Environmental Management Plan

June, 2015

Lao PDR: Second Greater Mekong Subregion Corridor Towns Development Project, PPTA 8425

Houayxay Subproject

ABBREVIATIONS

ADB	Asian Development Bank
AH	Affected Household
DPWT	Department of Public Works and Transport
DONRE	Department of Natural Resources and Environment
EA	Environmental Assessment
EA	Executing Agency
ECC	Environmental Compliance Certificate
EIA	Environment Impact Assessment
EMP	Environment Management Plan
EMR	Environmental Monitoring Report
EERT	External Emergency Response Team
ERT	Emergency Response Team
ERTL	Emergency Response Team Leader
EO	Environmental Officer
IA	Project Implementing Agency
GMS	Greater Mekong Sub-Region
Government	Government of Lao PDR
GPS	Global Positioning System
IEE	Initial Environmental Examination
MONRE	Ministry of Natural Resources and Environment
MPWT	Ministry of Public Works and Transport
O&M	Operation and Maintenance
PCU	Project Coordinating Unit
PIU	Project Implementation Unit
PMIS	Project Management Implementation Support Consultant
SS	Safeguard Specialist
UDAA	Urban Development and Administration Authority
USD	United States Dollar
UXO	Unexploded Ordnance

WEIGHTS AND MEASURES

km	Kilometre
kg	Kilogram
ha	Hectare
mm	Millimeter

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I. INTRODUCTION

1. The environmental management plan (EMP) for the subproject in Houayxay town, Bokeo province provided herein is one of two EMPs that have been prepared for the subprojects of the Second Greater Mekong Subregion Corridor Towns Development Project in Lao PDR. The other EMP was prepared for the subproject in the town of Luang Namtha, Luang Namtha province. An Initial Environmental Examination (IEE) of both subprojects was prepared under separate cover. The separate EMPs are comprehensive and are developed as stand-alone management tools that are supported by the parent IEE.

A. Houayxay Subproject

2. The subproject in Hoayxay is comprised of the components summarized in Table 1.

Table 1: Subproject components of Houayxay

IUD[1] - Riverbank Upgrading and Protection
IUD - Riverside Road and Walkway
IUD - River Port Rehabilitation
IUD - Ecological Park and Recreation Area
Solid Waste Management
Urban Roads and Drainage Upgrading

II. INSTITUTIONAL ARRANGEMENTS & RESPONSIBILITIES

3. At the feasibility stage the primary management framework[2] responsible for the implementation of the environmental management plan (EMP) for the Houayxay subproject is summarized as follows. The Ministry of Public Works and Transport (MPWT) is the executing agency (EA) for the subproject which will take overall responsibility for successful implementation of the EMP. The Department of Public Works and Transport will be the Project Implementing Agency (IA) in which the Project Implementing Units (PIU) will be established (likely UDAA) to lead safeguards and monitoring support for the EMP. The PIUs will include a Safeguards Specialist (SS) who will lead the implementation of the EMP in conjunction with the Environmental Officer(s) (EO) of the construction contractor(s), and with support from the Project Management Implementation Support (PMIS) consultants. The SS will oversee the work of the EO of the contractor on the implementation of the CEMP[3] for the particular construction package.

4. External support of the PIU for the implementation of the EMP will be provided by the International and National Environment Specialists (ES) of the Project Management Implementation Support (PMIS) consultant who will have budget for an external Environmental Monitoring Consultant (EMC) which will conduct the field sampling and laboratory analyses of

[1] Integrated Urban Development
[2] Updated from Feasibility Mission 2/15.
[3] Contractor Environmental Management Plan prepared by contractor as part of bid documents based on updated EMP

field samples (e.g., water quality, air quality) that cannot be that cannot be performed by the contractor or PIU. Below is a summary of responsibilities for implementation of the EMP.

5. The responsibilities of the EA include:

1. Provide coordination role for environmental and social safeguards and monitoring for IA/PIU;
2. Liaise with ADB on the implementation of the EMP; and
3. Coordinate resolution with IA, and ADB if necessary with issues arising from the implementation of EMP.

6. The responsibilities of the Safeguards Specialist (SS) of PIU include:

1. Assist ES of PMIS with updating the EMP to meet final detailed subproject designs;
2. Notify DONRE to verify Government approvals of project are met, and that EMP compliant with Environmental Compliance Certificate (ECC) of project;
3. Assist PMIS with inclusion of CEMP requirements in contractor bid documents including bid evaluations based on updated EMP;
4. Undertake day to day management of EMP implementation activities;
5. Work with EMC on implementation of monitoring plan of EMP;
6. Ensuring compliance with loan covenants and assurances in respect of all subprojects, including EMPs (as well as IPPs, GAPs, resettlement plans);
7. Lead follow-up meetings with all affected stakeholders;
8. Prepare and submit quarterly reports on EMP implementation to PCU;
9. Oversee implementation of CEMP by contractor;
10. Coordinate with ES of PMIS for EMP implementation;
11. Undertake regular construction site inspections to ensure contractor implements CEMP properly; and
12. Ensure EO of contractor submits monthly reports on construction mitigations and monitoring.

7. The responsibilities of the ES of the PMIS are detailed in the indicative Terms of Reference for the two positions in Annex 1. Key responsibilities for the EMP are listed below:

1. Updating the EMP to meet final detailed designs of subprojects;
2. Provide technical direction and support to PIU for implementation of EMP;
3. Oversee design and delivery of capacity development & training of PIU and EO of contractor(s);
4. Provide advice and support to EMC with their monitoring activities;
5. Review all reports prepared by PIU and EMC for PCU and ADB; and
6. Review location of any possible contaminated sites near subprojects.

8. The responsibilities of Environmental Officer (EO) of Contractor include:

1. Implement CEMP for construction phase of subprojects; and
2. Prepare and submit monthly reports on mitigation and monitoring activities of CEMP and any environmental issues at construction sites.

9. The responsibilities of Environmental Monitoring Consultant (EMC) include:

1. Implement the environmental sampling required for monitoring plan of EMP that cannot be conducted by the contractor and PIU.
2. Perform required laboratory analyses for monitoring program detailed in EMP; and
3. Prepare and submit quarterly reports to PIU on monitoring activities.

10. The implementation of the EMP as part of the overall environmental due diligence (DD) of the subproject is conducted alongside the separate parallel DD of the government. Table 2 reproduces the summary table of environmental due diligence from the IEE. Table 2 shows that the government must approve the ADB IEE and EMP by formal letter, and that approval of the ADB IEE/EMP is not contingent on compliance with any specific government regulation.

Table 2. Responsibilities for environmental due diligence of subproject (from IEE)

Design and Implementation	Environmental DD and Approvals			Milestones & Notes
	ADB / PPTA	Lao PDR	PMIS / Contractor	
Feasibility design				
Initial stakeholder disclosure & consultation	PPTA	EA assists		
Draft IEEs and EMPs	PPTA			Draft IEEs & EMPs completed
Finalize IEEs and EMPs	ADB review & approves IEE/EMPs			ADB approved IEE/ EMPs as per SPS (2009).
		EA reviews and approves IEE/EMPs		EA approved IEE/ EMPs. ***Compliance with specific Lao / EA regulations not required***
Loan documents (PAM/RRP)	Document preparation, approval by ADB	Review & approval of PAM		Loan approval
Initiation of Lao PDR environmental DD[4]		EA leads with oversight from DONRE		MONRE approved Lao IEE or EIA follows independently after Lao DD begins
Detailed engineering design				
Continued stakeholder disclosure & consultation		IA/PIU lead	ES support to PMIS	As per PCP (2012) stakeholder disclosure and consultations continue throughout construction phase coincident with initiation of GRM. ***Also satisfies consultation requirement of Lao*.**
Update EMPs		Support to ES	Lead by ES	Approval of updated EMP by EA and ADB

[4] Lao PDR, 2012. Environmental Impact Assessment Guidelines, 94 pgs + 11 Appendices

Design and Implementation	Environmental DD and Approvals			Milestones & Notes
	ADB / PPTA	Lao PDR	PMIS / Contractor	
Tendering / contract award				
EMPs included in tender documents		Lead by EA/IU	Support by ES	
Tenders let and bids prepared		Lead by EA	Contractor drafts CEMP	CEMPs prepared and included in contractor bids
Construction packages	Input from ADB		CEMPs reviewed by ES/PMIS	Construction package awards
Construction & supervision				
Implementation of mitigation and monitoring plans		Support from IU/PIU	By contractor with support from ES	CEMP implemented by contractor, other aspects of EMP overseen by ES
Continued stakeholder disclosure and consultation		IA/PIU lead	Support from ES	As part of GRM
Monitoring reporting	To ADB	IA/PIU lead preparation of regular reports to ADB	Support from ES	Reports provide input for review missions

11. The Department of Natural Resources and Environment (DONRE) is the provincial agency which oversees environmental management of Bokeo. The DONRE with District staff provides direction and support for environmental protection-related matters including application of the Law on Environmental Protection No. 02/99/NA (1999), EIA, and environmental standards.

12. The ADB provides guidance to EA/PCU with any issues related to EMP, and reviews biannual reports on EMP activities compiled and submitted by PCU which are disclosed on ADB website pursuant to ADB Policy on Public Communication (2011).

A. Worker and Community Health and Safety

13. Central to construction and operation phases of all subprojects is to ensure workers and the public are not harmed from construction activities and ultimately the operation of the completed subprojects.

14. Based on the New Global Strategies in Occupational Safety and Health (OSH) developed by the International Labour Organization (ILO) in 2003 the Ministry of Labour and Social Welfare (MLSW) of Government is currently developing the Lao PDR National OSH Programme[5]. To facilitate the development of the OSH the National Occupational Health & Safety Programme (2005-2010) was initiated.

15. The emerging OSH, *inter alia,* addresses worker and public safety in the construction and operation of small-medium enterprises and notably rural roads. The EA/PCU as supported

[5] ILO, 2009. Asean-Oshnet, Occupational Safety and Health Practices.

by the PIUs must obtain and implement the directives of the OSH Programme. Pertinent associated laws and policy include the Labour Law of Lao PDR, and Decree No. 24/PR of the President of Republic, dated 21 April 1994, promulgating law No. 002/NA of 14 March 1994, concerning Labour.

16. To supplement the OSH the IFC/World Bank Environment, Health, and Safety Guidelines (2007) should also be consulted the IFC EHS guidelines currently provide the international standard for worker and public safety.

17. DONRE with District staff provides direction and support for environmental protection-related matters including application of the Law on Environmental Protection No. 02/99/NA (1999), EIA, and environmental standards.

18. The ADB assists the PCU with timely guidance at each stage of project implementation following agreed implementation arrangements, and with review all documents that require ADB approval including environmental safeguards.

