

Environmental Management Plan

April 2018

CAM: Second Urban Environmental Management in the Tonle Sap Basin Project Subproject Battambang

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

CURRENCY EQUIVALENTS

(as of 8 May 2018)

Currency unit	–	riel (KR)
KR 1.00	=	\$ 0.000245
\$1.00	=	KR 4,086.62

ABBREVIATIONS

ADB	-	Asian Development Bank
BOD	-	Biochemical Oxygen Demand
CDIA	-	Cities Development Initiative for Asia
CEMP	-	Construction Environmental Management Plan
C-EHS	-	Contractor Environmental Health and Safety Officer
COD	-	Chemical Oxygen Demand
CRVA	-	Climate Risk Vulnerability Assessment
DDPP	-	Detailed Design and Project Preparation
EA	-	Executing Agency
EIA	-	Environmental Impact Assessment
EMP	-	Environmental Management Plan
FGD	-	Focus Group Discussion
GHG	-	Greenhouse Gas
GRM	-	Grievance Redress Mechanism
IA	-	Implementing Agency
IEE	-	Initial Environmental Examination
IEIA	-	Initial Environmental Impact Assessment
MoE	-	Ministry of Environment
MOWRAM	-	Ministry of Water Resources and Meteorology
MPWT	-	Ministry of Public Works and Transport
PDoE	-	Provincial Department of Environment
PMC-I/NES	-	PMC-International and National Environment Specialists
PIU	-	Project Implementation Unit
PIU-SFP	-	PIU Safeguards Focal Point
PMC	-	Project Management Consultant
PMU	-	Project Management Unit
PMU-ESO	-	PMU Environmental Safeguards Officer
PSC	-	Project Steering Committee
RCP	-	Representative Concentration Pathway
SHC	-	Sewer Household Connection
STP	-	Sewage Treatment Plant
SPS	-	Safeguards Policy Statement
TS-1	-	Tonle Sap Urban Environmental Improvement Project
TSBR	-	Tonle Sap Biosphere Reserve
TSS	-	Total Suspended Solid
WHO	-	World Health Organisation

WEIGHTS AND MEASURES

dBA	-	A-weighted Decibel
km	-	Kilometer
km ²	-	Square kilometer
LAeq	-	Equivalent Continuous Level 'A weighting' - 'A'-weighting = correction by factors that weight sound to correlate with the sensitivity of the human ear to sounds at different frequencies
m	-	Meter
oC	-	Degree Celsius
PM10	-	Particulate Matter 10 micrometers or less
PM2.5	-	Particulate Matter 2.5 micrometers or less
µg/m ³	-	Microgram per cubic meter

NOTE

- (i) In this report, "\$" refers to United States dollars.

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CONTENTS

1. INTRODUCTION.....	6
1.1. Purpose.....	6
1.2. Outline of Technical Approach.....	6
1.3. Component Investment - Sub-project Description.....	7
2. SUMMARY OF POTENTIAL RECEPTORS & IMPACTS	8
3. INSTITUTIONAL ARRANGEMENTS & RESPONSIBILITIES	11
3.1. Institutional Capacity Review and Needs.....	17
4. MITIGATION MEASURES PLAN	19
5. MONITORING PLAN.....	36
5.1. Project Readiness Monitoring for All Sub-Projects.....	37
5.2. Environmental Quality Monitoring	38
5.3. EMP Compliance Monitoring	42
5.4. Environmental Policy and Standards	44
6. PUBLIC CONSULTATION	45
7. GRIEVANCE REDRESS MECHANISM	45
7.1. GRM Objective	45
7.2. Proposed GRM System.....	45
8. REPORTING.....	49
8.1. Mechanisms for Feedback and Adjustment.....	50
9. ESTIMATED COST OF EMP	50
10. CONCLUSION	51

