Environmental Management Plan - Updated

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CAM: Greater Mekong Subregion Southern Economic Corridor Towns Development Project

Battambang Subprojects:

(i) Urban Storm Water Drainage

(ii) Materials Recovery Facility

December 2018

Prepared by the Ministry of Public Works and Transport for the Asian Development Bank.

CURRENCY EQUIVALENTS
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Currency Unit	-	Riel R
R1,00	=	$0.00025
$1.00	=	R4.000

ABBREVIATIONS

ADB	:	Asian Development Bank
AH	:	Affected Household
BOD	:	Biological Oxygen Demand
COD	:	Chemical Oxygen Demand
CS	:	Construction Supervision
CTDP	:	Corridor Towns Development Project
DED	:	Detailed Engineering Design
EA	:	Executing Agency
ECO	:	Environmental Control Officer
EIA	:	Environmental Impact Assessment
EMP	:	Environment Management Plan
EERT	:	External Emergency Response Team
ERT	:	Emergency Response Team
ERTL	:	Emergency Response Team Leader
ESMU	:	Environment and Social Management Unit
ESO	:	Environmental Site Officer
GMS	:	Greater Mekong Sub-Region
GoC	:	Government of Cambodia
IA	:	Implementing Agency
IEE	:	Initial Environmental Examination
MRF	:	Materials Recovery Facility
MoE	:	Ministry of Environment
MPWT	:	Ministry of Public Works and Transport
NGOs	:	Non-Government Organization
O&M	:	Operation and Maintenance
PISCD	:	Project Implement Support and Capacity Development
PIU	:	Project Implementation Unit
PDE	:	Provincial Department of Environment
PMU	:	Project Management Unit
PDPWT	:	Provincial Department of Public Works and Transport
RAP	:	Resettlement Action Plan
RF	:	Resettlement Framework
SEC	:	Southern Economic Corridor
SLEDP	:	Strategic Local Economic Development Plan
SDP	:	Social Development Plan
SWOT	:	Strength-Weakness-Opportunities-Treats
SWM	:	Solid Waste Management
USD	:	Urban Sector Development
US$	:	United States Dollar
USD	:	United States Dollar
UXO	:	Unexploded Ordinance

WEIGHTS AND MEASURES

km	:	Kilometre
kg	:	Kilogram
ha	:	Hectare
mm	:	Millimetre

NOTE

In this report, "$" refers to US dollars.

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I. INTRODUCTION

A. PROJECT OVERVIEW

1. The Environmental Management Plan (EMP) provided herein is one of three updated EMPs that have been prepared for the subprojects of the Corridor Towns Development Project in Bavet, Battambang, and Poipet, Cambodia. The updated EMP for Battambang integrates and reformats the three EMPs that were originally prepared for the components of the subproject. The parent Initial Environmental Examination (IEE) of the Battambang subproject on which the EMP is provided under separate cover.

2. Updating of the EMP commenced with the preparation of detailed engineering designs (DEDs) for the Materials Recovery Facility (MRF) and urban storm water drainage to ensure that all potential environmental impacts of these components are considered. The review of the original IEE and EMP focuses mainly on the changes made in facility siting, designs, processes/technologies selection and resource utilization, sufficiency to ADB's safeguards[1] adherence, as well as inclusion of climate resiliency measures to the designs. This updated EMP is still supported by the original EMP in the preparation of detailed designs of the components.

3. The updated EMP covers the components of the subproject as per the original feasibility studies for the Materials Recovery Facility (MRF) and urban storm water drainage. A detailed description of the Battambang subproject components is provided in the Detailed Engineering Design (DED) Reports of each component. Schematic plans of the main components are also presented in the Reports.

4. In general, the aim of the MRF is to facilitate the sanitary and centralized manual recovery of recyclable materials from the source segregated waste of households, institutions and commercial establishments. Specifically, the objectives are to: i) increase resource recovery and re-use in order to reduce the total quantity of waste directed to the open dumpsite for final disposal; ii) extend the life of the dumpsite; iii) reduce the contaminant loading of the waste disposed to the dumpsite, thereby reducing the potential environmental impacts of waste disposal; iv) reduce smoke from open burning practices; and v) reduce overall risk to public health.

5. Key objectives of the urban storm water drainage are to: i) provide essential urban environment infrastructure that would contribute to the improving the quality of life of the local residents particularly the poor households in the eastern side of the city; ii) reduced health hazards and environmental contamination; and iii) the storm drainage system, a flood mitigating measure will be an important element in protection of human life, property and avoidance of social disruption.

6. This updated EMP, after obtaining clearance from ADB will form part of the bidding and contract documents and will serve as a guide in project execution. Contractors shall comply with and implement environmental management and mitigation requirements defined in this updated EMP, as applicable to each Contract scope of work.

[1] ADB, Safeguard Policy, 2009.

7. The updated EMP defines which management and mitigation measures are applicable to each Contract scope of work. Contractors shall prepare, and submit CEMP to MPWT for review and approval, and maintain and implement the EMP.

B. SUBPROJECT COMPONENTS

8. The subproject in Battambang consists of the following components:

1) The urban storm water drainage:

- The storm water drainage system was previously planned to include 60 km of storm drains but the size/diameter of the storm drains was increased during detailed design which affected to budget so that the total length of storm drains was now only 13.5 km in Rottanak Sangkat, Preak Preah Sdach Sangkat and Anlong Veal Sangkat to meet the limitation of the budget available.

- Four catchment areas with corresponding drainage outfalls were developed for detailed engineering; three catchments covering Sangkat Rottanak and one for Sangkat Prek Preah Sdach.

- It should be noted that the proposed system may be limited by the capacity of discharge points, during extreme weather conditions, particularly the outfalls discharging change from Anglong Veal stream into the existing earth channels and irrigation canal in Anlong Veal village, Anlong Veal Sangkat.

- Total length of storm water drainage to be constructed is 13,50 m and including 63 manholes and 600 catch basin:

  - Line L1-1, RC Box Drain (2.25 x 1.75m) = 1202 m
  - Line L1-1, RC Box Drain (2.0 x 1.5m) = 1032 m
  - Line L1-1, L1-4 & L2-1, RC Box Drain (1.75 x 1.5m) = 1312 m
  - Line L1-2, L1-3a & L1-4a, RC Drain Pipe (dia. 800 mm) = 956
  - Line L1-2, L1-3 & L2-1, RC Drain Pipe (dia. 1000 mm) = 822 m
  - Line L1-1 to 4 & L2-1 to 5, RC Drain Pipe (dia. 1200 mm) = 2964 m
  - Line L1-1 to 4 & L2-1, RC Drain Pipe (dia. 1500 mm) = 1965 m
  - Earth Canal (North side) = 1340 m
  - Other = 1907 m

2) Materials Recovery Facility:

- The construction of 800 m^2 material recovery facility adjacent to the sanitary landfill and have a capacity of processing a maximum of 60 cu m or 8 tons of dry waste, source segregated and non-biodegradable waste on a daily 8-hour, 6-days-a-week operations.

- The MRF compound will be enclosed by perimeter fencing with the necessary signage, access gates, internal road network, parking spaces, and support facilities (drainage system, water supply, sanitary, lighting, etc.).

II. INSTITUTIONAL ARRANGEMENTS & RESPONSIBILITIES

9. The primary management framework overseeing the implementation of the environmental management plan (EMP) will be defined by the: 1) Ministry of Public Works and Transport (MPWT) who is the executing agency (EA) of the subproject; 2) the Provincial Department of Public Works and Transport (PDPWT) who will be the implementing agency (IA) of subproject; 3) a project management unit (PMU) formed by the EA who will oversee implementation of the subproject in Battambang Town and the other two subprojects in Cambodia; and 4) the town of Battambang who will be the project implementation unit (PIU) who will assist the PMU.

10. Along with the PMU an environmental control officer (ECO) will be identified. The ECO will form part of the environmental and social management unit (ESMU) for all three subprojects in Cambodia.

11. The Project Implementation and Capacity Development (PISCD) Consultant, Detailed Engineering Design (DED) Consultant and Construction Supervision (CS) Consultant will assist with detailed designs of the subproject, and will update the EMP to ensure EMP meets the final subproject designs. The ADB is responsible for monitoring to ensure subproject meets the environmental safeguards of the SPS (2009).

12. The responsibilities of the EA/PMU are summarized below:

    1) Overall responsibility for subproject implementation and establishment of the subproject Management Unit (PMU);
    2) Sign the subproject Agreement on behalf of the National Government;
    3) Approve medium term and annual rolling plans for subproject implementation;
    4) Ensure compliance of Loan Covenants;
    5) Ensure government counterpart fund allocation;
    6) Establish and manage first generation impress accounts;
    7) Submit disbursement projections and withdrawal applications to ADB;
    8) Submit audited subproject accounts and audited financial statements to ADB;
    9) Approve procurement plans, bidding documents, bid evaluation and contract awards;
    10) Submit regular quarterly and annual subproject reports to ADB;
    11) Submit updated resettlement plans for ADB concurrence prior to implementation;
    12) Ensure compliance of subproject implementation with ADB's social and environmental policies and guidelines;
    13) Approve proposed actions in the event of adverse financial audits or monitoring and evaluation reports; and
    14) Select Consultant for Project Implementation Support and Capacity Development (PISCD).

13. The PMU will hold overall accountability of the subproject implementation and operation on behalf of the EA and work as national subproject agency.

The responsibilities of the IA are summarized below:

1) Coordinate and monitor subproject activities of the PIU;
2) Support PIU in carrying out the approved annual rolling plans;
3) Coordinate and provide capacity development program for PIU;
4) Obtain necessary approvals from respective departments prior to awarding of civil works contracts;
5) Support PIU in the implementation of EMPs;
6) Coordinate regular reporting of PIU to EA on EMP implementation;
7) Undertake regular quality control inspection of subproject facilities; and
8) Manage the handover of subproject facilities to agencies responsible for operation and maintenance.

14. As the PIU, the town of Battambang will oversee and coordinate the implementation of the subproject investments including the management of the institutional strengthening plan. It will also be responsible for coordinating subproject implementation with the participating agencies and institutions at the municipality and corridor town levels to ensure broad participation in subproject related activities and further enhance subproject ownership.

15. Responsibilities of the PIU are summarized below:

1) Undertake day to day management of subproject activities;
2) Implement approved annual rolling work and financial plans;
3) Prepare and submit regular quarterly and annual subproject reports;
4) Establish and manage second generation impress accounts;
5) Undertake procurement of civil works and equipment;
6) Supervise civil works contractors;
7) Manage separate subproject financial records and account, and prepare financial reports for submission to EA and IA;
8) Prepare withdrawal application for submission to EA;
9) Ensure that EMPs are incorporated in the detailed designs and included in civil works contracts;
10) Ensure EMP implementation; submit regular monitoring reports to IA and EA; and
11) Monitor implementation of resettlement activities by the respective corridor towns and submit monitoring reports to IA and EA.