B. Regulatory Framework and Guidelines for Subproject

19. Specific regulations and guidelines for the Houayxay subproject are summarized in Table 3. The regulations and guidelines, *inter alia,* identify how access road upgrades and Mekong river shoreline works should be implemented to prevent or minimize negative impacts on the environment. Environmental standards are found in Annex 2

Table 3. Regulations and Guidelines Applicable to Houayxay Subproject[6].

Road Upgrades
• Lao PDR Road Design Manual with reference to AASHTO A Policy on Geometric Design of Highways and Streets, 5th edition. • RDA's Lao Bridge Design Manual, 1998 with reference to AASHTO LRFD Bridge Design Specifications, 4th, Edition, 2007 • Transport Research Laboratory's (TRL) Road Note 31, 4th edition. • Road Development Authority (RDA's) standards incorporating relevant standards from the AASHTO Highway Drainage Guidelines. • MPWT (2006). Specifications for drainage system, culverts, street lighting and tree planting
Mekong Riverbank Works
• The Manual and Study on Mekong Riverbank Protection around the Vientiane Municipality, Lao PDR. Draft Final Report. JICA September 2004 • California Bank and Shore Rocks Slope Protection Design, Practitioner's Guide and Field Evaluations of Riprap Methods Final Report No. FHWA-CA-TL-95-10, Caltrans Study No.F90TL03, Third Edition - Internet October 2000, Prepared in Cooperation with the US Department of Transportation Federal Highway Administration • Highway Design Manual, Chapter 870 Channel and Shoe Protection Erosion Protection Control, 26 June, 2006. • NRCS Stream Restoration Design Handbook, Stone Sizing Criteria, National Handbook, 210-NEH, August 2007.
Occupational and Public Health and Safety
• MSLW, Lao PDR Occupational, Safety, and Health Guidelines Programme, Draft 2005-2010 • IFC/World Bank, 2007. Environment, Health, and Safety Guidelines
Environmental Standards
• National Environmental Standard Order No. 2734/PMU-DONRE (2009): Annex 1

III. SUMMARY OF POTENTIAL IMPACTS

20. The environmental potential impacts of the subproject in Houayxay (Table 4) primarily concern construction-related impacts and disturbances of dust, noise, increased traffic and risk of traffic accidents, disrupted boat traffic, reduced or blocked urban access, erosion and sedimentation of Mekong river and lake of ecological park, local pollution from construction waste, and tree and vegetation removal.

[6] Regulations and guidelines compiled by study from agencies, earlier IEEs, and internet.

21. The potential construction impact of the greatest magnitude is cumulative sedimentation of the Mekong river and impact on community fisheries and aquatic habitat caused by the river port rehabilitation, riverbank upgrades and protection, and riverside road and walkway components. Careful mitigation must be undertaken to prevent or minimize exposure of the river to soil erosion from each component along the approximately 2-3 km of affected shoreline.

Table 4. Summary of Potential Impacts of Houayxay Subproject

Pre-construction Phase
• Fifty five households will lose some garden and agriculture land (see RP) • Potential impacts of waste stream of Thai Recycling Company on existing, and renovated landfill need to be determined to ensure a sustainable landfill renovation • As part of above a study of groundwater at and below landfill is needed to complete landfill renovation design, and to be able to monitor impact of renovated landfill on groundwater. See Appendix C of IEE. • GHG emissions from old landfill prevented and minimized with proper consolidation and renovation (see Appendix D of IEE).
Construction Phase
Common potential impacts of all components: • Reduced and/or blocked public access, disrupted business and recreation, noise, dust, caused by increased truck traffic and heavy equipment use, soil and surface water pollution caused by equipment operation and maintenance, public and worker accidents, disruption of traffic, increased traffic accidents, land erosion and surface water sedimentation, drainage and flooding problems, solid and domestic waste from worker camps, social issues and community problems caused by migrant workers. These short-term impacts will vary in magnitude with construction activities of the different subprojects. Sedimentation of Mekong river: • The common impact of sedimentation due to erosion could be significant on the Mekong river given the potential cumulative sedimentation of the three shoreline subproject components Boat traffic and community fisheries • Depending on scheduling of the component civil works significant disruption of boat traffic in the river and to/from river port could occur as a result of all the shoreline and river works. The two Mekong community fisheries located at Houayxay could be disrupted.
Operation Phase
Solid Waste Management: • Contamination of groundwater at the renovated landfill from landfill. Regular groundwater quality monitoring is required at established site bore wells, which is supported with sufficient O&M to maintain landfill in good working order. Waste Management at River Port and Ecological Park • Sufficient waste bins, and garbage collection should be provided at rehabilitated port and ecological park to prevent build-up of garbage and litter at both sites Improved Wastewater and Stormwater Drainage: • Seasonal flooding events prevented with regular cleaning of all drains with adequate annual O&M budget

A. Public Consultation

22. The stakeholder consultation strategy that was developed for the IEE should be continued with the start of the pre-construction phase of the subproject. The first step will be the disclosure of the IEE to the affected stakeholders identified in the IEE for their review and comment.

1. Follow-up Consultation

23. As indicated in the IEE, a primary concern of the public and stakeholders of the subproject were disturbances during construction phase of the subproject components. Those issues plus any others will be reviewed during follow-up consultations throughout the pre-construction, construction, and operation of the completed subproject components.

IV. MITIGATION PLAN

24. The mitigation measures of the EMP are presented in a comprehensive mitigation plan for the subproject in Table 5. Following the IEE, the mitigation plan is structured by the three development phases of the subproject defined by the pre-construction; construction; and post construction operational phase. The mitigation plan addresses the environmental issues and concerns raised at the stakeholder meetings.

25. The mitigation plan combines construction phase impacts common to all subproject components for which single mitigation measures are prescribed. In this way redundant mitigation measures are not re-stated numerous times. However, impacts and required mitigations specific to a subproject are also identified. Or, common mitigations that are particularly important for a subproject component are emphasized.

26. The mitigation plan identifies potential impacts, required mitigations, responsible parties, location, timing, and indicative costs. The mitigation plan is comprehensive and will be updated to meet the final detailed designs of the subproject.

Table 5. Environmental Impact Mitigation Plan

Subproject Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Location	Timing	Activity Reporting	Estimated Cost[7] (USD)	Responsibility	
							Supervision	Implementation
Pre-Construction, Detailed Design Phase								
Confirmation of required compensation	No negative environmental impacts	1. Affected persons well informed well ahead of subproject implementation.	All affected persons in subproject areas	Before detailed designs initiated	See resettlement plans	See resettlement plan	EA/IA	Resettlement committees
Disclosure, & engagement of community	No community impacts	2. Initiate Information Disclosure and Grievance process of IEE	For all construction sites.	Before detailed designs initiated	Quarterly	No marginal cost[8]	IA/PIU	PIU
Government approvals	No negative impact	3. Notify DONRE of subproject initiation to complete EA requirements, and obtain required project permits and certificates.	Entire subproject	Before construction	As required	No marginal cost	PIU/DONRE	DONRE
Contact tourist & commercial boat companies	No negative impact	4. Inform tourist and commercial boat companies of schedule of civil works for river port, and all shoreline civil works.	Mekong river	Before construction	As required	No marginal cost	PMIS/PIU	PMIS/PIU
Contact Thai recycling company and DONRE	No negative impact on renovated landfill	5. Review waste stream management of Thai Recycling Company and impacts on dumpsite, and future renovated landfill.	Existing dumpsite	Before construction	As required	No marginal cost	PMIS/PIU	PMIS/PIU
Groundwater study	No negative impact on groundwater	6. Complete TOR, and commission groundwater study at existing dumpsite including installation of bore holes for groundwater sampling	Existing dumpsite	Before construction	As required	See Monitoring Plan	PMIS/PIU	PMIS/PIU

[7] Costs will need to be updated during detailed design phase.
[8] No marginal cost indicates that costs to implement mitigation are to be built into cost estimates of bids of contractors

Subproject Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Location	Timing	Activity Reporting	Estimated Cost[7] (USD)	Responsibility	
							Supervision	Implementation
Detailed designs of subproject,	Minimize negative environmental impacts	7. Work by PMIS[9] to complete detailed designs of all components of both subprojects. Ensure the following measures are included: a) identification of spill management prevention plans, and emergency response plans for all construction sites; b) no disturbance or damage to culture property and values; c) minimal acquisition of agriculture and forested lands; d) locate DONRE-approved borrow pits areas away from human settlements with fencing and access barriers; e) no, or minimal disruption to water supplies along access roads, utilities, and electricity with contingency plans for unavoidable disruptions; f) no, or minimal disruption to normal pedestrian and vehicle traffic along all road segments with contingency alternate routes; g) for all areas include specific plan to notify & provide residents and merchants of construction activities & schedule to minimize disruption to normal commercial and residential activities.	Final siting	Before construction initiated	Once with detailed designs documents	No marginal cost	PMIS	EA/PIU

[9] DDSC is detailed design and supervision consultant to be determined

Subproject Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Location	Timing	Activity Reporting	Estimated Cost[7] (USD)	Responsibility	
							Supervision	Implementation
Update EMP	Positive environmental impacts	8. Identify any new potential impacts of subprojects and include in EMP with special attention to all affected villages and tourist reception areas. 9. Re-clarify with DONRE that no known rare or endangered species inhabit the subproject areas 10. Update mitigation measures and monitoring requirements of EMP where necessary to meet detailed designs, and to protect affected environments. 11. Submit updated EMP with new potential impacts to ADB to review. 12. Develop individual management sub-plans for: a) Construction drainage; b) Erosion; c) Noise and Dust; d) Contaminated Spoil Disposal; e) Solid and Liquid Waste Disposal; f) Construction & Urban Traffic; g) Utility and Power Disruption; h) Worker and Public Safety; i) Tree and Vegetation Removal and Site Restoration; j) Construction Materials Acquisition, Transport, & Storage, and k) Cultural chance finds.	All sites	Before construction initiated	Once with detailed designs documents	No marginal cost	PMIS	EA/PIU
Confirm Government approved construction waste disposal sites	No negative impact	13. Notify DONRE, DAF, DPWT to confirm locations of sites for borrow pits and disposal areas for construction and hazardous waste for subprojects, and obtain required permits.	Entire subproject	Before construction	As required	No marginal cost	PIU/DONRE/ DAF/DPWT	PIU
UXO survey, & removal	Injured worker or public	14. Ensure Government and UXO LAO is consulted and clears areas where necessary	All construction sites.	Beginning of subproject	Once	See Monitoring Plan below	EA/PIU	UXO LAO
Create awareness of physical cultural resources in area	No negative environmental impact	15. Dept of Culture &Tourism to review potential locations of physical resources, and explain possible PCR to contractors and PMIS	All subproject areas	Before construction begins	Once	No marginal cost	PIU/DICT	DICT