List of tables

<i>Table 1 Summary of Receptors in Sub-Project Area</i>	<i>8</i>
<i>Table 2 Key Roles for Project Implementation.....</i>	<i>11</i>
<i>Table 3 Capacity Building and Training Requirements</i>	<i>18</i>
<i>Table 4 EMP Mitigation Measures for All Sub-Projects.....</i>	<i>19</i>
<i>Table 5 EMP Mitigation Measures for Landfill Sub-Project</i>	<i>27</i>
<i>Table 6 EMP Mitigation Measures for STP Sub-Project</i>	<i>33</i>
<i>Table 7 Project Readiness Assessment Indicators.....</i>	<i>37</i>
<i>Table 8 Environmental Quality Monitoring: Landfill and STP Sub-Projects</i>	<i>39</i>
<i>Table 9 EMP Compliance Monitoring</i>	<i>42</i>
<i>Table 10 GRM Steps.....</i>	<i>47</i>
<i>Table 11. Reporting Requirements.....</i>	<i>49</i>

List of figures

<i>Figure 1 Battambang STP Site1</i>	<i>9</i>
<i>Figure 2 Battambang STP Site1 Indicative Receptors.....</i>	<i>9</i>
<i>Figure 3 Battambang Landfill Site1, 2 and 3.....</i>	<i>10</i>

<i>Figure 4 Battambang Landfill Site 1 and 2 Indicative Receptors.....</i>	<i>10</i>
<i>Figure 5 Battambang Landfill Site3 Indicative Receptors.....</i>	<i>10</i>

List of annexes

<i>Annex 1 Environmental Safeguards Terms of Reference</i>	<i>52</i>
<i>Annex 2 Affected Person Monitoring Form</i>	<i>54</i>
<i>Annex 3 GRM – Complaint Recording Form</i>	<i>57</i>
<i>Annex 4 Particular Conditions (For Bidding Documents)</i>	<i>58</i>
<i>Annex 5 Environmental Quality Standards</i>	<i>59</i>

1. INTRODUCTION

1.1. Purpose

1. This document is the environmental management plan (EMP) for the Battambang city, Battambang Province sub-projects for the Second Integrated Urban Environmental Management in The Tonle Sap Basin Project (the project). The EMP for the sub-projects defines mitigation and monitoring measures and describes the institutions, responsibilities and mechanisms to monitor and ensure compliance. Such institutions and mechanisms will seek to ensure continuous improvement of environmental protection activities during preconstruction, construction, and operation of the sub-projects in order to prevent, reduce, or mitigate adverse impacts.

2. This EMP is prepared for construction of a controlled landfill and sewage treatment plant (STP). It is one of three EMPs prepared for the project. The Project also includes infrastructure components in the sub-project locations of Serei Saophoan city, Banteay Meanchay Province, and Stueng Saen City, Kampong Thom Province. The integrated Initial Environmental Examination (IEE) that covers all the sub-projects is found under separate cover.

1.2. Outline of Sub-Project Technical Approach

1.2.1. Sewage treatment plant outline

3. The technology is based on a pond system. Each step of treatment represents a progressively more advanced technology which leads to an enhanced pollutant removal efficiency and includes:

- ▶ Inlet screening – An automatic fine screen.
- ▶ Anaerobic ponds, 5m deep - A first stage for treatment of high strength wastewaters, including mixtures of industrial/domestic wastewaters and septage with high organic loading
- ▶ Facultative ponds 3 m deep - Designed to be naturally aerated to maintain the biological activity of the bacteria
- ▶ Maturation ponds 2 m deep - aerobic lagoons used as UV disinfection for bacteriological pollutant removal and tertiary or “effluent polishing” treatment
- ▶ Sludge stabilization/drying ponds - sludge will need to be removed after 3-5 years

1.2.2. Landfill technology outline

4. A controlled landfill standard facility is to be provided. This is considered to be the appropriate standard of intervention required which as it provides the best balance between capital cost and operating difficulty compared with environmental controls and sustainability. The landfills are of different sizes and layout but generally include the following common features:

- ▶ A gravel or laterite access road from the appropriate main road to the landfill site;
- ▶ Full perimeter fence;
- ▶ Buildings for the gatehouse, generator where required and office buildings and ablution facilities;
- ▶ An artificially lined cell with sufficient life for five years operation;
- ▶ A leachate collection system;
- ▶ Internal access roads;
- ▶ Appurtenant works such as lighting, weighbridge, sump pumps;
- ▶ Equipment including a 20-ton bulldozer, a 20-ton tracked excavator and a 6 x 4 tipping truck
- ▶ Groundwater monitoring wells.

