2018	Canal exposed sidings on both sides still requires grass cover to prevent soil erosion during the rainy season. Further ground levelling and cleaning is necessary. Contractor should comply to this requirement before turn over
4. Mak Hiau2	90% completed: but ground restoration not yet started. Target completion date on or before December 31, 2018	Water extraction and distribution are in operation. Pumping area is now being planted with ornamental trees as part of ground restoration measures. However, the canal exposed sidings on both sides still requires grass cover to prevent soil erosion during the rainy season. Further ground levelling and cleaning is necessary.
5. Sanghouabor	86% completed: but ground restoration not yet started. Target completion date on or before February 28, 2018	This is a lag behind subproject relative to the other sites. There are still a huge remaining civil works to be done in terms of the installation of the water flume connected to the pumps as well as ground digging for them. Canal exposed sidings on both sides still requires grass cover to prevent soil erosion during the rainy season. Further ground levelling and cleaning is necessary. Contractor should comply to this requirement before turn over

APPENDIX C: Results of the Water Quality Laboratory Analysis



Lao People's Democratic Republic
Peace Independence Democracy Unity Prosperity

Ministry of Agriculture and Forestry

Department of Irrigation

N0: 8463/DoI

Vientiane Capital, date 30.11.2018

Water Quality Analysis Report

Project Name : Flood and Drought Risk Management and Mitigation Project

Sample Source: Wastewater

Sampling date: 15-Nov -2018

Registered date : 15 - Nov-2018

N0:	Parameters	Unit	Point 1	Point 2	Point 3	Point 4	Point 5
1	Temperature	°C	32.1	29.2	34.5	28.7	27.6
2	pH		7.43	7.66	7.45	7.37	7.79
3	Conductivity (EC)	mS/m	50.70	83.80	80.90	67.5	31.7
4	Alkalinity as CaCO ₃	mg/l	123.9	129.1	97.5	80.2	109.2
5	BOD ₅ (Biological Oxygen Demand)	mg/l	28.6	13.6	15.8	9.60	5.40
6	COD (Chemical Oxygen Demand)	mg/l	43.0	34.0	31.0	24.0	12.0

Remark :

Point 1 - That Luang Bridge

Point 3- Head Work

Point 5- Houay Deua

Point 2 - Chomsy village 's Bridge

Point 4- Houay Mak Hiew

Director General of DoI

Irrigation Technical Management Division

Head of WQA Unit



Bouakeo DOUANGPASERT

Maykong PHONEPHOMMAVONG

PHOTO DOCUMENTATION OF WORK IN PROGRESS



Plate 1: Completed asphalt paved new access road along the flood embankment subproject



Plate 2: Concrete rapping of stone wall for the box culvert approach along the road-dike



Plate 3: Completed concrete drainage along the road-dike



Plate 4: One time contractor's office and workers' camp already turned over to the owner

PHOTO DOCUMENTATION OF WORK IN PROGRESS



Plate 5: Almost completed primary irrigation canal at Donkhuay Irrigation Scheme



Plate 6: Newly installed water pump at Mak Hiao River



Plate 7: A lot of ground restoration and clearing operation that needs to be done yet along the canals in the irrigation subproject



Plate 8: The barren slope of the main canal embankment needing grasses or any vegetative cover as soil conservation measure