16. The PMU, PIU, ESMU and ECO with assistance from the Consultants ensure that the EMP becomes part of the construction contract, that the EMP is implemented, and that the contractor(s) abide by the EMP. The ECO should undertake regular site inspections and the results should be recorded and submitted to the relevant authorities as part of progress reporting.

III. SUMMARY OF POTENTIAL IMPACTS

17. The potential impacts of construction of the urban storm water drainage and the Materials Recovery Facility in Battambang Town are summarized in Table 1. The IEE indicates that potential environmental impacts of the infrastructure developments are primarily construction related and can be mitigated.

18. Potential impacts of the urban storm water drainage during the pre-construction concern possible of land acquisition and land clearing. During construction, the impacts which are likely to be imposed on the bio-physical environment are limited and can be managed through the EMP, but common nuisances including noise and air pollution, accident, serious traffic jam, illegal waste disposal, and occupational safety will be temporarily and localized at all sites of construction. During the Post-construction will not be concern possible of disturbance to local community from operation of MRF and urban storm water drainage, pollution of groundwater or surface waters/domestic water use in Sang Kae River.

Table 1:
Summary of Potential Environmental Impacts of Battambang Town Subproject

Pre-construction Phase	
(i)	Urban storm water drainage
	1) Land acquisition and unforeseen resettlement, addressed by RAP. 2) Land clearing. 3) Detailed Engineering Design (DED)-(Minimize negative environmental impacts)
(ii)	Materials Recovery Facility
	1) Land acquisition and unforeseen resettlement, addressed by RAP. 2) Land clearing. 3) DED (Minimize negative environmental impacts)
Construction Phase	
(i)	Urban storm water drainage
	1) Civil works (e.g., dust, air pollution, noise, solid & liquid waste, erosion, sedimentation, local flooding, land & surface water pollution). 2) Civil disturbance (e.g., increased traffic, reduced access, disrupted business and community activity, social issues from migrant workers, noise to school, worker and public accidents). 3) Environment, Health and Safety (e.g., No safety pole, no safety tape, no traffic sign, no first aid kid, no PPE for workers use, bad living environment, no safe water and unsafe camp site for workers). 4) Impacts on Community (e.g., no bypass, no temporary wooden bridge or detour road, contracts agreement between contractor and land owner) 5) Other potential impacts including accident, disease transmission, bad living environment and other risk to workers and mechanician during construction.
(ii)	Materials Recovery Facility
	1) Civil works (e.g., dust, air pollution, noise, solid & liquid waste, erosion, sedimentation, local flooding, land & surface water pollution). 2) Increase in dust emissions from site construction, noise arising from construction of the site facilities. 3) Local community health impacts (such as bad smelling, increasing fly and insect, and

illegal disposal of waste residue after recycling)

4) Working condition of workers (insecurity, accidents, and health risks if unproper management)
5) Solid waste management not properly (no pit latrine, no garbage bin, illegal disposal)
6) Worker camp (bad living environment, no clean water, unsafe site, no bathroom/toilet, pollution and social problem)
7) Contamination of land and surface waters from excavation and construction waste.
8) Tree and vegetation removal (Damage or loss of trees and vegetation)
9) Public safety (accident and risks if un proper management, or no traffic sign)

Post-Construction/Operation Phase

(i) Urban storm water drainage.

1) Urban storm water drainage will be possible to pollute on groundwater, land or surface waters from discharge.
2) Farmland will be flooded by storm water drainage if poor monitoring.
3) Poor maintenance and cleaning, particularly runoff garbage into the drainage system.
4) No or insufficient training program on maintenance and operation.

(ii) Materials Recovery Facility

1) Noise and Smell Management: Smell and noise will not disturb to local community during operation due to distance between the MRF and local resident is far (approximately 5 km far) and it will be protected by a fence, clear time schedule for operation and trees planting around subproject area.
2) Environment, Health and Safety (EHS): Potential impacts including accident, disease transmission, bad living environment and other risk to workers, mechanician and operator during operation.
3) Issues on maintenance and operation: the issues will be occurred if there is insufficient training program on maintenance, operation and safety to workers and operational staffs.
4) Issues on water supply and electricity: No facilities (water supply, electricity...) for operation.

IV. ENVIRONMENTAL IMPACT MITIGATION PLAN

19. The mitigation measures of the EMP are presented in a comprehensive mitigation plan for the subproject is summarized in Table 2. The plan includes the environmental issues and concerns raised at the stakeholder meetings. The plan identifies responsible parties, location, and timing.

20. The mitigation plan combines the construction phase activities common to all components while highlighting activities and mitigations specific to a single component.

Table 2:
Potential Environmental Impact and Mitigation Measures

Subproject Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Location	Timing	Activity Reporting	Responsibility		Cost Estimate
						Supervision	Implementation	
Pre-Construction, Detailed Design Phase								
(i) Urban storm water drainage								
Confirmation of required Resettlement and temporary relocation	No negative environmental impacts	1. Affected persons well informed ahead of subproject implementation 2. GoC resettlement policy and ADB safeguard policy must be applied.	Affected persons in subproject area	Before project implemented	See resettlement plans	IA/PMU	Resettlement committee	
Disclosure and engagement of community	No community impacts	3. Initiate Information Disclosure and Grievance process of IEE	For all Construction sites.	Beginning of project	Quarterly	IA/PMU	IA/ PISCD Environmental Safeguards Consultants	2,000
GoC approvals	No negative impact	4. Notify MoE of subproject initiation to complete EMP requirements, and obtain required project permits and certificates if required by MoE.	Entire subproject	Before construction	As required	PMU/ CS Consultant/ PISCD Consultant	IA/ PISCD Environmental Safeguards Consultants	
Develop bid documents	No negative environmental impact	5. Ensure updated EMP is included in contractor tender documents, and that tender documents specify requirements of EMP must be budgeted. 6. 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	IA/ PISCD Consultant	PMU	

Subproject Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Location	Timing	Activity Reporting	Responsibility		Cost Estimate
						Supervision	Implementation	
Capacity development	No Negative environmental impact	7. Develop and schedule training plan for PMU, PIU and CS to be able to fully implement EMP, and to manage implementation of mitigation measures by contractors. 8. Create awareness and training plan for contractors whom will implement mitigation measures.	All subproject areas	Before construction begins	Initially, refresher later if needed	PMU/PISCD Consultant	PISCD Consultant	2,000
Recruitment of workers	Spread of sexually transmitted disease	9. Use local workers as much as possible, reducing the number of migrant workers	All work forces.	Throughout construction phase	Worker hiring stages	PMU/PIU	Contractor	
(ii) Materials Recovery Facility								
Confirmation of required Resettlement and temporary relocation	No negative environmental impacts	10. Affected persons well informed ahead of subproject implementation 11. GoC resettlement policy and ADB safeguard policy must be applied.	Affected persons in subproject area	Before project implemented	See resettlement plans	IA/PMU	Resettlement committee	
Disclosure and engagement of community	No community impacts	12. Initiate Information Disclosure and Grievance process of IEE	For all Construction sites.	Beginning of project	Quarterly	IA/PMU	IA	500
GoC approvals	No negative impact	13. Notify MoE of subproject initiation to complete EMP requirements, and obtain required project permits and certificates if required by MoE.	Entire subproject	Before construction	As required	PMU/ CS Consultant/ PISCD Consultant	IA/PMU	
Develop bid documents	No negative environmental impact	14. Ensure updated EMP is included in contractor tender documents, and that tender documents specify requirements of EMP must be budgeted. 15. 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	IA/ PISCD Consultant	PMU	
Recruitment of workers	Spread of sexually transmitted disease	16. Use local workers as much as possible, reducing the number of migrant workers	All work forces.	Throughout construction phase	Worker hiring stages	PMU/PIU	Contractor	

Subproject Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Location	Timing	Activity Reporting	Responsibility		Cost Estimate
						Supervision	Implementation	
Construction Phase – General Mitigations								
(i) Urban storm water drainage								
Obtain & activate Permits and licenses	Prevent or minimize impacts	17. Contractors to comply with all statutory requirements set out by GoC for use of construction equipment, and operation construction plants such as concrete batching.	For all construction sites	Beginning of construction	Once	PMU/PIU/ CS Consultant	Contractors	
Worker camps	Pollution and social problems	18. Locate worker camps away from human settlements. 19. Ensure adequate housing and waste disposal facilities including pit latrines and garbage bins. 20. A solid waste collection program must be established and implemented that maintains a clean worker camps. 21. Locate separate pit latrines for male and female workers away from worker living and eating areas. 22. A clean-out or infill schedule for pit latrines must be established and implemented to ensure working latrines are available at all times. . 23. Worker camps must have adequate drainage, good living environment and safe place 24. Local food should be provided to worker camps. Guns and weapons are not allowed in camps. 25. Transient workers should not be allowed to interact with the local community. HIV Aids education should be given to workers. 26. Camp areas must be restored to original condition after construction completed.	All worker camps	Throughout construction phase	Monthly	PMU/ CS Consultant/ MoE	Contractor	
Training & Capacity Development	Prevent impacts through	27. Implement training and awareness plan for PMU (PIU/ESMU/ECO) and contractors.	PMU/PIU offices, constructi	Beginning of constru	After each event	Consultant	Contractor PMU/PIU/ CS	3,000

Subproject Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Location	Timing	Activity Reporting	Responsibility		Cost Estimate
						Supervision	Implementation	
	education		on sites	ction				
Land clearing (loss of trees, vegetation, and landscape)	Minimize negative environmental impacts	28. Minimize damage to trees and vegetation outside of the proposed site. 29. Restrict tree and vegetation removal within the proposed site. 30. Install protective physical barriers	Construction sites	Beginning of construction	After each event	PMU/PIU/CS Consultant	Contractor	
Implement Construction Materials Acquisition, Transport, and Storage Subplan	Pollution, injury, increased traffic, disrupted access	31. All topsoil and overburden removed should be stockpiled for later restoration. 32. Define & schedule how many equipment and trucks are used for excavation, transportation, and handled & stored at sites. 33. Define and schedule how fabricated materials such as steel, wood structures, and scaffolding will transported and handled. 34. All aggregate loads on trucks should be covered. 35. Piles of aggregates at sites should be used/or removed promptly, or covered and placed in non-traffic areas.	For all Construction areas.	Throughout construction phase	Monthly	PMU/PIU/CS Consultant/. MoE	Contractor	
Implement Spoil Management Subplan	Contamination of land and surface waters from excavated spoil, and construction waste	36. Uncontaminated spoil to be disposed of in GoC-designated sites, which must never be in or adjacent surface waters. Designated sites must be clearly marked and identified. 37. 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. 38. A record of type, estimated volume, and source of disposed spoil must be recorded. 39. Contaminated spoil disposal must follow GoC regulations including handling, transport, treatment (if necessary), and disposal. 40. Suspected contaminated soil must be tested, and disposed of in designated sites identified as per GoC regulations.	All excavation areas	Throughout construction phase	Monthly	PMU/PIU/CS Consultant/ MoE	Contractor	