1.3. Component Investment - Sub-project Description

1.3.1. Sewage Treatment Plant

5. The project will include the following investments:
- ▶ Construction of a primary, secondary and tertiary sewer collection network, including sewer household connections (SHCs);
 - 28 km gravity sewer pipeline
 - 9.7 km pressurized sewer pipeline
 - 51 km of Ø160mm tertiary sewers for SHCs within project timescale
 - ▶ Construction of two primary sewer pump stations and associated pumping mains;
 - ▶ construction of four secondary sewer pump stations and pumping mains;
 - ▶ Construction of an 8,500 m³/day STP
 - ▶ Construction of administration, workshop, generator and security buildings at STP;
 - ▶ Upgrade and raise four km of access road to the STP site;
 - ▶ Provision of operations & maintenance equipment.

1.3.2. Landfill Construction

6. The project will include the following investments
- ▶ Earthworks for the site construction;
 - ▶ Buildings;
 - Administration building
 - Generator building
 - Gatehouse
 - ▶ Roads, dikes, hardstanding;
 - ▶ Site infrastructure
 - Including HDPE liner
 - 3 groundwater monitoring wells
 - 1 water supply well

2. SUMMARY OF POTENTIAL RECEPTORS & IMPACTS

7. The impacts of the project are influenced by the presence of receptors in the sub-project area. Without receptors, there will not be any impacts. The receptors are summarized in Table 1. In addition to these facility specific receptors, there are housing, businesses and access requirements that are also considered impact receptors at all locations where any excavations for pipe networks associated with the STPs sub-project.

Table 1. Summary of Receptors in Sub-Project Area

City	Sub-Project	GPS	Surface Water Receptors	Socio-Economic & Cultural Receptors	Land Cover/ Ecological Receptors	Protected Area Status
Battambang	STP	13° 6'28.97"N, 103°14'31.62"E	Ou Mony stream 850m (Effluent), Canals 5m surrounding site and conveying effluent to Ou Mony	Nearest housing area: 0.8km East of STP, House adjacent to Pumping Station 2, Preah Kunkud Pagoda west of Pumping Station 1 along access road (260m) 13° 6'7.87"N, 103°13'22.73"E, Distance to town: 4.5km	Lowland rice fields	None
	Landfill Opt. 1	12°55'51.47"N, 103° 9'52.57"E	Sangke River 1.5 km West, Irrigation canal adjacent to west, tertiary canal across site	Nearest housing area: 1 km North East and 300m individual houses to north west, Distance to City: 18 km Pagoda (new): 4 km East	Rice fields, some cultivated shrub/small trees e.g. Tamarind, Neem, Bamboo, Sugar Palm, Euphorbia.	None
	Landfill Opt. 2	12°55'37.03"N, 103° 9'20.47"E	Sangke River 0.3 km West	Nearest housing area: 0.2 km South (opposite site) Distance to City: 19 km	Borrow site used for excavation, highly disturbed. Some shrub cover e.g. Bamboo, Euphorbia.	None
	Landfill Opt. 3	12°56'52.45"N, 103° 9'50.83"E	Drainage canal adjacent, Sangke River 1.5 km West	Nearest housing area: 0.5 km North East Pagoda: Wat Banan 3 km West, Distance to City: 16 km	Rice fields, some cultivated shrub/small trees e.g. Tamarind, Neem, Bamboo, Sugar Palm, Euphorbia.	None

8. A summary of adverse impacts on the receptors is presented below:

- ▶ **Air Quality.** Moderate temporary air quality impacts during the construction stage of the project are anticipated because of fugitive dust generation associated with all construction works, earth works and waste movements.
- ▶ **Noise.** Noise impacts will be temporary and localized at all construction sites as construction machinery and vehicles generate noise as they operate. Other noise sources include loading and unloading of equipment and materials and the construction of boreholes for landfill groundwater monitoring.
- ▶ **Surface Water.** Construction will take place in areas which have a network of irrigation canals, used for both household water requirements such as laundry and

bathing as well as for fishing. Short term construction impacts may be seen in terms of increased turbidity, when access roads improvement or other construction is taking place adjacent to the canals. Also some construction activity will be required at the river bank where outfalls for STP effluent are required. Effluent discharges will also negatively impact on water quality and water users, if the design discharge standards are not met.