Subproject Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Location	Timing	Activity Reporting	Estimated Cost[7] (USD)	Responsibility	
							Supervision	Implementation
Develop bid documents	No negative environmental impact	16. Ensure updated EMP is included in contractor tender documents, and that tender documents specify requirements of the CEMP must be budgeted. 17. Specify in bid documents that contractor must have experience with implementing EMPs, or provide staff with the experience.	All subproject areas	Before construction begins	Once for all tenders	No marginal cost	PMIS	PIU
Obtain & activate permits and licenses	Prevent or minimize impacts	18. Contractors to comply with all statutory requirements set out by Government for use of construction equipment, and operation construction plants such as concrete batching.	For all construction sites	Beginning of construction	Once	No marginal cost	PMIS	PIU & contractors
Capacity development	No negative environmental impact	19. Develop and schedule training plan for (PIU/SS) to be able to fully implement EMP, and to manage implementation of mitigation measures by contractors. 20. Create awareness and training plan for contractors whom will implement mitigation measures.	All subproject areas	Before construction begins	Initially, refresher later if needed	No marginal cost	PMIS	PMIS
Recruitment of workers	Spread of sexually transmitted disease	21. Use local workers as much as possible thereby reducing number of migrant workers	All work forces.	Throughout construction phase	Worker hiring stages	No marginal cost	EA/PIU	Contractor's bid documents
Construction Phase of Subproject Components								
Initiate EMP & sub-plans,	Prevent or minimize impacts	22. Initiate updated EMP & CEMP including individual management sub-plans for different potential impact areas that are completed in pre-construction phase (see sub-plan guidance below).	For all construction sites	Beginning of construction	Once	No marginal cost	PMIS	PIU & contractors

Subproject Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Location	Timing	Activity Reporting	Estimated Cost[7] (USD)	Responsibility	
							Supervision	Implementation
Worker camps	Pollution and social problems	23. Locate worker camps away from human settlements. 24. Ensure adequate housing and waste disposal facilities including pit latrines and garbage cans. 25. A solid waste collection program must be established and implemented that maintains a clean worker camps 26. Locate separate pit latrines for male and female workers away from worker living and eating areas. 27. A clean-out or infill schedule for pit latrines must be established and implemented to ensure working latrines are available at all times. 28. Worker camps must have adequate drainage. 29. Local food should be provided to worker camps. Guns and weapons not allowed in camps. 30. Transient workers should not be allowed to interact with the local community. HIV Aids education should be given to workers. 31. Camp areas must be restored to original condition after construction completed.	All worker camps	Throughout construction phase	Monthly	No marginal cost	PMIS/PIU	contractor
Training & capacity	Prevent of impacts through education	32. Implement training and awareness plan for PIU/SS and contractors.	PIU office, construction sites	Beginning of construction	After each event	No marginal cost	PMIS	PMIS/PIU

Subproject Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Location	Timing	Activity Reporting	Estimated Cost[7] (USD)	Responsibility	
							Supervision	Implementation
Implement construction materials acquisition, transport, and storage sub-plan	Pollution, injury, increased traffic, disrupted access	33. All borrow pits should be approved by DONRE, including any plans to mine sand from Mekong river . 34. Select pits in areas with low gradient and as close as possible to construction sites. 35. Required aggregate volumes must be carefully calculated prior to extraction to prevent wastage. 36. Pits should not be located near surface waters, forested areas, critical habitat for wildlife, or cultural property or values. 37. If sand mining from Mekong river for shoreline work is essential then only at licensed locations. 38. All topsoil and overburden removed should be stockpiled for later restoration. 39. All borrow pits should have a fence perimeter with signage to keep public away. 40. After use should be dewatered and permanent fences installed with signage to keep public out, and restored as much as possible using original overburden and topsoil. 41. Unstable slope conditions in/adjacent to the quarry or pit caused by the extractions should be rectified with tree planting. 42. Define & schedule how materials are extracted from borrow pits, transported, and handled & stored at sites. 43. Define and schedule how fabricated materials for Mekong shoreline component such as steel, wood structures, and scaffolding will transported and handled. 44. All aggregate loads on trucks should be covered. .	For all construction areas.	Throughout construction phase	Monthly	No marginal cost	PMIS/PIU	contractor

Subproject Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Location	Timing	Activity Reporting	Estimated Cost[7] (USD)	Responsibility	
							Supervision	Implementation
Road bitumen (DBST) production, and application	Air pollution, land and water contamination, and traffic & access problems,	45. Piles of aggregates at sites should be used/or removed promptly, or covered and placed in non-traffic areas 46. Store DBST materials well away from all human activity and settlements, and cultural (e.g., schools, hospitals), and ecological receptors. Bitumen production and handling areas should be isolated. 47. Contractors must be well trained and experienced with the production, handling, and application of bitumen. 48. All spills should be cleaned immediately and handled as per hazardous waste management plan, and according to Government regulations. 49. Bitumen should only be spread on designated road beds, not on other land or near any human activities. 50. Bitumen should not be used as a fuel.	For all construction areas.	Throughout construction phase	Monthly	No marginal cost	PMIS & PIU	contractor

Subproject Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Location	Timing	Activity Reporting	Estimated Cost[7] (USD)	Responsibility	
							Supervision	Implementation
Implement spoil management sub-plan	Contamination of land and surface waters from excavated spoil, and construction waste	51. Uncontaminated spoil to be disposed of in DONRE-designated sites, which must never be in or adjacent surface waters. Designated sites must be clearly marked and identified. 52. Spoil must not be disposed of on sloped land, near cultural property or values, ecologically important areas, or on/near any other culturally or ecologically sensitive feature. 53. Where possible spoil should be used at other construction sites, or disposed in spent quarries or borrow pits. 54. A record of type, estimated volume, and source of disposed spoil must be recorded. 55. Contaminated spoil disposal must follow DONRE regulations including handling, transport, treatment (if necessary), and disposal. 56. Suspected contaminated soil must be tested, and disposed of in designated sites identified as per DONRE regulations. 57. Before treatment or disposal contaminated spoil must be covered with plastic and isolated from all human activity.	All excavation areas	Throughout construction phase	Monthly	See Monitoring Plan for contaminated soil analyses	PMIS & PIU & DONRE	contractor

Subproject Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Location	Timing	Activity Reporting	Estimated Cost[7] (USD)	Responsibility	
							Supervision	Implementation
Implement solid and liquid construction waste sub-plan	Contamination of land and surface waters from construction waste	58. Management of general solid and liquid waste of construction will follow DONRE regulations, and will cover, collection, handling, transport, recycling, and disposal of waste created from construction activities and worker force. 59. Areas of disposal of solid and liquid waste to be determined by DONRE. 60. Disposed of waste should be catalogued for type, estimated weigh, and source. 61. Construction sites should have large garbage bins. 62. A schedule of solid and liquid waste pickup and disposal must be established and followed that ensures construction sites are as clean as possible. 63. Solid waste should be separated and recyclables sold to buyers in community. <u>Hazardous Waste</u> 64. Collection, storage, transport, and disposal of hazardous waste such as used oils, gasoline, paint, and other toxics must follow DONRE regulations. 65. Wastes should be separated (e.g., hydrocarbons, batteries, paints, organic solvents) 66. Wastes must be stored above ground in closed, well labeled, ventilated plastic bins in good condition well away from construction activity areas, all surface water, water supplies, and cultural and ecological sensitive receptors. 67. All spills must be cleaned up completely with all contaminated soil removed and handled with by contaminated spoil sub-plan.	All construction sites and worker camps	Throughout construction phase	Monthly	No marginal cost	PMIS & PIU & DONRE	contractor

Subproject Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Location	Timing	Activity Reporting	Estimated Cost[7] (USD)	Responsibility	
							Supervision	Implementation
Implement Noise and dust sub-plan	Dust Noise	68. Regularly apply wetting agents to exposed soil and construction roads. 69. Cover or keep moist all stockpiles of construction aggregates, and all truck loads of aggregates. 70. Minimize time that excavations and exposed soil are left open/exposed. Backfill immediately. 71. As much as possible restrict working time between 07:00 and 17:00. In particular are activities such as pile driving. 72. Maintain equipment in proper working order 73. Replace unnecessarily noisy vehicles and machinery. 74. Vehicles and machinery to be turned off when not in use. 75. Construct temporary noise barriers around excessively noisy activity areas where possible.	All construction sites.	Fulltime	Monthly	No marginal cost	PMIS & PIU	contractor
Implement utility and power disruption sub-plan	Loss or disruption of utilities and services such as water supply and electricity	76. Develop carefully a plan of days and locations where outages in utilities and services will occur, or are expected. 77. Contact local utilities and services with schedule, and identify possible contingency back-up plans for outages. 78. Contact affected community to inform them of planned outages. 79. Try to schedule all outages during low use time such between 24:00 and 06:00.	All construction sites.	Fulltime	Monthly	No marginal cost	PMIS & PIU & Utility company	contractor

Subproject Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Location	Timing	Activity Reporting	Estimated Cost[7] (USD)	Responsibility	
							Supervision	Implementation
Implement tree and vegetation removal, and site restoration sub-plan	Damage or loss of trees, vegetation, and landscape	80. Contact provincial forestry department for advice on how to minimize damage to trees and vegetation. 81. Restrict tree and vegetation removal to within RoWs. 82. Within RoWs minimize removals, and install protective physical barriers around trees that do not need to be removed. 83. All RoWs to be re-vegetated and landscaped after construction completed. Consult provincial forestry department to determine the most successful restoration strategy and techniques. Aim to replant three trees for each tree removed.	All construction sites.	Beginning and end of subproject	Monthly	No marginal cost	PMIS & PIU	contractor
Implement erosion control sub-plan	Land erosion	84. Berms, and plastic sheet fencing should be placed around all excavations and earthwork areas. 85. Earthworks should be conducted during dry periods. 86. Maintain a stockpile of topsoil for immediate site restoration following backfilling. 87. Protect exposed or cut slopes with planted vegetation, and have a slope stabilization protocol ready. 88. Re-vegetate all exposed soil immediately after activity is completed.	All construction sites	Throughout construction phase	Monthly	No marginal cost	PMIS & PIU	contractor