Subproject Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Location	Timing	Activity Reporting	Responsibility		Cost Estimate
						Supervision	Implementation	
		41. Before treatment or disposal contaminated spoil must be covered with plastic and isolated from all human activity.						
Implement Solid and Liquid Construction Waste Subplan	Contamination of land and surface waters from construction waste	42. Management of general solid and liquid waste of construction will follow GoC regulations, and will cover, collection, handling, transport, recycling, and disposal of waste created from construction activities and worker force. 43. Areas of disposal of solid and liquid waste to be determined by GoC. 44. Construction sites should have sufficient container/garbage bins 45. A schedule of solid and liquid waste pickup and disposal must be established and followed that ensures construction sites are as clean as possible. 46. Solid waste should be separated and recyclables sold to buyers. <u>Hazardous Waste</u> 47. Collection, storage, transport, and disposal of hazardous waste such as used oils, gasoline, paint, and other toxics must follow GoC regulations. 48. Wastes should be separated (e.g., hydrocarbons, batteries, paints, organic solvents) 49. 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. 50. All spills must be cleaned up completely with all contaminated soil removed and handled with by contaminated spoil subplan.	All construction sites and worker camps	Throughout construction phase	Monthly	PMU/PIU/ CS Consultant/ MoE	Contractor	

Subproject Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Location	Timing	Activity Reporting	Responsibility		Cost Estimate
						Supervision	Implementation	
Implement Noise and Dust Subplan	Dust Noise	51. Regularly apply wetting agents to exposed soil and construction roads. 52. Cover or keep moist all stockpiles of construction aggregates, and all truckloads of aggregates. 53. Minimize time that excavations and exposed soil are left open/exposed. Backfill as soon as possible. 54. As much as possible restrict working time between 07:00-11:00 and 13:00-17:00. In particular are activities such as pile driving. 55. As much as possible restrict working schedule at school area on weekend, while restrict working time at hospital areas between 07:00-11:00 and 13:00-17:00 or additional proper consultation with hospital staff and local community nearby. 56. Maintain equipment in proper working order 57. Replace unnecessarily noisy vehicles and machinery. 58. Vehicles and machinery to be turned off when not in use. 59. Construct temporary noise barriers around excessively noisy activity areas where possible.	All Construction sites.	Fulltime	Monthly	PMU/PIU/ CS Consultant	Contractor	
Implement Utility and Power disruption Subplan	Loss or disruption of utilities and services such as water supply and electricity	60. Develop carefully a plan of days and locations where outages in utilities and services will occur, or are expected. 61. Contact local utilities and services with schedule, and identify possible contingency back-up plans for outages. 62. Contact affected community to inform them of planned outages. 63. Try to schedule all outages during low use time such between 24:00 and 06:00.	All Construction sites.	Fulltime	Monthly	PMU/PIU/ CS Consultant & Utility company	Contractor	

Subproject Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Location	Timing	Activity Reporting	Responsibility		Cost Estimate
						Supervision	Implementation	
Implement Tree and Vegetation removal, and site restoration Subplan	Damage or loss of trees, vegetation, and landscape	64. Restrict tree and vegetation removal within RoWs. 65. Within RoWs minimize removals, and install protective physical barriers around trees that do not need to be removed. 66. All RoWs to be re-vegetated and landscaped after construction completed. Consult MAFF to determine the most successful restoration strategy and techniques.	All Construction sites.	Beginning and end of subproject	Monthly	PMU/PIU/ CS Consultant	Contractor	
Implement Erosion control Subplan	Land erosion	67. Berms and plastic sheet fencing should be placed around all excavations and earthwork areas. 68. Earthworks should be conducted during dry periods. 69. Maintain a stockpile of topsoil for immediate site restoration following backfilling. 70. Protect exposed or cut slopes with planted vegetation, and have a slope stabilization protocol ready. 71. Re-vegetate/replantation at all soil exposure areas asap.	All Construction sites.	Throughout construction phase	Monthly	PMU/PIU/ CS Consultant	Contractor	3000
Implement Worker and Public Safety Subplan	Public and worker injury, and health	72. Proper fencing, protective barriers, and buffer zones should be provided around all construction sites. 73. Sufficient signage and information disclosure, and site supervisors and night guards should be placed at all sites. 74. Worker and public safety guidelines GoC should be followed. 75. Population near blast areas should be notified 24 hrs ahead, and evacuated well before operation. Accepted GoC blast procedures and safety measures implemented. 76. Speed limits should be imposed on all roads used by construction vehicles.	All Construction sites.	Fulltime	Monthly	PMU/PIU/ CS Consultant	Contractor	8007.35

Subproject Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Location	Timing	Activity Reporting	Responsibility		Cost Estimate
						Supervision	Implementation	
		77. Standing water suitable for disease vector breeding should be filled in. 78. Worker education and awareness seminars for construction hazards should be given. A construction site safety program should be developed and distributed to workers. 79. Appropriate safety clothing and footwear should be mandatory for all construction workers. 80. Adequate medical services must be on site or nearby all construction sites. 81. Drinking water and first aid kids must be provided at all construction sites. 82. Sufficient lighting shall be used during necessary night work. 83. All construction sites should be examined daily to ensure unsafe conditions are removed.						
Civil works	Degradation of water quality & aquatic resources	84. Protective coffer dams, berms, plastic sheet fencing, or silt curtains should be placed between all earthworks and surface waters. 85. Erosion channels must be built around aggregate stockpile areas to contain rain-induced erosion. 86. Earthworks should be conducted during dry periods. 87. All construction fluids such as oils, and fuels should be stored and handled well away from surface waters. 88. No waste of any kind is to be thrown in surface waters.	All Construction sites.	Throughout construction phase	Monthly	PMU/PIU/ CS Consultant	Contractor	

Subproject Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Location	Timing	Activity Reporting	Responsibility		Cost Estimate
						Supervision	Implementation	
		89. No washing or repair of machinery near surface waters. 90. Pit latrines to be located well away from surface waters. 91. No unnecessary earthworks in or adjacent to water courses. 92. No aggregate mining from rivers or lakes. 93. All irrigation canals and channels to be protected the same way as rivers, streams, and lakes						
Civil Works	Degradation of terrestrial resources	94. All construction sites should be located away forested or all plantation areas as much as possible. 95. No unnecessary cutting of trees. 96. All construction fluids such as oils, and fuels should be stored and handled well away from forested and plantation areas. 97. No waste of any kind is to be discarded on land or in forests/plantations.	All Construction sites.	Throughout construction phase	Monthly	PMU/PIU/ CS Consultant	Contractor	
Implement Construction and Urban Traffic Subplan	Traffic disruption, accidents, public injury	98. Schedule construction vehicle activity during light traffic periods. Create adequate traffic detours, and sufficient signage & warning lights. 99. Post speed limits, and create dedicated construction vehicle roads or lanes. 100. Inform community of location of construction traffic areas, and provide them with directions on how to best coexist with construction vehicles on their roads. 101. Increase the number of pedestrian crossings away from construction areas.	All Construction sites.	Fulltime	Monthly	PMU/PIU/ CS Consultant	Contractor	9,609.4

Subproject Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Location	Timing	Activity Reporting	Responsibility		Cost Estimate
						Supervision	Implementation	
		102. Increase road and walkway lighting. 103. Warm parking car or vehicle on roads particularly at the market areas. The car/vehicle parking place must be safe and not disturbed to social business and traffic. 104. Install protective traffic poles and safety tapes around manholes under construction.						
Implement Construction Drainage Subplan	Loss of drainage & flood storage	105. Provide adequate short-term drainage away from construction sites to prevent ponding and flooding. 106. Manage to not allow borrow pits and quarries to fill with water. Pump periodically to land infiltration or nearby water courses. 107. Install temporary storm drains or ditches for construction sites. 108. Ensure connections among surface waters (ponds, streams) are maintained or enhanced to sustain existing storm water storage capacity. 109. Protect surface waters from silt and eroded soil .	All areas with surface waters	Design & construction phases	Monthly	PMU/PIU/ CS Consultant	Contractor	
Civil works	Damage to cultural property or values, and chance finds	110. As per detailed designs all civil works should be located away from all cultural property and values. 111. Chance finds of valued relics and cultural values should be anticipated by Contractors. Site supervisors should be on the watch for finds. 112. Upon a chance find all work stops immediately, find left untouched, and PMU notified. If find deemed valuable, provincial cultural authorities must be notified. 113. Work at find site will remain stopped until authorities allow work to continue.	All areas with surface waters	At the start and throughout construction phase	Monthly	PMU/PIU/ CS Consultant	Contractor	

Subproject Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Location	Timing	Activity Reporting	Responsibility		Cost Estimate
						Supervision	Implementation	
Bypass	Community	114. During construction temporary bypass will be provided to local people and animal passage	For all construction sites	Throughout construction phase	Monthly	PMU/ CS Consultant/ MoE	Contractor	1000
EHS	Pollution and social problems	115. Contractor's work plans have to provide role and responsibilities to make sure the workers are living and working in safe-healthy condition: primary health care sanitation and welfare to staff/workers; first aid kit and accommodation arrangement of workers. 116. Information and instruction to be disseminated to workers regarding risks of communicable diseases and fire extinguisher.	All worker camps	Throughout construction phase	Monthly	PMU/ CS Consultant/ MoE	Contractor	2000
(ii) Materials Recovery Facility								
Obtain & activate Permits and licenses	Prevent or minimize impacts	117. Contractors to comply with all statutory requirements set out by GoC for use of construction equipment, and operation construction plants such as concrete batching.	For all construction sites	Beginning of construction	Once	PMU/PIU/ CS Consultant	Contractors	
Worker camps	Pollution and social problems	118. Locate worker camps away from human settlements. 119. Ensure adequate housing and waste disposal facilities including pit latrines and garbage bins. 120. A solid waste collection program must be established and implemented that maintains a clean worker camps. 121. Locate separate pit latrines for male and female workers away from worker living and eating areas. 122. A clean-out or infill schedule for pit latrines must be established and implemented to ensure working latrines are available at all times. 123. Worker camps must have adequate drainage and safe place.	All worker camps	Throughout construction phase	Monthly	PMU/ CS Consultant	Contractor	500