- ▶ **Soil and Land.** Soil erosion is not anticipated given the nature of the sub-projects and their locations however borrow sites will cause local impacts to the land. The sub-projects are in fertile agricultural locations and fertile top soil is a valuable resource which requires protection measures, particularly for construction areas which are located in and around rice fields where encroachment from inappropriate spoil disposal could have detrimental impacts
- ▶ **Solid waste management.** Impacts on resource use and impacts associated with disposal will arise from waste generated during construction. This includes generation of inert wastes e.g. spoil, biodegradable wastes e.g. cleared vegetation, and hazardous wastes e.g. oily wastes.
- ▶ **Community and Occupational Health and Safety.** Construction sites and access roads will necessarily mean health and safety risks not only to construction workers, but also to people living and working around the sites. Community risks come from unauthorized access to construction sites and construction traffic i.e. heavy vehicles which the community may not be used to on their neighbourhood roads. Occupational risks come from a range of activities including the use of heavy machinery, earth moving, and use of chemicals
- ▶ **Socio-Economic Impacts (accessibility).** The installation of sewage pipe network will require the excavation of parts of the road network. This is in urban areas where businesses and other activities take place. The community in and around these areas will be disrupted by the noise and dust, as described above, and also by potentially impaired access (for themselves and their customers) to their properties and businesses.