Subproject Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Location	Timing	Activity Reporting	Estimated Cost[7] (USD)	Responsibility	
							Supervision	Implementation
Implement worker and public safety sub-plan	Public and worker injury, and health	89. Proper fencing, protective barriers, and buffer zones should be provided around all construction sites. 90. Sufficient signage and information disclosure, and site supervisors and night guards should be placed at all sites. 91. Worker and public safety guidelines should be followed (Lao PDR OSH Programme section III) . 92. Speed limits suitable for the size and type of construction vehicles, and current traffic patterns should be developed, posted, and enforced on all roads used by construction vehicles. 93. Standing water suitable for disease vector breeding should be filled in. 94. Worker education and awareness seminars for construction hazards should be given at beginning of construction phase, and at ideal frequency of monthly. A construction site safety program should be developed and distributed to workers. 95. Appropriate safety clothing and footwear should be mandatory for all construction workers. 96. Adequate medical services must be on site or nearby all construction sites. 97. Drinking water must be provided at all construction sites. 98. Sufficient lighting be used during necessary night work. 99. All construction sites should be examined daily to ensure unsafe conditions are removed.	All construction sites.	Fulltime	Monthly	No marginal cost	PMIS & PIU	contractor

Subproject Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Location	Timing	Activity Reporting	Estimated Cost[7] (USD)	Responsibility	
							Supervision	Implementation
Civil works	Degradation of water quality & aquatic resources	100. Protective coffer dams, berms, plastic sheet fencing, or silt curtains should be placed between all earthworks and surface waters. 101. Erosion channels must be built around aggregate stockpile areas to contain rain-induced erosion. 102. Earthworks should be conducted during dry periods. 103. All construction fluids such as oils, and fuels should be stored and handled well away from surface waters. 104. No waste of any kind is to be thrown in surface waters. 105. No washing or repair of machinery near surface waters. 106. Pit latrines to be located well away from surface waters. 107. No unnecessary earthworks in or adjacent to water courses. 108. All irrigation canals and channels to be protected the same way as rivers, streams, and lakes	All construction sites	Throughout construction phase	Monthly	No marginal cost	PMIS & PIU	contractor
Civil works	Degradation of terrestrial resources	109. All construction sites should be located away forested areas as much as possible. 110. No unnecessary cutting of trees 111. All construction fluids such as oils, and fuels should be stored and handled well away from forested and plantation areas. 112. No waste of any kind is to be discarded on land or in forests/plantations.	All construction sites	Throughout construction phase	Monthly	No marginal cost	PMIS & PIU	contractor

Subproject Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Location	Timing	Activity Reporting	Estimated Cost[7] (USD)	Responsibility	
							Supervision	Implementation
Civil works: Cultural chance finds sub-plan	Damage to cultural property or values, and chance finds	113. As per detailed designs all civil works should be located away from all cultural property and values.. DICT identified potential sites and types of PCR in pre-con phase. 114. Chance finds of valued relics and cultural values should be anticipated by contractors. Site supervisors should be on the watch for finds. 115. Upon a chance find all work stops immediately, find left untouched, and PIU notified to determine if find is valuable. Culture section of DICT notified by telephone if valuable. 116. Work at find site will remain stopped until DICT allow work to continue.	All construction sites	At the start , and throughout construction phase	Monthly	No marginal cost	PMIS & PIU	contractor
Implement Construction and urban traffic sub-plan	Traffic disruption, accidents, public injury	117. Schedule construction vehicle activity during light traffic periods. Create adequate traffic detours, and sufficient signage & warning lights. 118. Post speed limits, and create dedicated construction vehicle roads or lanes. 119. Inform community of location of construction traffic areas, and provide them with directions on how to best co-exist with construction vehicles on their roads. 120. Demarcate additional locations where pedestrians can develop road crossings away from construction areas. 121. Increase road and walkway lighting.	All construction sites	Fulltime	Monthly	No marginal cost	PMIS & PIU	contractor
Implement Construction Drainage sub-plan	Loss of drainage & flood storage	122. Provide adequate short-term drainage away from construction sites to prevent ponding and flooding. 123. Manage to not allow borrow pits to fill with water. Pump periodically to land infiltration or nearby water	All areas with surface waters	Design & construction phases	Monthly	No marginal cost	PMIS & PIU	contractor

Subproject Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Location	Timing	Activity Reporting	Estimated Cost[7] (USD)	Responsibility	
							Supervision	Implementation
		courses. 124. Install temporary storm drains or ditches for construction sites 125. Ensure connections among surface waters (ponds, streams) are maintained or enhanced to sustain existing stormwater storage capacity. 126. Protect surface waters from silt and eroded soil.						
Mitigations for Riverbank Protection and River Port Upgrading on Mekong River								
Shoreline works to upgrade port	Erosion / Sedimentation	127. Implement subproject during the dry season 128. Install berms, plastic fencing, or silt curtains to isolate main river of Mekong from civil works sites 129. Isolate all excavation or infilling near river from river as much as possible. Use erosion berms, and install industrial silt curtain parallel in river to separate entire construction zone from river.	All civil works sites at river	Throughout construction period	Monthly	No marginal cost	PMIS & PIU	contractor
Shoreline works to upgrade & protect riverbank	Loss of nearshore aquatic habitat	130. Implement subproject during the dry season. Minimize in-river civil works	All civil works sites at river	Throughout construction period	Monthly	No marginal cost	PMIS & PIU	contractor
	Disruption of community fisheries	131. Notify local community managers of both fisheries areas of scheduled civil works activities, and to determine sensitive periods to avoid in-river works	At Poy Ou and Tin That villages	Throughout construction period	Monthly	No marginal cost	PMIS & PIU	contractor
	Disrupted boat	132. Establish well-marked, nearshore access lane for construction boat traffic away main traffic areas, and	In river in front of pier areas	Throughout construction	Monthly	No marginal cost	PMIS & PIU	contractor

Subproject Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Location	Timing	Activity Reporting	Estimated Cost[7] (USD)	Responsibility	
							Supervision	Implementation
	traffic in river	fishing areas. Schedule construction boat during periods of low river traffic		period				
Mitigations for Construction of Ecological Park and Recreation Area								
Civil works around lake	Sedimentation and pollution of lake	133. Install temporary berms and plastic fencing around entire shoreline of lake. 134. As part of construction waste management sub-plan keep all waste away from lake, and regularly disposed in DONRE-approved locations.	Lake of ecological park	fulltime	As needed	No marginal cost	PMIS/PIU	SS
Mitigations for Construction of Solid Waste Management								
Civil works for renovation of landfill	Disruption of dumping and recycling operations	135. Inform waste pickers of plan and detailed schedule of renovations to landfill in order to prevent or minimize disruption of ongoing operations .	Existing dumpsite	Throughout construction period	Monthly	No marginal cost	PMIS & PIU	contractor
Operation Phase of Renovated Landfill								
Operation of renovated landfill	Pollution of groundwater and downstream wetlands area	136. Regularly monitor groundwater quality from wells bored during construction to ensure renovated landfill operating properly.	Renovated landfill	Quarterly	Annually	O&M	DPWT	
Operation Phase of Upgraded Stormwater and Wastewater Drains								
Operation of drains	Back-up and flooding events	137. Regularly clean and maintain all drains with adequate annual O&M budget	All stormwater and wastewater drains	Quarterly	Annually	O&M	DPWT	

Subproject Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Location	Timing	Activity Reporting	Estimated Cost[7] (USD)	Responsibility	
							Supervision	Implementation
Operation Phase of Upgraded River Port on Mekong river								
Operation of upgraded port	Boat accidents due to increased traffic	138. Dedicated shoreline lanes should be set for ferry boats away from other boat traffic. Enforced speed limits for all boats should be posted in area	At river port area	Fulltime	Biannual	O&M	DPWT	

V. MONITORING PLAN

27. The environmental monitoring plan for the EMP is provided in Table 6. The monitoring plan addresses all three implementation phases (pre-construction, construction, post-construction operation), and consists of environmental indicators, the sampling locations & frequency, method of data collection, responsible parties, and estimated costs. The purpose of the monitoring plan is to determine the effectiveness of the impact mitigations, and to document any unexpected positive or negative environmental impacts of the subproject. Table 2 summarizes the responsibilities for monitoring during the construction-implementation of the subproject.

1. Environmental Standards for Subproject Components

28. Environmental standards for ambient water quality in urban areas in Lao PDR (Appendix B) are provided by the National Environmental Standard Order No. 2734/PMU-WREA (2009). The environmental standards provided by the Environmental, Health and Safety Guidelines of the IFC/World Bank (2007) (e.g., ambient air quality & noise) should be followed to supplement standards that are not provided by the Government.

29. An independent environmental monitoring consultant (EMC) will be required to perform the sampling and laboratory analyses for the environmental monitoring program. The SS will coordinate with the EMC under the direction of the PMIS/PIU who will provide logistical support to the EMC where necessary.

2. Performance Monitoring

30. Performance monitoring is required to assess the overall performance of the EMP. A performance monitoring system is normally developed by the EA for the entire subproject. Select indicators of major components of the environment that will be affected primarily by the construction phase are drawn from the mitigation and monitoring plans and summarized in Table 7.

3. Reporting

31. Regular reporting on the implementation of mitigation measures, and on monitoring activities during construction phase of the subproject is required. Reporting is the responsibility of PIU and should be conducted in conjunction with regular meetings with stakeholders as part of the continuation of stakeholder communications. The mitigation and monitoring plans (Tables 5 and 6) summarize proposed timing of reporting. A report on environmental monitoring and implementation of EMP will be prepared quarterly for the EA/PCU by the PIU. The PIU report will compile monthly reports provided by the EO of contractor, the reports of the EMC on monitoring, and input from the ES of the PMIS. The PIU report will also be sent to the DONRE and the EA for consolidation and transmission to ADB.

32. The reports will table all indicators measured with the monitoring plan of EMP including performance monitoring indicators (Table 7), and will include relevant Government environmental quality standards. Appendix C provides a monitoring report template for the PIU that the PIU with assistance from the PMU and PMIS must complete and attach as part of regular PIU reporting to the PMU/IA.

Table 6. Environmental Monitoring Plan

ENVIRONMENTAL EFFECTS MONITORING							
Environmental Indicators	Location	Means of Monitoring	Frequency	Reporting	Responsibility Supervision / Implementation		Estimated Cost[10] (USD)
					Supervision	Implementation	
Pre-construction Phase – Update Baseline Conditions							
Where needed update baseline on sensitive receptors (e.g., cultural property & values, new schools or hospitals, rare/endangered species, critical habitat), and aquatic resources and human uses of Mekong river	A) Final RoWs for riverside road and walkway B) Riverbank protection sites C) Ecological park; D) Drainage areas	Contact DONRE, community consultations	Once	Once	EA/PIU	PIU	$1,000.
A) Dust, noise, and vibration levels B) Affected surface water quality: TSS, heavy metals (As, Cd, Pb,) oil and grease, pH, DO, COD, BOD_5, temperature, TDS, NH_3, NH_4, other nutrient forms of N & P C) water table depth and groundwater quality (see Appendix C of IEE)	A) All civil works sites B) Mekong river, and lake of ecological park C) At dumpsite	Using field and analytical methods approved by DONRE.	One day and one night measurement during rainy & dry seasons.	One baseline supplement report before construction phase starts	PIU	Environmental Monitoring Consultant	A) $1,500. B) $6,000. C) 50,000.
Inventory of present and past land uses that could cause contaminated soil.	Possible contaminated lands at all excavation sites	Using field and analytical methods approved by DONRE.	Once	Once	PIU	Environmental Monitoring Consultant	$500.