Subproject Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Location	Timing	Activity Reporting	Responsibility		Cost Estimate
						Supervision	Implementation	
		124. Local food should be provided to worker camps. Guns and weapons not allowed in camps. 125. Transient workers should not be allowed to interact with the local community. HIV Aids education should be given to workers. 126. Camp areas must be restored to original condition after construction completed.						
Training & Capacity Development	Prevent impacts through education	127. Implement training and awareness plan for PMU (PIU/ESMU/ECO) and contractors.	PMU/PIU offices, construction sites	Beginning of construction	After each event	Consultant	Contractor PMU/PIU/ CS	417.00
Implement Construction Materials Acquisition, Transport, and Storage Subplan	Pollution, injury, increased traffic, disrupted access	128. Define & schedule how many equipment and trucks are used for excavation, transportation, and handled & stored at sites. 129. Define and schedule how fabricated materials such as steel, wood structures, and scaffolding will transported and handled. 130. All aggregate loads on trucks should be covered. 131. Piles of aggregates at sites should be used/or removed promptly, or covered and placed in non-traffic areas.	For all Construction areas.	Throughout construction phase	Monthly	PMU/PIU/ CS Consultant	Contractor	
Implement Spoil Management Subplan	Contamination of land and surface waters from excavated spoil, and construction waste	132. Uncontaminated spoil to be disposed of in GoC-designated sites, which must never be in or adjacent surface waters. Designated sites must be clearly marked and identified. 133. 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. 134. A record of type, estimated volume, and source of disposed spoil must be recorded.	All excavation areas	Throughout construction phase	Monthly	PMU/PIU/ CS Consultant	Contractor	

Subproject Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Location	Timing	Activity Reporting	Responsibility		Cost Estimate
						Supervision	Implementation	
		135. Contaminated spoil disposal must follow GoC regulations including handling, transport, treatment (if necessary), and disposal. 136. Suspected contaminated soil must be tested, and disposed of in designated sites identified as per GoC regulations. 137. Before treatment or disposal contaminated spoil must be covered with plastic and isolated from all human activity.						
Implement Solid and Liquid Construction Waste Subplan	Contamination of land and surface waters from construction waste	138. Management of general solid and liquid waste of construction will follow GoC regulations, and will cover, collection, handling, transport, recycling, and disposal of waste created from construction activities and worker force. 139. Areas of disposal of solid and liquid waste to be determined by GoC. 140. Construction sites should have sufficient garbage bins.. 141. A schedule of solid and liquid waste pickup and disposal must be established and followed that ensures construction sites are as clean as possible. 142. Solid waste should be separated and recyclables sold to buyers in community. <u>Hazardous Waste</u> 143. Collection, storage, transport, and disposal of hazardous waste such as used oils, gasoline, paint, and other toxics must follow GoC regulations. 144. Wastes should be separated (e.g., hydrocarbons, batteries, paints, organic solvents) 145. Wastes must be stored above ground in closed, well labeled,	All construction sites and worker camps	Throughout construction phase	Monthly	PMU/PIU/ CS Consultant	Contractor	500

Subproject Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Location	Timing	Activity Reporting	Responsibility		Cost Estimate
						Supervision	Implementation	
		ventilated plastic bins in good condition well away from construction activity areas, all surface water, water supplies, and cultural and ecological sensitive receptors. 146. All spills must be cleaned up completely with all contaminated soil removed and handled with by contaminated spoil subplan.						
Implement Noise and Dust Subplan	Dust Noise	147. Regularly apply wetting agents to exposed soil and construction roads. 148. Cover or keep moist all stockpiles of construction aggregates, and all truckloads of aggregates. 149. Minimize time that excavations and exposed soil are left open/exposed. Backfill as soon as ossible. 150. As much as possible restrict working time between 07:00-11:00 and 13:00-17:00. In particular are activities such as pile driving. 151. Maintain equipment in proper working order 152. Replace unnecessarily noisy vehicles and machinery. 153. Vehicles and machinery to be turned off when not in use. 154. Construct temporary noise barriers around excessively noisy activity areas where possible.	All Construction sites.	Fulltime	Monthly	PMU/PIU/ CS Consultant	Contractor	500
Implement Utility and Power disruption Subplan	Loss or disruption of utilities and services such as water supply and electricity	155. Develop carefully a plan of days and locations where outages in utilities and services will occur, or are expected. 156. Contact local utilities and services with schedule, and identify possible contingency back-up plans for outages. 157. Contact affected community to inform them of planned outages.	All Construction sites.	Fulltime	Monthly	PMU/PIU/ CS Consultant & Utility company	Contractor	

Subproject Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Location	Timing	Activity Reporting	Responsibility		Cost Estimate
						Supervision	Implementation	
		158. Try to schedule all outages during low use time such between 24:00 and 06:00.						
Implement Erosion control Subplan	Land erosion	159. Berms and plastic sheet fencing should be placed around all excavations and earthwork areas. 160. Earthworks should be conducted during dry periods. 161. Maintain a stockpile of topsoil for immediate site restoration following backfilling. 162. Protect exposed or cut slopes with planted vegetation, and have a slope stabilization protocol ready. 163. Re-vegetate all soil exposure areas asap.	All Construction sites.	Throughout construction phase	Monthly	PMU/PIU/ CS Consultant	Contractor	
Implement Worker and Public Safety Subplan	Public and worker injury, and health	164. Proper fencing, protective barriers, and buffer zones should be provided around all construction sites. 165. Sufficient signage and information disclosure, and site supervisors and night guards should be placed at all sites. 166. Worker and public safety guidelines GoC should be followed. 167. Speed limits should be imposed on all roads used by construction vehicles. 168. Standing water suitable for disease vector breeding should be filled in. 169. Worker education and awareness seminars for construction hazards should be given. A construction site safety program should be developed and distributed to workers. 170. Appropriate safety clothing and footwear should be mandatory for all	All Construction sites.	Fulltime	Monthly	PMU/PIU/ CS Consultant	Contractor	500.00

Subproject Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Location	Timing	Activity Reporting	Responsibility		Cost Estimate
						Supervision	Implementation	
		construction workers. 171. Adequate medical services must be on site or nearby all construction sites. 172. Drinking water must be provided at all construction sites. 173. Sufficient lighting shall be used during necessary night work. 174. All construction sites should be examined daily to ensure unsafe conditions are removed. 175. Precaution and warning plate on the machineries should be translate in Khmer word for operators or workers easy to understand 176. First aid kits must be provided at all construction sites.						
Civil Works	Degradation of terrestrial resources	177. All construction sites should be located away forested or all plantation areas as much as possible. 178. No unnecessary cutting of trees. 179. All construction fluids such as oils, and fuels should be stored and handled well away from forested and plantation areas. 180. No waste of any kind is to be discarded on land or in forests/plantations.	All Construction sites.	Throughout construction phase	Monthly	PMU/PIU/ CS Consultant	Contractor	
Implement Construction and Urban Traffic Subplan	Traffic disruption, accidents, public injury	181. Schedule construction vehicle activity during light traffic periods. Create adequate traffic detours, and sufficient signage & warning lights. 182. Post speed limits, and create dedicated construction vehicle roads or lanes. 183. Inform community of location of construction traffic areas, and provide them with directions on how to best coexist with construction	All Construction sites.	Fulltime	Monthly	PMU/PIU/ CS Consultant	Contractor	300.00

Subproject Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Location	Timing	Activity Reporting	Responsibility		Cost Estimate
						Supervision	Implementation	
		vehicles on their roads. 184. Increase the number of pedestrian crossings away from construction areas. 185. Increase road and walkway lighting.						
Implement Construction Drainage Subplan	Loss of drainage & flood storage	186. Provide adequate short-term drainage away from construction sites to prevent ponding and flooding. 187. Install temporary storm drains or ditches for construction sites. 188. Ensure connections among surface waters (ponds, streams) are maintained or enhanced to sustain existing storm water storage capacity. 189. Protect surface waters from silt and eroded soil .	All areas with surface waters	Design & construction phases	Monthly	PMU/PIU/ CS Consultant	Contractor	
Civil works	Damage to cultural property or values, and chance finds	190. As per detailed designs all civil works should be located away from all cultural property and values. 191. Chance finds of valued relics and cultural values should be anticipated by Contractors. Site supervisors should be on the watch for finds. 192. Upon a chance find all work stops immediately, find left untouched, and PMU notified. If find deemed valuable, provincial cultural authorities must be notified. 193. Work at find site will remain stopped until authorities allow work to continue.	All areas with surface waters	At the start and throughout construction phase	Monthly	PMU/PIU/ CS Consultant	Contractor	
EHS	Pollution and social problems	194. Contractor's work plans have to provide role and responsibilities to make sure the workers are living and working in safe-healthy condition: primary health care sanitation and	All worker camps	Throughout constru	Monthly	PMU/ CS Consultant/ MoE	Contractor	

Subproject Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Location	Timing	Activity Reporting	Responsibility		Cost Estimate
						Supervision	Implementation	
		welfare to staff/workers; first aid kit and accommodation arrangement of workers. 195. Information and instruction to be disseminated to workers regarding risks of communicable diseases and fire extinguisher.		ction phase				
Post-construction/Operation Phase								
(i) Urban storm water drainage								
Operation and maintenance of storm water drainage	Pollution of surface water	1. Conduct water quality baseline of the stream or wetland where will be discharged of the storm water into (**before and during operation**). 196. 197. Population near project areas should be notified ahead. 198. Ensure all drainage system are operated and maintained in accordance with Operation and Maintenance Manuals.	drainage system	Throughout operation	Semi-annual	MPWT/ PMU	PIU/PDMPWT/ Municipal	3000
Maintenance of upgraded drainage canals	Flooding	199. Scheduled cleaning and maintenance of drainage canals	Drainage canals	Periodically	Semi-annual	MPWT/ PMU	PIU/PDMPWT/ Municipal	
Odors and waste management	Community / or Clogge	200. Implementation of best-practice operating procedures to minimize the odors generated by drainage system, including properly control on the sludge in drainage system. 201. Provide education and awareness program to residents and others in the vicinity of the drainage system avoiding disposal solid waste/rubbish into the manhole.	WWTP and pumping station	Throughout operation	Semi-annual	MPWT/ PMU	PIU/PDMPWT/ Municipal	
Capacity building on an operation and maintenance of drainage system	municipal and PIU staffs	202. Provide training program on safe operation and maintenance to PIU and Battambang Municipal staff who will work on this sector.	Drainage sytem	Throughout operation	Semi-annual	MPWT/ PMU	PIU/PDMPWT/ Municipal	
(ii) Materials Recovery Facility								
Operation and Maintenance of	Debris along	203. Population near project area should be notified ahead.	Materials Recovery	Throughout	Semi-annually	CS and PMU	Contractor and PIU/	