9. The locations of the sub-projects in Battambang and indicative receptors are shown in Figure 1 to Figure 5.

Figure 1 Battambang STP Site1

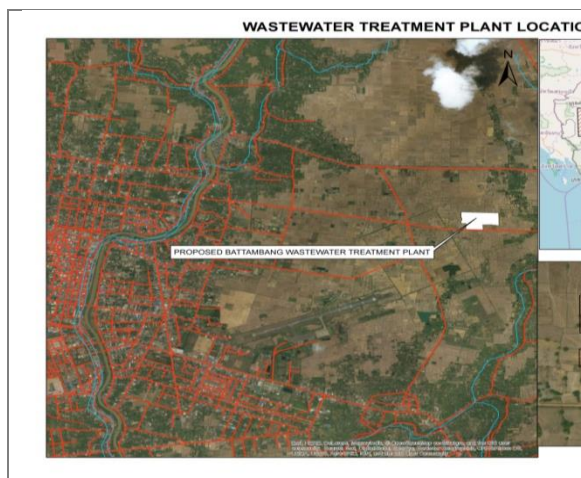


Figure 2 Battambang STP Site1 Indicative Receptors

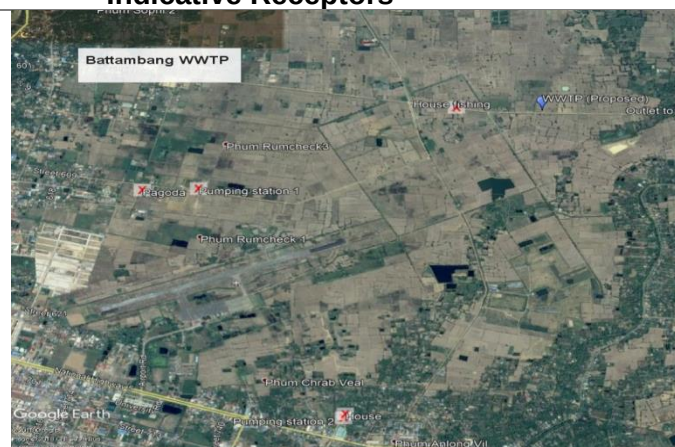


Figure 3 Battambang Landfill Site1, 2 and 3

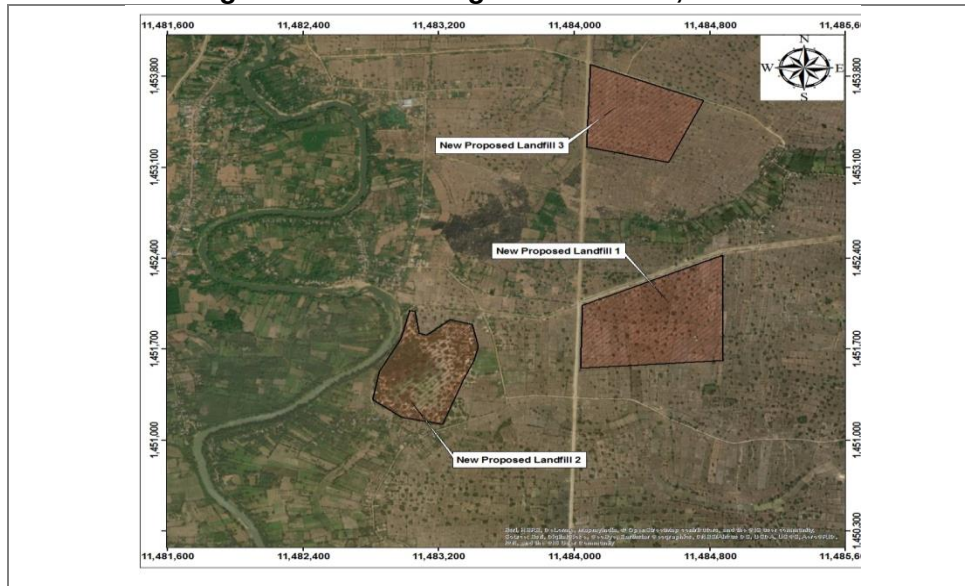
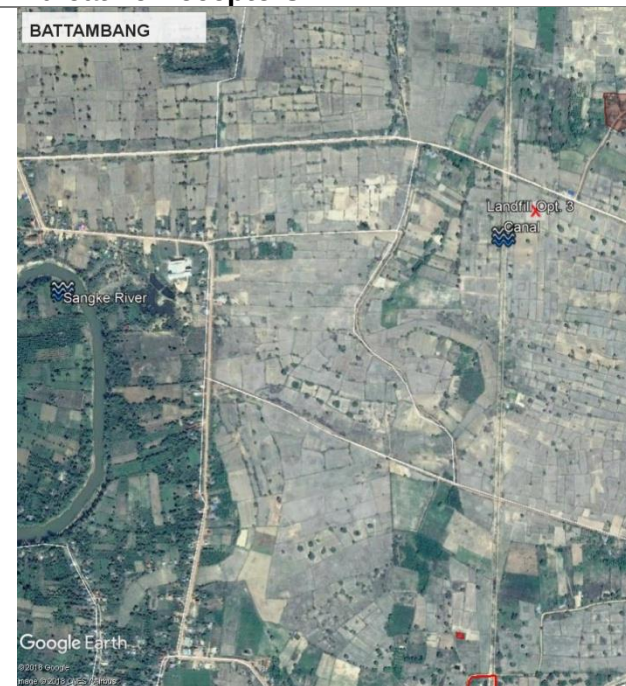


Figure 4 Battambang Landfill Site 1 and 2 Indicative Receptors



Key:  = Residential area

Figure 5 Battambang Landfill Site3 Indicative Receptors



Key:  = Residential area

3. INSTITUTIONAL ARRANGEMENTS & RESPONSIBILITIES

10. The framework for implementation of the environmental management plan (EMP) for the project is described here. It will be reconfirmed at the detailed design stage and any necessary changes incorporated into the final documents. The key institutions, organizations and stakeholders relevant to environmental safeguards are set out below.

11. The overall responsibility for EMP implementation and compliance with loan assurances lies with the Executing Agency, the Ministry of Public Works and Transport. The EA will establish a Project Management Unit (PMU) based in Phnom Penh, responsible for general project implementation. The Implementing Agency is the Provincial Department of Public Works and Transport (PDPWT) in each sub-project city. The PDPWT will establish a Project Implementation Unit (PIU) in each province, comprising relevant provincial government representatives including the Provincial Department of the Environment.