[10] To be updated with EMP at detailed design stage

Construction Phase of all Houayxay Subproject Components							
Analysis of soil quality (heavy metals (As, Cd, Pb, oil & grease, hydrocarbons).	Possible contaminated lands at all excavation sites	Using field and analytical methods approved by DONRE.	Once, if needed	Once	PIU	Environmental Monitoring Consultant	$2,500.
A) Dust, noise, wind, and vibration levels B) Water quality of Mekong river, and Eco park pond: TSS, heavy metals (As, Cd, Pb,) oil and grease, pH, DO, COD, BOD_5, temperature, TDS, NH_3, NH_4, other nutrient forms of N & P C) Analysis of soil quality (heavy metals (As, Cd, Pb, Hg, Mn), hydrocarbons. D) Domestic (worker) and construction solid waste inside & outside construction sites including worker camps. E) Public comments and complaints F) Incidence of worker or public accident or injury	A & B): Baseline sites of pre-construction phase. C) At sites where contaminated soil is suspected. D) All construction sites and worker camps E) Using hotline number placed at construction areas F) At all construction areas	A – C : Using field and analytical methods approved by DONRE. Include visual observations of dust and noise from contractor & public reports . D) Visual observation E) Information transferred by telephone hotline number posted at all construction sites. F) regular reporting by contractors/PMU	(A – B): Quarterly during construction periods Daily visual records C) Once at start of excavations D) Monthly E) Continuous public input F) Continuous	Monthly	(A - D):		A & B: $7,000./yr C: $1,500 /yr D: $0.0 E: $1,500./yr F: $0.0
					PIU	Monitoring Consultant	
					(E & F) & daily observations:		
					EA/PIU	contractor	
Operation of Renovated Landfill							
Groundwater quality	Bore wells at landfill.	Using field and analytical methods approved by DoE.	Biannually for 5 years	Biannual	DPWT/UDAA/ DONRE	$3000. /yr	Groundwater quality (see groundwater study, Appendix C of IEE
Vehicle traffic accidents	Access road.	Regular record keeping.	Continuous	For each event	DPWT	$0.0	Traffic accidents
Operation of Upgraded River Port							

Boat traffic accidents	Mekong river at Houayxay.	Regular record keeping.	Continuous	For each event	DPWT	$0.0
Water Pollution (garbage, oil, gas), Incidence of garbage & litter	Mekong river Ecological Park	Using field and analytical methods approved by DONRE, and visual.	Quarterly	For each event	DPWT/UDAA/DONRE	$2,500. /yr
Operation of Upgraded Stormwater and Wastewater Drains						
Incidence of flooding	Along or near upgraded drains	Surveys, public complaints	Rainy season for 5 years	Quarterly	DPWT/UDAA	$0.0./yr

Table 7. Performance Monitoring Indicators for Houayxay Subproject

Major Environmental Component	Key Indicator	Performance Objective	Data Source
Pre-construction Phase			
Public Consultation and Disclosure	Affected public and stakeholders	Meetings with stakeholders contacted during IEE & new stakeholders convened for follow-up consultation and to introduce grievance mechanism	Minutes of meeting, and participants list
EMP	Updated EMP	All stakeholders contacted during IEE re-contacted for follow-up consultation	EMP
Bid Documents	Requirements of EMP (CEMP)[11]	EMP appended to bidding documents with clear instructions to bidders for CEMP	Bid documents
Training of PIU/SS	Training course(s) & schedule	By end of preconstruction phase, required course(s) that will be delivered are designed and scheduled	Course(s) outline, participants, and schedule
Construction Phase			
All subproject areas	Critical habitat, rare or endangered species ***if present***	All *present* critical habitat and R & E species if unchanged, and unharmed	Monitoring by EMC[12]
Groundwater quality at landfill	Heavy metals, coliform bacteria, TDS, H_2S, BOD_5, TN, NH_3, TP, nutrient forms of N & P[13]	Government environmental standards and criteria met	Monitoring by EMC
Mekong river and Eco-pond water quality	TSS, DO, BOD, COD, pH, oil & grease, nutrient forms of T & N, metals (Pb, Fe, As)[14]	Government environmental standards and criteria met	Monitoring by EMC
Air quality	Dust, noise, vibration	Levels never exceed pre-construction baseline levels	EMC & contractor monitoring reports,
Soil quality	Solid and liquid waste	Rigorous program of procedures and rules to collect and store all waste from construction camps and sites practiced.	Contractor and EMC monitoring reports
Hazardous materials and waste	Oil, gasoline, grease, alum, chlorine, soda	Rigorous program of procedures to manage and store all waste from construction camps and sites practiced.	Contractor and EMC monitoring reports
Public and worker safety	Frequency of injuries	Adherence to Government policy and site-specific procedures to prevent accidents	Contractor reports
Cultural property	Incidence of damage or complaints	No valued cultural property, or unearthed valuable relic is harmed in any way	Public input, contractor reports, public input, EMC reports
Traffic	Frequency of disruptions and/or blocked roadways	Disruptions, stoppages, or detours are managed to absolute minimum.	Public input, contractor reports, EMC reports

[11] Contractor Environmental Management Plan developed from EMP in contractor bidding document
[12] Environmental Monitoring Consultant hired to assist PMIS and implementation of Environmental Monitoring Plan
[13] See Appendix B for environmental standards
[14] Appendix B

Major Environmental Component	Key Indicator	Performance Objective	Data Source
Operation Phase of Upgraded River Port			
Public safety	Incidence of boat accidents	None	DPWT
Water quality	garbage, oil & grease,	No deviation from baseline	DPWT/DONRE
Operation of Renovated Landfill Site			
Groundwater quality	Heavy metals, coliform bacteria, TDS, H_2S, BOD_5, TN, NH_3, TP, nutrient forms of N & P	No deviation from baseline levels, compliance with standards Appendix B	DPWT/DONRE
Public safety	Incidence of traffic accidents on access road	No deviation from baseline frequency	DPWT

VI. ESTIMATED COST OF EMP

33. The marginal costs for implementing the EMP are primarily for environmental monitoring because the costs for implementing impact mitigation measures are included with the construction costs in contractor bid documents. From Table 5 the preliminary costs for the implementation of the EMP for Houayxay subproject are summarized in Table 8. These costs include per diem technician fees. These costs include per diem technician fees. Note that contingencies have been provided to account for cost uncertainty to the total EMP cost

34. An estimated budget of USD $10,000.00 is required for capacity building for environmental management in conjunction with other capacity development activities of the subproject. The costs will need to be updated by the PMIS in conjunction with the PIU during the pre-construction, detailed design phase of the subproject.

Table 8. Estimated costs for Environmental Monitoring Plan of EMP

Activity Type	Estimated Cost[15] (USD)
Pre-construction Phase	
Updating Environmental Baseline	
cultural receptors	$1,000.00
environmental quality	$8,000.00
groundwater quality at landfill	$50,000.00
Construction Phase	
environmental quality	$19,500.00
public consultation	$3,000.00
Post-construction Operation Phase	
environmental quality	$15,000.00
public input	$0.0
Capacity development and training	$10,000.00
Total	**$106,500.00**

[15] To be updated with EMP at Detailed Design Phase

VII. EMERGENCY RESPONSE PLAN

35. The Contractor must develop emergency or incident response procedures during construction. In the operational phase the operator/civil authorities will have responsibility for any emergencies or serious incidents. The construction phase should ensure:

i) Emergency Response Team (ERT) of the Contractor as initial responder;
ii) District fire and police departments, emergency medical service, the Department of Public Health (DPH), collectively referred to as the External Emergency Response Team (EERT), as ultimate responders.

36. The Contractor will provide and sustain the required technical, human and financial resources for quick response during construction.

Table 9: Roles and Responsibilities in Emergency Incident Response

Entity	Responsibilities
Contractor Team (ERT)	- Communicates / alerts the EERT. - Prepares the emergency site to facilitate the response action of the EERT, e.g., vacating, clearing, restricting site. - When necessary & requested by the EERT, lends support / provides assistance during EERT's response operations.
External Emergency Response Team (EERT)	- Solves the emergency/incident
Contractor Resources	- Provide and sustain the people, equipment, tools & funds necessary to ensure Subproject's quick response to emergency situations. - Maintain good communication lines with the EERT to ensure prompt help response & adequate protection, by keeping them informed of Subproject progress.

37. The ERT will be led by the senior contractor engineer (designated ERTL) on site with a suitably trained foreman or junior engineer as deputy. Trained first-aiders and security crew will be the core members of the ERT.

38. The Contractor will ensure that ERT members are physically, technically and psychologically fit for their emergency response roles and responsibilities.

39. Prior to the mobilization of civil works, the Contractor, through its Construction Manager, ERTL, in coordination with the PCU/PIU, will meet with the ultimate response institutions to discuss the overall construction process, including, but not limited to:

i) subproject sites;
ii) construction time frame and phasing;
iii) any special construction techniques and equipment that will be used; i
iv) any hazardous materials that will be brought to and stored in the construction premise and details on their applications and handling/management system;
v) the Contractor's Emergency Management Plan
vi) names and contact details of the ERT members

40. The objective of this meeting is to provide the ultimate response institutions the context for:

i) their comments on the adequacy of the respective Emergency Management Plans
ii) their own assessment of what types, likely magnitude and likely incidence rate of potential hazards are anticipated
iii) the arrangements for coordination and collaboration.

41. To ensure effective emergency response, prior to mobilization of civil works, the Contractor will:

i) set up the ERT;
ii) set up all support equipment and facilities in working condition
iii) made arrangements with the EERT;
iv) conducted proper training of ERT members, and encouraged and trained volunteers from the work force; v) conducted orientation to all construction workers on the emergency response procedures and facilities, particularly evacuation procedures, evacuation routes, evacuation assembly points, and self-first response, among others; and vi) conducted drills for different possible situations.

42. To sustain effective emergency response throughout Subproject implementation an adequate budget shall be provided to sustain the capabilities and efficiency of the emergency response mechanism, the emergency response equipment, tools, facilities and supplies. Drills and reminders will take place regularly, the former at least every two months and the latter at least every month.