Subproject Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Location	Timing	Activity Reporting	Responsibility		Cost Estimate
						Supervision	Implementation	
Materials Recovery Facility	access road and within site	204. Policing area and collection of debris 205. Ensure MRF operated and maintained in accordance with Operation and Maintenance Manual	Facility	operation			Municipal	
Health and Safety	Waste pickers	206. Provide training program to waste pickers on health, safety and handing practice. 207. Ensure working areas are good condition, safety, and separate toilet for man and woman.	Materials Recovery Facility	Throughout operation	Semi-annually	CS and PMU	Contractor and PIU/ Municipal	
Waste residue	Pollution of surface water, and soil.	208. Prohibit to dispose to water body or free land area 209. Must be managed properly and disposed into approval landfill by local authority.	Materials Recovery Facility	Throughout operation	Semi-annually	CS and PMU	PIU and Municipal	
Odors	Community	210. Implementation of best-practice operating procedures to minimize the odors generated by the plant 211. Planting vegetation around MFR site also one method to reduce smell spread out	Materials Recovery Facility	Throughout operation	Semi-annual	CS and PMU	Contractor and PIU	
Noise disturbance	Community	212. Planting vegetation around MFR site also one method to reduce noise spread out 213. Noise reducing buffer shall be provided. 214. Construct concrete fence around MFR site	Materials Recovery Facility	Throughout operation	Semi-annual	CS and PMU	Contractor and PIU/ Municipal	
Capacity building on an operation and maintenance	Operator, municipal and PIU staff	215. Provide training program on safety operation and maintenance to PIU and Poipet Municipal staff who will work on this sector. 216. Provide training program on safety, health and operation to workers and operational staffs	Materials Recovery Facility	Throughout operation	Semi-annual	CS and PMU	Contractor and PIU/ Municipal	500
Drainage	Stagnant water/pollution	217. Provide sufficient drainage to ensure that wastewater from cleaning will flow properly into drainage system	Materials Recovery Facility	Before operation	Semi-annual	CS and PMU	Contractor and PIU	

V. ENVIRONMENT MANAGEMENT COST

PAY ITEM NO.	PAY ITEM DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL AMOUNT (USD)
Urban storm water drainage Battambang					
1	Disclosure and engagement of community	lot	1	2,000.00	2,000.00
2	Capacity development before construction	lot	1	2,000.00	2,000.00
3	Training program for Contractors, PMU,PIU and CS	lot	1	3,000.00	3,000.00
4	Implement erosion control	lot	1	3,000.00	3,000.00
5	Implement public safety	lot	1	8,007.35	8,007.35
6	Implement construction and traffic	lot	1	9,609.40	9,609.40
7	Bypass	lot	1	1,000.00	1,000.00
8	EHS	lot	1	2,000.00	2,000.00
9	Water quarlity control	lot	3	1,000.00	3,000.00
				Sub-total	**33,616.75**
MRF Battambang					
1	Disclosure and engagement of community	lot	1	500.00	500.00
3	Worker camp	lot	1	2000.00	500.00
4	Training program for Contractors, PMU,PIU, CS and operation workers	lot	1	2,417.00	417.00
5	Implement solid and liquid	lot	1	1,000.00	500.00
6	Implement noise and dust	lot	1	2,000.00	500.00
7	Worker and public safety	lot	1	500.00	500.00
8	Implement traffic	lot	1	300.00	300.00
9	capacity development on O&M	lot	1	2,000.00	500.00
				Sub-total	**3,717.00**
				Grand total	**37,333.75**

The costs of implementing the environmental management and impact mitigation measures listed in the EMP matrix (Table 2) are included in the design costs, construction contracts and operational budgets. Final budget allocations for the other the items in the EMP will be developed by the PMU. The total environmental management cost is **$ 37,333.75**

VI. MONITORING PLAN

21. The environmental monitoring plan for the EMP is provided in Table 3. 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.

22. The monitoring plan focuses on all three phases (pre-construction, construction, post construction operation) of the subproject and consists of environmental indicators, the sampling locations & frequency, method of data collection, and responsible parties.

23. After the construction phase is completed and all components are in operation the impact of the new infrastructure developments on urban development should be monitored by the contractor and then should be monitored by PIU after subproject hand over by contractor.

24. Irrigation canal in Anlong Veal' water quality will be monitor by contractor and then should be monitored by PIU after subproject hand over by contractor, and frequency as required by MoE.

25. Air quality and vibration will be monitored by contractor during subproject construction and frequency as required by MoE.

Table 3:
Monitoring Plan

ENVIRONMENTAL EFFECTS MONITORING

Environmental Indicators	Location	Means of Monitoring	Frequency	Reporting	Responsibility	
					Supervision	Implementation
Pre-construction Phase – Update Baseline Conditions						
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 affected surface waters.	Urban drainage and MRF	Original field work, community consultations	Once	Once	EA/PMU	Contractor
Inventory of present and past land uses that could cause contaminated soil.	Possible contaminated lands at all excavation sites	Original field work, community consultations	Once	Once	PMU/PIU	Contractor
Disclosure and engagement of community	Community in project area	Original field work, community consultations	Once	Once	PMU/CS	PIU/Contractor
Training & Capacity Development	Contractors, CS, PIU/PMU	Original field work, report	Once	Once	ADB/PMU	Consultant
CEMP	Contractor	Review and Comment	Once	Once	ADB/PMU	Consultant
Air quality: particulate matter, noise, wind,	At construction sites (two	Using field and analytical	One day and one	One baseline	PMU/PIU	Contractor

Environmental Indicators	Location	Means of Monitoring	Frequency	Reporting	Responsibility	
					Supervision	Implementation
temperature, and vibration levels.	locations, one near City Center, one away from City Center) At construction site (one at wastewater treatment plant site)	methods approved by MoE. Include visual observations of dust and noise from Contractor & public reports.	night measurement	supplemental report before construction starts		
Surface water quality: TSS, total and faecal coliform, pH, DO, COD, BOD_5, temperature	Urban Drainage ((two drainage canals, one near city center and one away from city center)	Using field and analytical methods approved by MoE.	Quarterly during construction periods Daily visual records	Quarterly	PMU/PIU/MoE	Contractor
Construction Phase						
Soil quality heavy metals (As, Cd, Pb) and petroleum hydrocarbons	Possible contaminated lands at excavation sites	Using field and analytical methods approved by MoE.	Once if needed	Once	PMU/PIU	Contractor
) Air quality: particulate matter noise, wind, temperature, and vibration level.	A): Urban Drainage (at three locations – two at baseline locations and one at work site)	A) Using field and analytical methods approved by MoE. Include visual observations of dust and noise from Contractor & public reports.	A) Quarterly during construction periods Daily visual records	Quarterly	(A –C): PMU/PIU	Contractor
B) Surface water quality: TSS, total and faecal coliform, pH, DO, COD, BOD_5, temperature	B) Urban Drainage (three drainage canals, two at baseline locations and near work site)	B) Using field and analytical methods approved by MoE.	B) Quarterly during construction periods			
C) Domestic (worker) and construction solid waste inside & outside construction sites including worker camps.	C) All construction sites and worker camps	C) Visual observation	C) Monthly			
D) Public comments and Complaints	D) Using hotline number	D) Information transferred by	D) Continuous		D & H) & daily observations:	

Environmental Indicators	Location	Means of Monitoring	Frequency	Reporting	Responsibility	
					Supervision	Implementation
	placed at construction areas	telephone hotline number posted at all construction sites.	Public input		EA/PMU/PIU	Contractor
E) Incidence of worker or public accident or injury	E) At all construction areas	E) Regular reporting by Contractors	E) Continuous	Monthly report		
F)Leaks and spills of hazardous material	F) Fuel storage area	F) Regular reporting by Contractors	F) Continuous	Monthly report		
G) Waste Management	G) Project site, Worker camp	G) Regular reporting by Contractors	G) Continuous	Monthly report		
H) Safety	H) Project site/ Workshop	H) Regular reporting by Contractors	H) Continuous	Monthly report		
I)Erosion	I)At all construction areas	I)Visual observation	I) Continuous	Monthly report		
J) Traffic	J) At all construction areas	J) Visual observation	J) Continuous	Monthly report		
K) Bypass	K) At all construction areas	K) Visual observation	k)Continuous	Monthly report		
Post Construction Operation and Maintenance Phase						
Incidence of flooding	Adjacent to new or upgraded drainage canals	Surveys, public complaints	Annually	Annually	PIU/PDPWT	
Odors and waste management	Drainage system and MRF	Include visual observations of operation & public reports	As required by MoE	Semi-annually	PIU/PDPWT	
Safety and Healthy(Instruction and safety guidance on the Machineries should be available in Khmer word to ensure that workers can understand; First aid kits should be provided, Separated Toilet for women and man, roof at location of waste separating)	MRF	observations	Monthly	Semi-annually	EA/PMU/	Company/ PIU
Noise disturbance	MRF	observations	Monthly	Semi-annually	EA/PMU/	Company/ PIU
Training	Drainage system and MRF	observations	Monthly	Semi-annually	EA/PMPMU/CS	Company/ Workers, waste pickers, PIU

VII. REPORTING

26. Regular reporting on the implementation of mitigation measures and on monitoring activities during construction phase of the subproject is required. Monthly reporting is the responsibility of Contractor and submit to PIU and CS Consultant and semi-annual report is responsible of contractor and submit to CS and then submit to PMU if requite by MOE. The mitigation and monitoring plans (Tables 2 and 3) summarize proposed timing of reporting. Environmental monitoring reports will be prepared quarterly and semi-annually for the EA by the PMU/PIUs and sent to the MoE and ADB. The reports will table all indicators measured with the monitoring plan of EMP including performance monitoring indicators (Table 4), and will include relevant GoC environmental quality standards. A report format of the monitoring plan and checklist see in annex 6.