12. A summary of the key functions for project implementation and environmental safeguards is presented in Table 2 for ease of reference:

Table 2. Key Roles for Project Implementation

Role	Abbreviation	Location	Summary of Overall Function
Project Steering Committee	PSC	Phnom Penh	Policy and technical guidance for subproject implementation
Project Management Unit	PMU	Phnom Penh within MPWT	Responsible for general project implementation and reporting
PMU Environment Safeguards Officer (funded through CTDPA Loan)	PMU-ESO	Phnom Penh within PMU	EMP compliance across the sub-projects for environmental safeguards – Full Time
Project Implementation Unit	PIU	Provinces within PDPWT	Responsible for sub-project implementation
PIU Safeguards Focal Point	PIU-SFP	Provinces within PIU	Responsible for sub-project environmental and social safeguard monitoring – Full Time
Contractor Environmental Compliance Officer	C-EHS	Construction Site	Mitigation measure implementation and reporting
Project Management Consultants	PMC	Phnom Penh	Project final design and implementation, support and capacity development Engineering supervision for all construction and reporting
International and National Environment Specialists	PMC-I/NES	Phnom Penh within PMC team	Environmental safeguards and reporting support during design and implementation - Intermittent
Asian Development Bank	ADB	-	Review project progress, compliance with covenants and advise on corrective actions

Source: IEE Preparation Team.

13. A Project Steering Committee (PSC) will be created to provide policy and technical guidance for subproject implementation. The PSC is chaired by the EA and comprises relevant ministry of provincial departments representatives including the Ministry of Environment, General Department of Resettlement (GDR) and Ministry of Labor as a minimum.

14. External support to the IA/PIU for EMP implementation during the project detailed design and implementation phase will be provided by the International and National Environment Specialists (I/NES) of the Project Management Consultants (PMC). An external Environmental Monitoring Institute (EMI) will be engaged to conduct the field sampling and laboratory analyses of environmental quality (e.g., water quality, air quality) that cannot be performed by other functions within the project. In Cambodia, this can be performed by qualified staff from the Ministry of Environment.

15. ADB is responsible for reviewing project progress reports and semi-annual environmental safeguards monitoring reports and undertaking review missions to ensure the project is implemented in line with project environmental safeguard requirements, SPS (2009) and Royal Government of Cambodia regulations and guidelines.

16. The EA will be accountable for project implementation and operation on behalf of the Royal Government of Cambodia. The responsibilities of the EA in relation to environmental safeguards requirements are summarized below:

- (i) Overall responsibility for subproject implementation and management of the Project Management Unit (PMU);
- (i) Recruit and manage qualified ESO for PMU;
- (ii) Recruit and manage Project Management Consultants
- (iii) Ensure compliance with Loan Covenants;
- (iv) Approve procurement plans, bidding documents, bid evaluation and contract awards including EMP;
- (v) Submit regular quarterly and annual subproject reports to ADB including summary on EMP and GRM implementation;
- (vi) Ensure compliance of subproject/component implementation with ADB and Government social and environmental policies, guidelines and plans;
- (vii) (Approve proposed corrective actions in the event of identified impacts or non-compliance issues identified in monitoring and evaluation reports.

17. The responsibilities of the IA in relation to environmental safeguards requirements are summarized below:

- (i) Coordinate and monitor subproject implementation activities including all environmental safeguards activities;
- (ii) Coordinate capacity development program for PIU;
- (iii) Obtain necessary approvals from respective departments and other institutions prior to awarding of civil works contracts;
- (iv) Support PMU-ESO in the implementation of EMP;
- (v) Coordinate regular reporting of PMU to EA on EMP implementation;
- (vi) Undertake regular quality control inspection of subproject facilities; and
- (vii) Manage the handover of subproject facilities to agencies responsible for operation and maintenance.

(viii) Ensure PIU engage with and follow the Grievance Redress Mechanism GRM.