A. Alert Procedures

43. Means of communicating, reporting and alerting an emergency situation may be any combination of the following: i) audible alarm (siren, bell or gong); ii) visual alarm (blinking/rotating red light or orange safety flag); iii) telephone (landline); iv) mobile phone; v) two-way radio; and vi) public address system/loud speakers. Some rules relative to communicating/alerting will be:

(i) Whoever detects an emergency situation first shall immediately :
- call the attention of other people in the emergency site,
- sound the nearest alarm, and/or
- report/communicate the emergency situation to the ERT.

(ii) Only the ERTL and, if ERTL is not available, the Deputy ERTL are authorized to communicate with the EERT. Exceptional cases to this rule may be necessary and should be defined in the Emergency Management Plans.

(iii) When communicating/alerting an emergency to the EERT, it is important to provide them with at least: i) the type of emergency situation; ii) correct location of the emergency; ii) estimated magnitude of the situation; iii) estimated persons harmed; iv) time it happened; v) in case of a spill, which hazardous substance spilled; and vi) in case of fire and explosion, what caused it. Such details would allow the EERT to prepare for the appropriate response actions.

For an effective reporting/alerting of an emergency situation:

(i) The names and contact details of the relevant persons and institutions should be readily available in, or near to, all forms of communication equipment, and strategically posted (at legible size) in all Subproject sites and vehicles:
- Most relevant construction/operations staffs namely, the ERTL, Deputy ERTL, first-aiders, supervising engineers, foremen
- EERT institutions/organizations

- Concerned village authority/ies
- PIU Office, SS

(ii) All Subproject sites should have good access to any combination of audible and visual alarms, landline phones, mobile phones and two-way radio communication at all times.

(iii) Contractor's construction vehicles should also be equipped with the appropriate communication facilities.

B. Emergency Response Situations

The following tables suggest general procedures that will be refined in the final EMP during detailed design, and described in more detail in the Emergency Management Plans of the Contractor.

Table 10: Evacuation Procedure

Procedure	Remarks
▪ Move out as quickly as possible as a group, but avoid panic.	▪ All workers/staff, sub-contractors, site visitors to move out, guided by the ERT.
▪ Evacuate through the directed evacuation route.	▪ The safe evacuation shall have been determined fast by the ERTL/Deputy ERTL & immediately communicated to ERT members.
▪ Keep moving until everyone is safely away from the emergency site and its influence area.	▪ A restricted area must be established outside the emergency site, all to stay beyond the restricted area.
▪ Once outside, conduct head counts.	▪ Foremen to do head counts of their sub-groups; ERTL/Deputy ERTL of the ERT.
▪ Report missing persons to EERT immediately.	▪ ERTL/Deputy ERTL to communicate with the EERT.
▪ Assist the injured in evacuation & hand them over to the ERT first-aiders or EERT medical group	▪ ERT to manage injured persons to ensure proper handling.
▪ If injury warrants special care, DO NOT MOVE them, unless necessary & instructed/directed by the EERT.	▪ ERTL/Deputy ERTL communicates with EERT to get instructions/directions in handling the injured.

Table 11: Response Procedure during Medical Emergency

Procedure	Remarks
▪ Administer First Aid regardless of severity immediately.	▪ Fundamentals when giving First Aid: - Safety first of both the rescuer and the victim. - Do not move an injured person unless: - victim is exposed to more danger when left where they are, e.g., during fire, chemical spill - it would be impossible for EERT to aid victims in their locations, e.g., under a collapsed structure - instructed or directed by the EERT.

Procedure	Remarks
	▪ First AID to be conducted only by a person who has been properly trained in giving First Aid.
▪ Call the EERT emergency medical services &/or nearest hospital.	▪ ERTL/Deputy ERTL or authorized on-site emergency communicator
▪ Facilitate leading the EERT to the emergency site.	▪ ERTL/Deputy ERTL to instruct: - an ERT member on- site to meet EERT in access road/strategic location. He/she shall hold orange safety flag to get their attention & lead them to site. - Other ERT members to clear access road for smooth passage of the EERT.
▪ If applicable, vacate site & influence area at once, restrict site, suspend work until further notice.	▪ Follow evacuation procedure.

Table 12: Response Procedure in Case of Fire

Procedure	Remarks
▪ Alert a fire situation.	▪ Whoever detects the fire shall immediately: - call the attention of other people in the site, - sound the nearest alarm, and/or - Foreman or any ERT member among the construction sub-group contacts the fire department (in this case it should be agreed on that it is alright for any ERT member in the sub-group to alert the fire department) - Report/communicate the emergency situation to the ERTL/Deputy ERTL.
▪ Stop all activities/operations and evacuate.	▪ All (non-ERT) workers/staff sub-contractors, site visitors and concerned public to move out to safe grounds following the evacuation procedure.
▪ Activate ERT to contain fire/control fire from spreading.	▪ Guided by the training they undertook, ERT members assigned to mitigate the fire shall assess their own safety situation first before attempting to control fire spread.
▪ Call the nearest fire & police stations &, if applicable, emergency medical services.	▪ When alerting the EERT, ERTL will give the location, cause of fire, estimated fire alarm rating, any injuries.
▪ Facilitate leading the EERT to the emergency site.	▪ ERTL/Deputy ERTL to instruct: - an ERT member to meet the EERT in the access road or strategic location and lead them to the site. He/she shall hold the orange safety flag to get their attention and lead them to the site. - some ERT members to stop traffic in, & clear, the access road to facilitate

Procedure	Remarks
	passage of the EERT.
▪ ERT to vacate the site as soon as their safety is assessed as in danger.	▪ Follow appropriate evacuation procedure.

VIII. INSTITUTIONAL CAPACITY REVIEW AND NEEDS

44. Currently there is little experience and capacity for environmental assessment and management amongst national counterparts responsible for the implementation of the EMP. i.e., DPWT/PIU, and UDAA in Bokeo province and Houayxay. No dedicated environmental staff exist in the UDAA. The PMIS with assistance from the SS of the subproject will develop and deliver training courses to the DICT/PIU staff responsible for the implementation of the subproject. The purpose of the course(s) is to strengthen the ability of the PIU/PMU to oversee implementation of the EMP by construction contractors, and EMC

45. The SS who will be full-time environmental member of the PIU as well as the EO of the contractor should attend training courses as required. Costs for training should be included with costs for implementation of the EMP.

46. Training on the implementation of an EMP should address two thematic areas. The first area should be principles environmental management focused on the potential impacts of subproject activities on the natural and social environment. The second area should be environmental safeguard requirements of the ADB and Government with specific reference to the EMP.

APPENDIX A: INDICATIVE TOR FOR ENVIRONMENTAL SPECIALISTS OF PMIS

International Environmental Specialist.

With assistance from the national environmental specialist the international consultant will be responsible for updating the provincial EMPs at detailed design, and assisting the PIU with overall environmental management of the implementation of the subprojects in LAO. The consultant will: (i) update environmental management plans (EMP) for subprojects in Houayxay and Luang Namtha to ensure that EMPs address the detailed designs and engineering of subprojects. Updates to both EMPs include mitiation and monitoring plans, budget, and capacity development needs of executing agency (EA/PCU) and PIUs (/ DPWT/UDAA); (ii) with national consultant design comprehenisve training plan for safeguards specialist/PIU and on principles of EIA, and the purpose, content, and roles and responsibilities for implementation of updated EMPs highlighting environmental issues of subprojects; (iii) ensure that all relevant safeguards of the EMPs are adequately addressed in the bidding documents (instruction to bidders), and in the evaluation criteria for awarding contracts; (iv) Coordinate and work with the PIUs to ensure that contractors finalize their respective site-specific CEMPs based on the updated EMPs and the actual site conditions; (v) oversee the implementation of all safeguards of the three EMPs relating to construction phase activities including handling of construction spoil and waste, water and air quality protection, public nuisance impacts (noise, dust, traffic, blocked access, workers, and camps), and public safety; (vi) Assist with the finalzation of the groundwater monitoring study at landfill site; (vii) coordinate with the two provincial Departments of Natural Resources & Environment (DONRE) on all relevant environmental regulatory compliance issues (e.g. noise and dust from construction sites, sanitation in workers campsite etc); (viii) prepare TOR(s) for the LAO UXO for the survey, detection, and removal of unexploded ordnance (UXO) at all civil works sites. Ensure that EA and/or PIUs consult LAO UXO and Government authorities to assist with ToR development and implementation; (ix) with PIU/DPWTs, prepare TORs for the follow-up interviews and consultations with the same affected stakeholder and local residents contacted during the PPTA on issues and concerns arising during project construction; (x) work with PIU to understand potential influence of waste stream of Thai recycling Company on exiting and future renovated landfill at Houayxay; (xi) prepare TOR(s) for external national environment monitoring consultant (EMC) for conducting water and air quality sampling, and laboratory analyses for the monitoring plans for the town EMPs; (xii) coordinate with PWDTs to address vehicle and boat traffic issues; (xiii) advise PIU/DPWTs on environment-related concerns arising during sub-projects construction, and recommend corrective measures; (xiv) with PIU/DPWTs, ensure dissemination to stakeholders the results of environment quality monitoring and implementation of safeguards, especially among households or small businesses near the civil construction works areas; (xv) assist EA and PIU/DPWTs prepare a table of contents for regular reports PIU must submit to the EA on implementation of EMPs, environmental, issues, and corrective actions; (xvi) assist PIU/DPWTs prepare simple report template for construction contractors to report monthly on mitigation activities, and environmental issues that occur during construction phase; and (xvii) prepare a quarterly status report on implementation of EMPs, environmental issues, and public safety protection to be submitted through the PIU and EA to the provincial DONREs and ADB.

The consultant should have an advanced degree in environmental sciences, and at least 7 years experience implementing and managing environmental assessment of infrastructure projects in southeast Asia countries (preferably Lao PDR). Other requiremetns include: a) understanding of ADB and national environmental safeguard requirements; b) experience working with and supervising the activities of provincial and national environmental management agencies with envronmental safeguards; and c) designing and delivering training and capacity development programs to provincial environment, project implementing units.