Table 4:
Performance Monitoring Indicators

Major Environmental Component	Key Indicator	Performance Objective	Data Source
Public Consultation & Disclosure	Affected public & stakeholders	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/	EMP appended to bidding documents with clear instructions to bidders for CEMP	Bid documents
Training of PMU/PIU/ECO	Training course(s) & schedule	By end of P-C phase, required course(s) that will be delivered are designed and scheduled	Course(s) outline, participants, and schedule
Provision of Permit, Insurances, Guarantees, Securities, UXO removal and Others	Complaints, injure and safety	Procedures & rules to ensure the implement no obstacle	Contractor and CS Consultant reports
All subproject areas	Critical habitat, rare or endangered species (if present)	All critical habitat and R & E species unchanged, and unharmed	Contractor and CS Consultant reports
Surface water quality	TSS, total and faecal coliform, pH, DO, COD, BOD_5, temperature	GoC environmental standards & criteria	Contractor and CS Consultant reports
Ground water quality	PH, EC, TDC, Total hardness, Cl, F, As, Hg, Mn, Al, Ch2Cl2, Cd, Toatal coliform	GoC environmental standards & criteria	Contractor and CS Consultant reports
Noise	Particulate, noise, vibration	GoC environmental standards & criteria	Contractor and CS Consultant reports
Air quality	Dust, cover material, spry water	GoC environmental standards & criteria	Contractor and CS Consultant reports
Soil quality	Solid & liquid waste	Rigorous program of procedures & rules to collect and store all waste from construction camps and sites practiced.	Contractor and CS Consultant reports
Hazardous materials & 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 CS Consultant reports
Public & worker Safety	Frequency of injuries	Adherence to GoC policy and site-specific procedures to prevent accidents	Contractor and CS Consultant reports

Major Environmental Component	Key Indicator	Performance Objective	Data Source
Cultural property	Incidence of damage, or complaints	No valued cultural property, or unearthed valuable relic is harmed in any way	Public input, Contractor and CS Consultant reports
Traffic	Frequency of disruptions & blocked roadways	Disruptions, stoppages, or detours are managed to absolute minimum.	Public input, Contractor and CS Consultant reports
Land, quality, surface water quality and flooding	Land or surface water pollution, property damage	Prevent incidents by following O&M procedures	PDPWT
Worker health and safety	Affected health and safety	Adherence to GoC policy and site-specific procedures to prevent accidents	PDPWT

VIII. EMERGENCY RESPONSE PLAN

27. 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:
    a) Emergency Response Team (ERT) of the Contractor as initial responder
    b) District and City 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

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

Table 5:
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.

29. 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.

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

31. Prior to the mobilization of civil works, the Contractor, through its Construction Manager, ERTL, in coordination with the PMU/PCU, 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;
    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 Plank; and

vi) Names and contact details of the ERT members.

32. 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

33. 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) Make arrangements with the EERT;

iv) Conduct proper training of ERT members, and encourage and train volunteers from the work force;

v) Conduct 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) conduct drills for different possible situations.

34. 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

35. 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. Exceptions 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.

36. 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 authorities
- PMU Office, ESMU

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

37. 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 6:
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 7:
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. o Victim is exposed to more danger when left where they are, (e.g., during fire, chemical spill). o It would be impossible for EERT to aid victims in their locations, (e.g., under a collapsed structure). o Instructed or directed by the EERT. • 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 onsite 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 8:
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 proper 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 subcontractors, 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, fire alarm rating, any injuries
• Facilitate leading the EERT to the emergency site.	• ERTL/Deputy ERTL to instruct: ➢ 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, and clear, the access road to facilitate passage of the EERT.
• ERT to vacate the site as soon as their safety is assessed as in danger	• Follow appropriate evacuation procedure.

IX. TRAINING PROGRAM AND INSTITUTIONAL CAPACITY REVIEW AND NEEDS

38. A training program is required to address the safeguard reporting and implementation requirements during construction. The engagement of a contractor firm/consultants will be critical to ensuring the capacity of the PIU staff and to ensuring monitoring and reporting are managed effectively during implementation. This person will also work closely with the PMU Safeguard Officer in order to ensure safeguards are implemented and monitored. The proposed training required for project implementation is set out in table 9below.

Table 9:
Training Requirement

Subject/Content	Participants	Trainer	Frequency
EMP adjustment and implementation – Development and adjustment of the EMP, roles and responsibilities, monitoring, supervision and reporting	PMU, PIU, Contractors and CS	Environmental Specialist (KCC firm)	Once prior to construction
Grievance Redress Mechanism – roles and responsibilities	local authority, communities, PMU, PIU, and CS	Environmental Specialist (KCC firm)	Once prior before construction
Environmental Monitoring – monitoring methods, data collection and processing, reporting systems	Contractors, CS, PIU, PMU	Environmental Specialist (KCC firm)	Once prior before construction
O&M training program	Operators, staffs, workers, CS, PIU and PMU	contractor firm/consultants	Once prior before operation

39. Currently there is little capacity for environmental assessment and management among subproject staffs and contractors in Battambang Town. The PISCD Consultant will develop and deliver training courses to the contractors, CS and PIU/PMU staff. The purpose of the courses is to strengthen the ability of the CS and PIU/PMU to oversee implementation of the EMP by construction contractors.

40. Training must include environmental issues during the operational phase of wastewater management (storm water drainage) and MRF.

41. Training on the implementation of an EMP should focus on two thematic areas. The first area should be principles environmental management focused on the potential impacts of infrastructure development on the natural and social environment. The second area should be environmental safeguard requirements of the ADB and GoC with specific focus on the EMP.

X. GRIEVANCE REDRESS MECHANISM

A. GRM OBJECTIVE

42. A grievance redress mechanism (GRM), consistent with the requirements of the ADB Safeguard Policy Statement (2009) will be established to prevent and address community concerns, reduce risks, and assist the project to maximize environmental and social benefits. In addition to serving as a platform to resolve grievances, the GRM has been designed to help achieve the following objectives: (i) open channels for effective communication, including the identification of new environmental issues of concern arising from the project; (ii) demonstrate concerns about community members and their environmental well-being; and (iii) prevent and mitigate any adverse environmental impacts on communities caused by project implementation and operations. The GRM is accessible to all members of the community.

B. PROPOSED GRM SYSTEM

43. In Cambodia, there is currently no existing legally established system to resolve environmental concerns and complaints. The MPWT, as the EA of the CTD1 will establish the GRM. The setup shall be made before commencement of site works and have members from the PMU, district authority and commune councils. Grievances can be filed in writing or verbally with any entry point of the GRM. The committee will have 15 days to respond with a resolution. The PMU's Environment Safeguards Officer will oversee the implementation of the mechanism with technical support by PMU's environmental safeguard consultants and will be responsible for keeping the PMU informed. The PIU's Environmental Safeguards Focal Point will be responsible for ensuring GRM implementation at the sub-project level effectively.

C. ACCESS TO THE MECHANISM

44. A well-defined grievance redress and resolution mechanism will be established to resolve grievances and complaints in a timely and satisfactory manner. The PMU, through Environment Safeguards Officer (PMU-ESO) and staff in the MPWT, will ensure that: (i) The public and all stakeholders are aware of their rights to access, and will have access to, the GRM free of administrative and legal charges; and (ii) The GRM is fully disclosed prior to construction: (a) in public consultations, (b) through posters displayed in the commune office (posters to include names and contact details of the PIU-SFP). The GRM is fully disclosed prior to construction: (a) in public consultations, (b) through posters displayed in the commune office (posters to include names and contact details of the PIU-SFP).

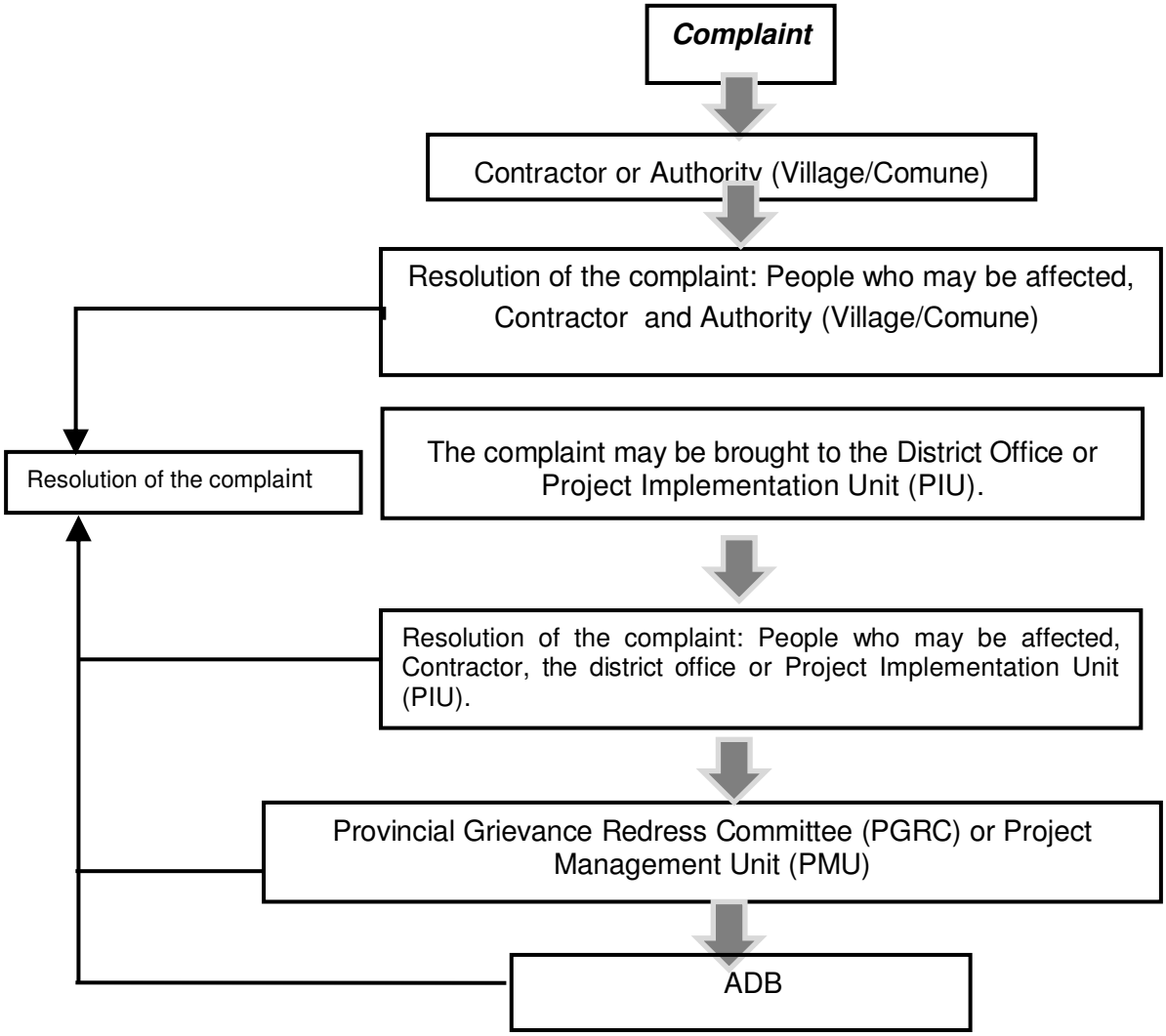
45. The grievance redress process applies to environmental issues and includes three steps of which three are followed before complaints may be elevated to the ADB as a last resort, as follows:

    (i) 1st step: Complaints and grievances will be provided verbally or in writing to the village chief, commune chief, or to contractor. The receiving agent will provide immediate written confirmation of receiving the complaint. If after 5 days the complainant does not hear from the contractor or not satisfied, the complainant will continue to village chief and then go to commune chief/council if still not satisfied. If after 15 days the complainant does not hear from the contractor, village and commune chiefs or if he/she is not satisfied with the decision taken in the first stage, the complaint may be brought to the District Office or Project Implementation Unit (PIU).