National Environmental Specialist. Provide assistance to the international environmental specialist including acquisition of information new information to update the provincial EMPs at detailed design, and work with the PIU with overall environmental management of the implementation of the subprojects in LAO. The national consultant will assist with: (i) updating environmental management plans (EMP) for subprojects in Houayxay and Luang Namtha to ensure that EMPs address the detailed designs and engineering of subprojects.; (ii) deliver initial training to DPWT and UDAA on the purpose, content, and roles and responsibilities for implementation of updated EMPs; (iii) ensure relevant safeguards of the EMPs are addressed in the bidding documents in paccurate local language and in evaluation criteria for awarding contracts; (iv) help PIUs to ensure that contractors prepare their respective site-specific plans based on the updated EMPs and the actual site conditions; (v) help international consultant oversee the implementation of all safeguards of the three EMPs relating to construction phase activities including handling of construction spoil and waste, water and air quality protection, public nuisance impacts (noise, dust, traffic, blocked access, workers, and camps), and public safety; (vi) assist coordination with the three provincial Departments of Natural resources & Environment (DONRE) on all relevant environmental regulatory compliance issues (e.g. noise and dust from construction sites, sanitation in workers campsite etc); (vii) with PIU/DPWTs, prepare ToRs for the follow-up interviews and consultations with the same affected stakeholder and local residents contacted during the PPTA on issues and concerns arising during project construction. Of particar concern is upgrades to access roads; (viii) assist PWDTs to address vehicle traffic issues, respectively during road upgrades; (ix) with international consultant advise the PIU/DPWTs on environment-related concerns arising during sub-projects construction, and recommend corrective measures; (x) with PIU/DPWTs, ensure dissemination to stakeholders the results of environment quality monitoring and implementation of safeguards, especially among households or small businesses near the civil construction works areas; (xi) assist with all eporting for the EMP. The consultant should have a university degree in the environmental sciences and at least 5 years experience with environmental assessment of infrastructure projects in Lao PDR) including: a) understanding of ADB and national environmental safeguard requirements; b) experience working with international consultants; and c) delivering training and capacity development programs to provincial project implementing units.

APPENDIX B: ENVIRONMENTAL STANDARDS

Water Resources and Environment Administration No 2734 / PMO.WREA (now MONRE)
Vientiane, 7 Dec 2009

Agreement on the National Environmental Standards

Based on the Environmental Protection Law No. 02/99/NA, dated 3 April 1999.
Based on decree on mandate of Water Resources and Environmental Administration dated 149/PM, dated 10 May 2007.

Surface water quality standards in Lao PDR

No	Substances	Symbol	Unit	Standard Value	Method of Measurement
1	Color, Odor and Taste	-	-	N	-
2	Temperature	t	°C	N'	Thermometer
3	Potential of Hydrogen	pH	-	5-9	Electronic pH Meter
4	Dissolved Oxygen	DO	mg/l	6	Azide Modification
5	COD	COD	ml/l	5	Potassium permanganate
6	BOD_5	BOD_5	mg/l	1,5	Azide Modification at 20 degree C, 5 days
7	Total Coliform Bacteria	Coliform Bacteria	MPN/100 ml	5000	Multiple Tube Fermentation
8	Fecal Coliform Bacteria	Fecal Coliform	MPN/ 100 ml	1000	
9	Nitrate-Nitrogen	NO_3-N	mg/l	<5.0	Cadmium Reduction
10	Ammonia-Nitrogen	NH_3-N	mg/l	0.2	Distillation Nesslerization
11	Phenols	C_6H_3-OH	mg/l	0.005	Distillation, 4-Amin anti-pyrenne
12	Copper	Cu	mg/l	0.1	Atomic Absorption Direct Aspiration
13	Nickel	Ni	mg/l	0.1	
14	Manganese	Mn	mg/l	1.0	
15	Zinc	Zn	mg/l	1.0	
16	Cadmium	Cd	mg/l	0.005	
17	Chromium, Hexavalent	Cr^{6+}	mg/l	0.05	
18	Lead	Pb	mg/l	0.05	
19	Mercury	Hg	mg/l	0.002	Atomic Absorption Cold Vapor

No	Substances	Symbol	Unit	Standard Value	Method of Measurement
20	Arsenic	As	mg/l	0.01	Atomic Absorption Direct Aspiration
21	Cyanide	CN^-	mg/l	0.005	Pyridine-Barbituric
22	Alpha ¬Radioactive	α	Becquere l/l	0.1	Counting machine
23	Beta ¬ Radioactive	β	Becquere l/l	1.0	
24	Total Organochlorine	-	mg/l	0.05	Gas Chromatography
25	DDT	$C_{14}H_9Cl_5$	mg/l	1.0	
26	Alpha -BHC	αBHC	mg/l	0.02	
27	Dieldrin	$C_{12}H_8Cl_6O$	mg/l	0.1	
28	Aldrin	-	mg/l	0.1	
29	Heptachlor and Heptachlor Epoxide	-	mg/l	0.2	
30	Endrin	-	mg/l	None	

Drinking Water Quality Standards

Bacteriological Parameters

Parameters	Units	Concentration
Fecal Coliform	MPN/100ml	0
Total Coliform	MPN/100ml	<2.2
Entero virus	MPN/100ml	0

Physical -Chemical Parameters

No.	Parameters	Symbol	Unit	Concentration	
				Minimum	Maximum
1	Aluminum	Al	mg/l	0.1	0.2
2	Ammonia	NH_3	mg/l	0.5	1.5
3	Chloride	Cl^-	mg/l	200	250
4	Copper	Cu	mg/l	1.0	2.0
5	Iron	Fe	mg/l	0.3	<1
6	Manganese	Mn	mg/l	0.1	0.5
7	Sodium	Na	mg/l	200	250
8	Sulphate	SO_4^{2-}	mg/l	200	250
9	Hydrogen Sulphide	H_2S	mg/l	0.05	0.1
10	Conductivity	Ec	µs/cm	-	<1,000
11	Total dissolved solids	TDS	mg/l	500	600
12	Sodium Chloride	NaCl	mg/l	100	300-350
13	Potential of Hydrogen	pH	-	6.5	8.5
14	Temperature	T	^0C	25	35
15	Hardness	-	mg/l	50	300
16	Turbidity	-	NTU	-	<10
17	Taste and Odor	-	-	-	Acceptable

18	Color	-	TCU	-	5
19	Residual Chloride (if Chlorine disinfection is used)	Cl_2	mg/l	-	<0.2

Health Significant Chemical Parameters

No.	Parameters	Symbol	Unit	Maximum Concentration
1	Antimony	Sb	mg/l	0.005
2	Arsenic	As	mg/l	0.01-0.05
3	Barium	Ba	mg/l	0.7
4	Boron	B	mg/l	0.50
5	Cadmium	Cd	mg/l	0.003
6	Chromium	Cr	mg/l	0.05
7	Cyanide	CN^-	mg/l	0.07
8	Fluoride	F^-	mg/l	1.5
9	Lead	Pb	mg/l	0.01
10	Mercury	Hg	mg/l	0.001
11	Nitrate	NO_3	mg/l	50
12	Nitrite	NO^-_2	mg/l	3
13	Selenium	Se	mg/l	0.01

A. Priority Parameters

No.	Parameters	Symbol	Unit	Maximum Concentration
1	Iron	Fe	mg/l	<1
2	Manganese	Mn	mg/l	<0.5
3	Arsenic	As	mg/l	<0.05
4	Fluoride	F^-	mg/l	<1.5
5	Nitrate	NO_3^-	mg/l	50
6	Nitrite	NO_2^-	mg/l	3
7	Nitrite Nitrogen	NO_2^-N	mg/l	1
8	Potential of Hydrogen	pH	-	6.5-8.5
9	Coliform	-	MPN/100ml	0
10	Conductivity	Ec	µs/cm	1000
11	Residual Chloride (if Chlorine disinfection is used)	Cl_2	mg/l	0.2
12	Total Hardness	-	mg/l	<300
13	Turbidity	-	NTU	<10
14	Taste and Odor	-	-	Acceptable

Groundwater Standards for Drinking Purposes

Characteristics	Parameters	Symbol	Unit	Permitted Standard Value	
				Suitable	Maximum
Physical	1. Colour	-	Platinum-Cobalt (Pt-Co)	5	15
	2. Turbidity	-	JTU	5	20
	3. Potential of Hydrogen	pH	-	7.0-8.5	6.5-9.2
Chemical	4. Iron	Fe	mg/l	≤0.5	1
	5. Manganese	Mn	mg/l	≤0.3	0.5
	6. Copper	Cu	mg/l	≤1.0	1.5
	7. Zinc	Zn	mg/l	≤5.0	15
	8. Sulphate	SO_4^{2-}	mg/l	≤200	250
	9. Chloride	Cl^-	mg/l	≤250	600
	10. Fluoride	F^-	mg/l	≤0.7	1
	11.Nitrate	NO_3^-	mg/l	≤15	45
	12. Total Hardness as CaCO3	Total $CaCO_3$	mg/l	≤300	500
	13.Non-carbo-nate hardness as CaCO3	Non $CaCO_3$	mg/l	≤200	250
Toxic chemical substances	14. Total solids	TS	mg/l	≤600	1,200
	15. Arsenic	As	mg/l	None	0.05
	16. Cyanide	CN^-	mg/l	None	0.1
	17. Lead	Pb	mg/l	None	0.05
	18. Mercury	Hg	mg/l	None	0.001
	19. Cadmium	Cd	mg/l	None	0.01
	20. Selenium	Se	mg/l	None	0.01
Bacteria	21. Coliform bacteria	Coliform	MPN/100 ml	<2.2	<2.2
	22. E. coli bacteria	E. coli	-	None	None
	23. Standard plate count	-	Colonies/ml	≤500	-

Soil Quality Standards for Residential and Agriculture

No.	Substances	Symbol	Unit	Standard Value	Method of Measurement
I. Volatile Organic Compound					
1	Benzene	C_6H_6	mg/kg	0.5	Gas Chromatography or Gas Chromatography/. Mass Spectrometry (GC/MS) or other methods approved by DONRE
2	CarbonTetrachloride	CCI_4	mg/kg	89	
3	1,2 Dichloroethane	CH_2CI-CH_2CI	mg/kg	230	
4	1,1 Dichloroethylene	$CCI_2=CH_2$	mg/kg	1,700	
5	Cis 1,2 Dichloroethylene	CHCl=CHCl	mg/kg	57	
6	Trans-1.2-Dichloroethylene	CHCl=CHCl	mg/kg	520	
7	Dichloromethane	CH_2CI_2	mg/kg	28	
8	Ethly benzene	lC_2ClC-CH_3	mg/kg	630	
9	Styrene	C_6H_5-$CH=CH_2$	mg/kg	8.4	
10	Tetrachloroethylene	C_2Cl_4	mg/kg	210	
11	Toluene	C_6H_5-CH_3	mg/kg	6.5	
12	Trichloroethylene	$CI_2C=CHCI$	mg/kg	2.5	
13	1.1.1 Trichloroethane	CI_3C-CH_3	mg/kg	3.5	
14	1.1.2 Trichloroethane	CI_2CH-CH_2CI	mg/kg	43	
15	Total Xylenes	(CH_3-C_6H_4-CH_3)	mg/kg	63	
II. Heavy Metals					
1	Arsenic	As	mg/kg	3.9	Inductively Coupled Plasma-Atomic Emission Spectrometry or Inductively Coupled Plasma-Mass Spectrometry or Atomic Absorption, Gaseous Hydride or Atomic Absorption, Borohydride Reduction or other Methods Approved by DONRE
2	Cadmium and its compounds	Cd	mg/kg	37	
3	Hexavalent Chromium	Cr^{+6}	mg/kg	300	Coprecipitation or Colorimetric or Chelation/ Extraction or other Methods Approved by DONRE
4	Lead	Pb	mg/kg	400	Inductively Coupled Plasma-Atomic Emission