(ii) 2nd step: The District Office in cooperation with Project Implementation Unit (PIU) has 15 days within which to resolve the complaint to the satisfaction of all concerned. If the complaint cannot be solved at this stage, the District Office or Project Implementation Unit (PIU) will bring the case to the Provincial Grievance Redress Committee (PGRC) or Project Management Unit (PMU) and has to inform the complainant. The Annex 10: GRM- Complaint Recording Form.

(iii) 3rd step: The PGRC or Project Management Unit (PMU) meets with the aggrieved party and tries to resolve the situation. Within 15 days of the submission of the grievance, the Committee or PMU will make a written decision and submit copies to ADB.

Figure 1: GRIEVANCE REDRESS MECHANISM CHART



Contractors, PIU and PMU's Telephone Numbers

PIU and Contractor (Bavet Town):

- Road improvement Contractor 077 258 224
- MRF Contractor 012 202 266 or 089 852 588
- Project Implementation Unit (PIU). 012 707 616 or 088 644 0544

PIU and Contractor, Battambang Town:

- Storm drainage Contractor 096 916 6190
- MRF Contractor 012 202 266 or 089 852 588
- Project Implementation Unit (PIU). 092 930 966 or 012 479 030

PIU and Contractor, Poipet Town:

- MRF Contractor 012 202 266 or 089 852 588
- Project Implementation Unit (PIU). 012 220 015 or 077 319 444

Envirenmental Spesialists of Project 012 916 545 or 012 863 994

Project Management Unit (PMU) 012 803 203 or 012 451545

Complaints Receiving Officer, Accountability Mechanism
Asian Development Bank
ADB Headquarters, 6 ADB Avenue, Mandaluyong City 1550, Metro Manila, Philippines
(+632) 632-4444 loc. 70309
(+632) 636 2086
amcro@adb.org

Instructions available here: http://www.adb.org/site/accountability-mechanism/how-file-complaint.

ANNEXES

Annex 1: Water Quality Standards in Public Water Areas for Bio-Diversity Conservation

No	Parameter	Unit	Standard Value
A. River			
1	pH	mg/l	6.5 – 8.5
2	BOD_5	mg/l	1 – 10
3	Suspended Solid	mg/l	25 – 100
4	Dissolved Oxygen	mg/l	2.0 - 7.5
5	Coliform	MPN/100ml	< 5000
B. Lakes and Reservoirs			
1	PH	mg/l	6.5 – 8.5
2	COD	mg/l	1 – 8
3	Suspended Solid	mg/l	1 – 15
4	Dissolved Oxygen	mg/l	2.0 - 7.5
5	Coliform	MPN/100ml	< 1000
6	Total Nitrogen	mg/l	0.1 – 0.6
7	Total Phosphorus	mg/l	0.005 – 0.05
C. Coastal water			
1	PH	mg/l	7.0 – 8.3
2	COD	mg/l	2 – 8
3	Dissolved Oxygen	mg/l	2 – 7.5
4	Coliform	MPN/100ml	< 1000
5	Oil content	mg/l	0
6	Total Nitrogen	mg/l	0.2 – 1.0
7	Total Phosphorus	mg/l	0.02 – 0.09

Note: l = liter; mg = milligram; ml = milliliter

Source: Annex 4 of Sub-decree on Water Pollution Control, 1999

Annex 2: Ambient Air Quality Standards[2]

No	Parameters	Period 1h Average (**mg**/m^3)	Period 8h Average (**mg**/m^3)	Period 24h Average (**mg**/m^3)	Period 1year Average (**mg**/m^3)
1	Carbon monoxide (CO)	40	20	-	-
2	Nitrogen dioxide (NO_2)	0.3	-	0.1	-
3	Sulfur dioxide (SO_2)	0.5	-	0.3	0.1
4	Ozone (O_3)	0.2	-	-	-
5	Lead (Pb)	-	-	0.005	-
6	Total Suspended Particulate (TSP)	-	-	0.33	0.1

Source: Sub-Decree on Air Pollution Control and Noise Disturbance, 2000.

[2] Note: This standard applied to evaluation of ambient air quality and to monitoring of air pollution status.

Annex 3: Maximum Permitted Noise Level in Public and Residential Area (dB)

No	Location	Period		
		06:00 to 18:00	18:00 to 22:00	22:00 to 06:00
Silence Area				
1	Hospital	45	40	35
2	Library			
3	School			
4	Nursery			
Resident Area				
1	Hotel	60	50	45
2	Administration place			
3	House			
Commercial, service areas and mixed small industrial factories		70	65	50
Intermingling in residential areas		75	70	50

Annex 4: Drinking Water Standards (2004)

No	Parameter	Unit	Standard Value
1	PH	mg/l	6.5 – 8.5
2	Turbidity	NTU	5
3	Arsenic	mg/l	0.05
4	Iron		0.03
5	Total Dissolved Solid	mg/l	800
6	Chlorine	mg/l	0.2-0.5
7	Copper	mg/l	1
8	Sulphate	mg/l	250
9	Nitrite	mg/l	3
10	Nitrate	mg/l	50
11	Lead	mg/l	0.01
12	Mercury	mg/l	0.001
13	Coliform	CFU/100ml	0

Annex 5: Effluent Standard for Pollution Sources Discharging Wastewater to Public Water Areas or Sewer

No.	Parameters	Unit	Allowable Limits for Pollutant Substance Discharging to	
			Protected Public Water Area	Public Water Area and Sewer
1	Temperature	°C	<45	<45
2	pH	Mg/l	6-9	5-9
3	BOD_5 (5 days at 200 C)	mg/l	<30	<80
4	COD	mg/l	<50	<100
5	Total Suspended Solids	mg/l	<50	<80
6	Total Dissolved Solids	mg/l	<1000	<2000
7	Grease and Oil	mg/l l	<5.0	<15.0
8	Detergents	mg/l	<5.0	<15.0
9	Phenols	mg/l	<0.1	<1.2
10	Nitrate (NO_3)	mg/l	<10	<20
11	Chlorine (free)	mg/l	<0.1	<2.0
12	Chloride (iron)	mg/l	<500	<700
13	Sulphate (as SO_4)	mg/l	<300	<500
14	Sulphide (as Sulphur)	mg/l	<0.2	<1.0
15	Phosphate (PO_4)	mg/l	<3.0	<6.0

No.	Parameters	Unit	Allowable Limits for Pollutant Substance Discharging to	
			Protected Public Water Area	Public Water Area and Sewer
16	Cyanide (CN)	mg/l	<0.2	<1.5
17	Barium (Ba)	mg/l	<4.0	<7.0
18	Arsenic (As)	mg/l	<0.1	<1.0
19	Tin (Sn)	mg/l	<2.0	<8.0
20	Iron (Fe)	mg/l	<1.0	<2.0
21	Boron (B)	mg/l	<1.0	<5.0
22	Manganese (Mn)	mg/l	<1.0	<5.0
23	Cadmium (Cd)	mg/l	<0.1	<0.5
24	Chromium $(Cr)^{+3}$	mg/l	<0.05	<1.0
25	Chromium $(Cr)^{+6}$	mg/l	<0.05	<0.5
26	Copper (Cu)	mg/l	<0.20	<1.0
27	Lead (Pb)	mg/l	<0.10	<1.5
28	Mercury (Hg)	mg/l	<0.002	<0.05
29	Nickel (Ni)	mg/l	<0.20	<1.0
30	Selenium (Se)	mg/l	<0.05	<0.5
35	DO	mg/l	>2.0	>1.0
36	Polychlorinated Byphemyl	mg/l	<0.003	<0.003
37	Calcium	mg/l	<150	<200
38	Magnesium	mg/l	<150	<200
39	Carbon tetrachloride	mg/l	<3	<3
40	Hexachloro benzene	mg/l	<2	<2
41	DTT	mg/l	<1.3	<1.3
42	Endrin	mg/l	<0.01	<0.01
43	Dieldrin	mg/l	<0.01	<0.01
44	Aldrin	mg/l	<0.01	<0.01
45	Isodrin	mg/l	<0.01	<0.01
46	Perchloro ethylene	mg/l	<2.5	<2.5
47	Hexachloro butadiene	mg/l	<3.0	<3.0
48	Chloroform	mg/l	<1.0	<1.0
49	1,2 Dichloro ethylene	mg/l	<2.5	<2.5
50	Trichloro ethylene	mg/l	<1.0	<1.0
51	Trichloro benzene	mg/l	<2.0	<2.0
52	Hexaxhloro cyclohexene	mg/l	<2.0	<2.0

Remarks: The Ministry of Environment and the Ministry of Agriculture, Forestry and Fishery shall collaborate to set up the standard of pesticides which discharge from pollution sources.

Annex 6: Monthly Report Form and Checklist

1. Introduction
    1.1 Project overall
    1.2 Project progress
    1.3 Purpose of the report
2. Environmental Monitoring Program
    2.1 Scope of works
    2.2 Methodology
3. Results of Environmental Monitoring
    3.1 Environmental Report of Contractor
    3.2 Field Monitoring by Environmental Specialist
4. Conclusions and recommendations
    4.1 Conclusions
    4.2 Recommendations

Project name:

Project site: ……..

Environmental monitoring sheet, monitoring date ……/……/……..