5	Manganese and its compounds	Mn	mg/kg	1,800	Spectrometry or Inductively Coupled Plasma-Mass Spectrometry or Atomic Absorption, Direct Aspiration or Atomic Absorption, Furnace Techniques or other Methods Approved by DONRE
6	Mercury and its compounds	Hg	mg/kg	23	Cold-Vapor Technique or other Methods Approved by DONRE
7	Nickel, soluble salts	Ni	mg/kg	1,600	Inductively Coupled Plasma-Atomic Emission Spectrometry or Inductively Coupled Plasma-Mass Spectrometry or Atomic Absorption, Direct Aspiration or Atomic Absorption, Furnace Techniques or other Methods Approved by DONRE
8	Selenium	Se	mg/kg	390	
III. Pesticides					
1	Atrazine	$C_8H_{14}ClN_5$	mg/kg	22	Gas Chromatography or other Methods Approved by DONRE
2	Chlordane	-	mg/kg	16	Gas Chromatography/ Mass Spectrometry (GC/MS) or other Methods Approved by DONRE
3	2,4 D	-	mg/kg	690	Gas Chromatography or High Performance Liquid Chromatography/ Thermal Extraction/ Gas Chromatography/Mass Spectrometry (TE/GC/MS) or other Methods Approved by DONRE
4	DDT	DDT	mg/kg	17	Gas Chromatography or Gas Chromatography/ Mass Spectrometry (GC/MS) or other Methods Approved by DONRE
5	Dieldrin	$C_{12}H_8Cl_6O$	mg/kg	0.3	
6	Heptachlor	Cl_7	mg/kg	1.1	
7	Heptachlor Epoxide	-	mg/kg	0.5	
8	Lindane	-	mg/kg	4.4	
IV. Others					
1	Benzo(a)pyrene	-	mg/kg	0.6	Gas Chromatography/ Mass Spectrometry (GC/MS) or Thermal Extraction Gas Chromatography/ Mass Spectrome-

No.	Substances	Symbol	Unit	Standard Value	Method of Measurement

					try (TE/GC/MS) Chromatography/ Fourier Transform Infrared (GC/FT-IR) Spectrometry or other Methods Approved by DONRE
2	Cyanide and its compounds	CN^-	mg/kg	11	Total and Amenable Cyanide: Distillation, or Total Amenable Cyanide (Automated Colorimetric, with off-line Distillation), or Cyanide Extraction Procedure for Solids and Oils or other Methods Approved by DONRE
3	PCBs	-	mg/kg	2.2	Gas Chromatography or other Methods Approved by DONRE
4	Vinyl Chloride		mg/kg	1.5	Gas Chromatography or Gas Chromatography/ Mass Spectrometry (GC/MS) or other Methods Approved by DONRE

Ambient Air Quality Standard

Parameters	Symbol	Average Time Unit: mg/m3					Method of Measurement
		Hours			1 month	1 year	
		1 hr	8 hr	24 hr			
Carbon monoxide	CO	30	10.26	-	-	-	Non dispersive infrared detection
Nitrogen dioxide	NO_2	0.32	-	-	-	-	Chemilumine scene method
Sulphur dioxide	SO_2	0.78	-	0.30	-	0.10	UV Fluorescence (1hr, 24hr, 1yr) or Pararosaniline (1hr,4hr)
Total Suspended Particulate	TSP	-	-	0.33	-	0.10	Gravimetric
Particulate Matter less than 10 microns	PM-10	-	-	0.12	-	0.05	Gravimetric or Beta Ray or Taper Element Oscillating Microbalance or Dichotomous
Ozone	O_3	0.20	-	-	-	-	Chemiluminescence or UV Absorption Phoptometry
Lead	Pb	-	-	-	1.5	-	Atomic Absorption Spectrometer

Noise Standard

Standards	Method of Measurement
Maximum Sound Level (L_{max}) should not exceed 115 dB(A)	Equivalent Sound Level (L_{eq}) from Fluctuating Noise
L_{eq} 24 hour not exceeding 70 dB(A)	Equivalent Sound Level (L_{eq}) from Steady Noise

Noise Standards for Other Places

Type of Area	Standard Value in dB(A)		
	6.00-18.00	18.00-22.00	22.00-6.00
Quiet areas: hospitals, libraries, treatment places, kindergarten and schools	50	45	40
Residential areas: hotels and houses	55	55	45
Commercial and service areas	70	70	50
Small industrial factories located in residential areas	70	70	50

General Industrial Wastewater Discharge Standards

Standards for General Industries

No.	Parameters	Symbols	Unit	Maximum Concentration
1	BOD_5	BOD_5	mg/l	40
2	Ammonia Nitrogen	NH_3-N	mg/l	4
3	Total Suspended Substances	TSS	mg/l	40
4	Potential of Hydrogen	pH	-	6-9.5
5	Total Dissolved Substances	TDS	mg/l	3,500
6	Phenols	C_6H_5OH	mg/l	0.3
7	Phosphorous	P	mg/l	1.0
8	Silver	Ag	mg/l	0.1
9	Zinc	Zn	mg/l	1.0
10	Sulphide	S	mg/l	1.0
11	Free Chlorine	Cl_2	mg/l	1.0
12	Chloride	Cl^-	mg/l	500

13	Iron	Fe	mg/l	2.0
14	Fluoride	F	mg/l	15
15	Cyanide	CN^-	mg/l	0.1
16	Copper	Cu	mg/l	0.5
17	Lead	Pb	mg/l	0.2
18	Oil and Grease	-	mg/l	5
19	Nickel	Ni	mg/l	0.2
20	Mercury	Hg	mg/l	0.005
21	Manganese	Mn	mg/l	1.0
22	Arsenic	As	mg/l	0.25
23	Barium	B	mg/l	1.0
24	Cadmium	Cd	mg/l	0.03
25	Chromium	Cr^{+6}	mg/l	0.1
26	Total Chromium	Total Cr	mg/l	0.5

Wastewater Discharge Standards from the Urban Area
Wastewater Discharge Standards

No.	Parameters	Symbol	Standards				
			A	B	C	D	E
1.	Biochemical Oxygen Demand	BOD_5	Not more than (mg/l)				
			30	40	50	60	200
2.	Suspended Solids	SS	Not more than (mg/l)				
			30	40	50	50	60
3.	Settle able Solids	-	Not more than (mg/l)				
			0.5	0.5	0.5	0.5	-
4.	Total Dissolved Solids	TDS	Not more than (mg/l)				
			3000	2500	2000	1500	-
5.	Chemical Oxygen Demand	COD	Not more than (mg/l)				
			120	130	150	350	400
6.	Sulphide	S^{2-}	Not more than (mg/l)				
			1.0	1.0	3.0	4.0	-
7.	Total Kjeldahl Nitrogen	TKN	Not more than (mg/l)				
			35	35	40	40	-
8.	Fat Oil and Grease	-	Not more than (mg/l)				
			20	20	20	20	100
9.	Temperature	t	Not more than (degree Celsius)				
			40	40	40	40	40
10.	Potential of Hydrogen	pH	Not more than				
			6-9.5	6-9.5	6-9.5	6-9.5	6-9.5

APPENDIX C: MONITORING REPORT TEMPLATE FOR PROJECT IMPLENTATION UNIT

Safeguards Monitoring Report

This report is to be completed by the PIU with assistance from the PMIS and PMU. The report forms part of the regular reporting of PIU to PMU and ultimately to the EA and ADB.

1. Introduction and Project Overview

Project Number and Title:		
Safeguards Category	Environment	B
	Indigenous Peoples	C
	Involuntary Resettlement	B
Reporting period:		
Last report date:		
Key sub-project activities since last report:	*This section can include, among others, the following:* • *Activities of PIU/PMU* • *Progress of work (% physical completion)* • *Changes of surrounding environment* • *Status of permits / consents*	
Report prepared by:		

2. Environmental Performance Monitoring

a. Summary of Compliance with EMAP Requirements (Environmental Performance)

Monitoring Requirements	Compliance Status (Yes, No, Partial)	Comment or Reasons for Non-Compliance	Issues for Further Action
Use tabled performance monitoring indicators of EMP			

b. Issues for Further Action

Issue	Required Action	Responsibility and Timing	Resolution
Old Issues from Previous Reports			
List of monitoring or mitigation measures or activities not completed			

(last column of previous table)			
New Issues from This Report			

c. Other activities

- Other issues not covered by mitigation or monitoring plans of EMP
- Any additional environmental monitoring required (e.g., air quality, water sampling)

3. Occupational, Health and Safety (OHS) Performance Monitoring

a. OHS for worker

Issue	Required Action	Responsibility and Timing	Resolution
Old Issues from Previous Reports			
New Issues from This Report			

b. Public Safety

Issue	Required Action	Responsibility and Timing	Resolution
Old Issues from Previous Reports			

New Issues from This Report			

4. Information Disclosure and Socialization including Capability Building

Prepare brief summary of the information below where applicable

- Field visits conducted (sites visited, dates, persons met)
- Public consultations and meetings conducted (date; time; location; agenda; number of participants disaggregated by sex and ethnic group, not including project staff; Issues raised by participants and how these were addressed by the project team)
- Training conducted (nature of training, number of participants disaggregated by gender and ethnicity, date, location, etc.)
- Press/Media releases
- Material development/production (e.g., brochure, leaflet, posters)

5. Grievance Redress Mechanism

Summary:

- Number of new grievances, if any, since last monitoring period: ____
- Number of grievances resolved: _____
- Number of outstanding grievances: _____

Type of Grievance	Details (Date, person, address, contact details, etc.)	Required Action, Responsibility and Timing	Resolution
Old Issues from Previous Reports			
New Issues from This Report			

6. Conclusion

- Important results from the implementation of mitigation and monitoring of EMP

- Recommendations to improve EMP implementation

7. Attachments

- Consents / permits
- Monitoring data (water quality, air quality, etc.)
- Photographs
- Maps