No.	Description	Location	Appropriate Facilities/ Protection method	Degree of environmental condition				
				1	2	3	4	5
1	Leaks and spills of hazardous material	Fuel storage area	safety sign					
			far from watercourse >20m					
			far from drain channel >10m					
			concrete flooring					
			concrete curve or wall					
			leakage					
		Construction sites	spilling					
2	Erosion	Construction sites	soil type					
			side slope					
			compaction					
			re-vegetation					
		Borrow/quaries area	embankment					
			retention pond					
3	Borrow pit/quarry	At borrow pit	shape (ragtancular)					
			wall slope					
			depth (m)					
			fence					
		At quarry site	slope					
			depth (m)					
			fence					
4	Water quality	Project site	laden sidementation					
			floating solid waste					
			floating liquid waste					
5	Air quality	Project site	dust					
			spray water					
		Access road	dust					
			cover on materials					
			spray water					
6	Noise	Site close to settlement	any complain					
7	Waste management	Project site	liquid waste					
			solid waste/garbage					
			human waste					
			hazardous waste					
		Worker camp	liquid waste					
			solid waste/garbage					
			human waste					
		Storage area	liquid waste					
			solid waste/garbage					
			human waste					
			hazardous waste					
8	Drainage	Project site	arrangement					
			functioning					
		Worker camp	arrangement					
			functioning					
		Storage area	arrangement					
			functioning					
9	Damage road/culvert/bridge	Access road	pavement					
			foundation					
		Culvert and bridge along access road	pavement					
			structure					
10	Traffic	Access road	congestion					
			accident					
		Level crossing	safety sign					
			barrier					
			pavement condition					
			accident					
11	Safety	Project site	safety sign					
			tool/equipment					
			education/training					
		Quarry/workshop	safety sign					
			tool/equipment					
			education/training					
12	Community perception	Project site	conflict with local people					
			any complain from people					
		Camp/quarry	conflict with local people					
			any complain from people					

Note: 5- excellence, 4- very good, 3- good, 2- poor, 1- very poor

Annex 7: TRAINING PROGRAM AND INSTITUTIONAL CAPACITY REVIEW AND NEEDS

46. During updating of the EMP, a training course was conducted at contractor's campsite in Battambang on 19-20 July 2018. There are 18 participants from PMU, PIUs, CS and contractors in training program of which 6 participants from Battambang town.

47. The training on Environmental Management and Monitoring Plan was trained by Mr. Song Kim Chhuon and Mr. Bun San. Number of participants attended in the training course is shown in Table Capacity Building, Participants of Target Group 11 and the training schedule and attendant list is shown in Annex 8 and Annex 9.

Capacity Building, Participants of Target Group

No.	Target Groups	Number of Participant
1	Project Management Unit (PMU)	2
2	Project Implementation Unit (PIU), Bavet	2
3	Project Implementation Unit (PIU), Battambang	2(1 woman)
4	Project Implementation Unit (PIU), Poipet	2(1 woman)
5	Contractor (Urban road in Bavet)	3
6	Contractor (Wastewater treatment/urban drainage in BTB)	4(1 woman)
7	Contractor (MRF three towns)	1
8	Construction Supervision (CS)	2
	Total	**18 (3 women)**

A. OBJECTIVE AND EXPECTED OUTPUTS

48. The objective and expected outputs of the environmental management and monitoring plan training are as follows:

    a. Enhance the awareness of PMU, PIU, CS and contractors on environmental management and monitoring during pre-construction, construction and operation
    b. Enhance the awareness of PMU, PIU, CS and contractors on Healthy, safety and Emergency Response Plan
    c. Cite the role of each member of the PMUs, PIUs, CS and Contractors in environmental management and monitoring

B. TRAINING MATERIALS

49. The training materials were provided to all the participants. The training presentation handout entitled Environmental Management and Monitoring. All training materials, including: agenda handouts, pre-test and post-test were available to the participants. All of these documents are presented in the EMPs in each town. The materials were prepared according to the agree action plan and developed by the PISCD Consultant's. The materials were submitted to the PMU for review and approval in advance of the Training Session.

C. VENUE

50. This training took place from 19 to 20 July 2018, contractor's campsite, Battambang town, Battambang province, Kingdom of Cambodia.

D. Module Content

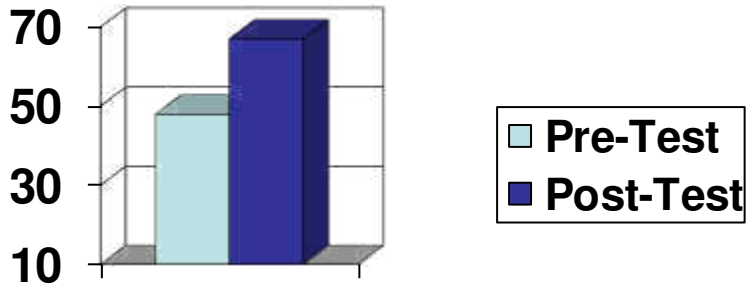
a. Introduction
b. institutional Arrangement& Responsibilities
c. Consultation, Information disclosure and grievance redress mechanism
d. Environmental Impact and Mitigation Plan
e. Emergency Response Plan
f. Monitoring and reporting
g. Environmental Monitoring Sheet, Instruction and Photograph

E. RESULTS OF PRE-POST TESTS

51. Ten questions were include in the pre- and post-tests, which were designed to assess the improvement of participant's knowledge and skills as a result of the training. The pre- and post-test were delivered to the participants before and after the training.

52. The score of each participant on the pre- and post-tests are shown on Figure 1. A comparison of pre-post-test scores is presented in table 10.

The Comparison of Pre-Post Test



The maximum score of post-test are higher than pre-test. Furthermore, the maximum score of post-test was >70, It is shown that the participants' knowledge and skill of the material were increased as a result of the training.

Pre-Test and Post-Test Comparison

Test	Poor		Fair		Good		Very Good	
	<50	%	50<60	%	60<70	%	>70	%
Pre-Test	4	33	2	17	6	50	0	
Post-Test	1	8	3	25	2	17	6	50

Annex 8: Training Schedule on Environmental Monitoring

PMUs, PIUs, Construction Supervision and Contractors will be conducted on 19-20 July, 2018
Contractor's Campsite Battambang Town

Time	Objective/Activities	Remark
DAY 1: July 19, 2018		
07:30 – 08:00	Registration of participants	Participants
08:00 – 08:30	Opening Speech	BB Town Authority
08:30 – 9:00	Pre-test	Participants
08:30 – 10:00	Introduction	Environmental Specialists
10:00 – 10:15	**Coffee break (including Group Photo)**	
10:15 -12:00	Institutional arrangement and responsibilities	Environmental Specialists
12:00 – 13:30	**Break for lunch**	
13:30 – 15:00	Consultation, information disclosure and grievance redress mechanism	Environmental Specialists
15:00 – 15:15	**Coffee break**	
15:15 – 16:40	Environmental Impact and Mitigation Plan	Environmental Specialists
16:40 – 17:00	Wrap Up and End of day 1	Environmental Specialists
DAY 2: July 20, 2018		
07:30 – 08:00	Registration of participants	Participants
08:00 – 10:00	Emergency Response Plan	Environmental Specialists
10:00 – 10:15	**Coffee break**	
10:15 – 12:00	Monitoring and reporting	Environmental Specialists
12:00 – 13:30	**Break for Lunch**	
13:30 – 15:00	Environmental Monitoring Sheet and Photograph	Environmental Specialists
15:00 – 15:15	**Coffee break**	
15:15 – 16:00	Wrap up and Post-test	Environmental Specialists and Participants

Annex 9: Attendance List

GMS: Southern Economic Corridor Towns Development Project
Attendant List
Training course on Environmental Management and Monitoring Plan
Date 19 July, 2018 Battambang Town

No.	Name	Sex	Position	Phone Number	Signature
1	Pov Manith	M	Deputy Director	012803203	
2	VONG RADA	M	PMU	012451545	
3	SANG SAM	M	PIU PP	092949482	
4		M	PIU BTB	012260560	
5	Tith Tykea	M	Project Manager CWOS	077258224	
6	Orng Leangmeng	M	engineer CWOS	046583484	
7	Cheam sitha	M	Translater	090835555	
8	Khaem Rithy	M	PIU	077828801	
9	Sarang Kleo	M	PIU	0886405444	
10	Sy Hayean	M	Civil Engineer (CADTIS)	077411301	
11	Seng HongChhay	M	Engineer BUCG	0969980036	
12		M	Site inspector (CADTIS)	016536163	
13	Sok Kinna	F	PIU-BTB	012479030	
14		F	PIU. POIPET	012622230	
15		M	Environment Specialist	012863994	
16		M	Environment Specialist	012916422	
17	Orn Seurong	M	Site Former BUG	079 558359	
18		F	BUG	096966490	
19		M	MRF BB	078 953816	
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GMS: Southern Economic Corridor Towns Development Project
Attendant List
Training course on Environmental Management and Monitoring Plan
Date 20 July, 2018 Battambang Town

No.	Name	Sex	Position	Phone Number	Signature
1	[illegible]	[illegible]	PIU.	077481801	
2	Cheamsotha	M	Res Man (translater)	090835555	
3	Orny Loangmeng	M	engineer	086883388	
4	Tith Tykea	M	Project Manager CWOS	077258224	
5	SANG. Sokry	M.	PIU (PP)	092909482	
6	Soghal Leapheo	F	PIU-POIPET	077622270	
7	Sok Kinna	F	PIU-BTB	012479030	
8	Orn Sovong	M	Site Forman BUCG	077558359	
9	CHHOUMSODARA	M	Site inspector	016536163	
10	Sy Hayean	M	Civil Eng. (CADTIS)	077411301	
11	Seng Hong Chhay	M	Engineer BUCG	096998036	
12	Sarang Keo	M	PIU Bavet	0886440544	
13	Nou. Dharavuth	M	PIU. BTB	017280560	
14	Bun San	M	Environmental Specialist	012863994	
15	[illegible]		[illegible]	078.953814	
16	Sony Kim Chhuon	M	Environmental Spec	012 916	
17	LEAT PHI PHOM	M	Engineer BUCG	069999698	
18	Chum Sreymoth	F	BUCG	096916619	
19	VONG RADA	M	PMU-MPWT	012451545	
20	Pov Manith	M	PMU. member	012 803 203	
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Annex 10: GRM-Complaint Recording Form

PIU Staff Responsible: (name and role)	
Date: (of this record)	

Date of Complaint:	
Date Resolution Required by (5 days from initial complaint):	
Complaint Made by: (Name & Contact Details)	
Method of Complaint: (direct to PMU, via Contractor, Via Commune People's Council)	
Details of Complaint: (issues, actions taken so far, when did it start – all details needed)	
PMU Actions: (Next steps for PMU to resolve the issue or to move complaint to next level)	
Follow Up Actions Needed and Date: (PMU to follow up on resolution if needed, e.g. check contractor actions)	