18. Specific environmental safeguard responsibilities are set out for each project phase in

Table 3. EMP Responsibilities

Responsible Entity	Project Preparation	Engineering Detailed Design	Tendering & Pre-construction	Construction	Operation
Executing Agency	Ministry of Construction and Urban Development responsible for ensuring the implementation of the mitigation in the EMP and for ensuring compliance with loan covenants				
PMU / PMU-ESO		Update IEE/EMP if needed	Engage PMC & PMU-ESO	Ensure EMP is implemented, and that the contractor(s) abide by the EMP	
		Review updated EMP	Coordinating the tendering process including overseeing incorporation of EMP clauses into the bidding documents	supervising project construction (with support of PMC engineers)	
		Confirm that mitigation measures have been included in engineering detail design	Ensuring the procurement of environmentally responsible contractors and approve CEMP	Prepare and submit quarterly and annual reports including environmental safeguard reporting to ADB	
			Ensuring that domestic EIA approvals by MoE have been secured prior to the awarding of civil works contracts		
			Dissemination and coordination of Grievance Redress Mechanism	Ensure EMP implementation and submit regular monitoring reports to IA and EA	
				ensure PIU-SFPs undertake regular site inspections as part of progress reporting	
PIU-SFP			Attend all pre-construction training courses regarding EMP implementation	working closely with the contractors to ensure EMP implementation	
				Support GRM	
				Support Progress Monitoring and Reporting requiements working with PMU-ESO	
				Conduct consultation interviews with affected people	
Project Management Consultants PMC		Engage appropriate engineer and safeguards staff	See PMC-I/NES	See PMC-I/NES	Operator training and support as per ToR in PAM

Responsible Entity	Project Preparation	Engineering Detailed Design	Tendering & Pre-construction	Construction	Operation
		Finalise Detailed Engineering Design in accordance with Environmental Safeguard principles			
Project Management Consultants PMC (PMC-I/NES)]		Update IEE/EMP if needed	providing training on EMP supervision and GRM to PMU, PIU and contractors	coordinate public consultation with PMUESO / PIU-SFP	Organize, prior to project completion report (PCR) mission, a survey to assess community satisfaction with project implementation and EMP implementation performance. Draft environment sections of the PCR.
			setting up environmental management and internal monitoring systems at PUSO and civil works contracts level	preparing annual EMP progress reports	
			review tender and contractor documents	identifying environment-related implementation issues and necessary corrective actions	
			review contractor Construction EMPs	Training of PMU, PIU and other stakeholders GRM and EMP implementation	
			Ensure grievance redress mechanism established		
			regular EMP and implementation monitoring		
			coordinate public consultation		
			Undertake Environmental Compliance Audit on dumpsite to be rehabilitated		
			Organize, prior to project completion report (PCR) mission, a survey to assess community satisfaction with project implementation and EMP implementation performance. Draft environment sections of the PCR.		
Contractor		Provision of Construction EMPs and environmental track record in bid response	Ensure sufficient funding and human resources for proper and timely implementation of required mitigation and monitoring measures in the EMP throughout the construction phase	Ensure handover of sites is in accordance with EMP and any corrective actions identified in Project Completion Report are completed.	

Responsible Entity	Project Preparation	Engineering Detailed Design	Tendering & Pre-construction	Construction	Operation
				Appoint an environment, health and safety (EHS) officer to oversee EMP implementation related to environment, occupational health and safety on construction site Ensure health and safety Implement mitigation measures Act as a local entry point for the project GRM and collaborate with PMU on all GRM issues	
External Monitoring Institute			Undertake specialised environmental monitoring as contracted by PMU	Undertake specialised environmental monitoring as contracted by PMU	Undertake specialised environmental monitoring as contracted by Operator
Operator				Testing prior to commissioning to ensure discharge standards can be met (STP)	Ensure proper operation of project facilities according to design standards & monitoring Allocation of budget for O&M

3.1. Institutional Capacity Review and Needs

19. Currently there is little experience of monitoring and implementing environmental mitigation measures particularly at a provincial level. There is little enforcement of environmental or health and safety legislation and routine environmental monitoring is not undertaken apart from in major urban centers (air quality) or major rivers (water quality).

20. During the preparation of this IEE the team checked the capacity and experience at MPWT and found that there are a number of people who have fulfilled the role of 'focal point' for safeguards on project by project basis, and there is an established Safeguards team within the ministry of six people. This team have experience of working on highways projects but have not to date been involved with urban development projects and are willing to be involved in any training and site visits required during project implementation and will be issued copies of relevant monitoring reports, EMPs and other relevant safeguards documents.

21. In addition, through understanding existing operations for the landfill in Phnom Penh, provincial disposal sites and existing wastewater treatment operations, it is clear that there is limited ability for operation and maintenance. The limiting factors affecting the operators' ability to maintain adequate standards are likely to be a function of (i) a lack of technical capacity and experience; and (ii) insufficient budget.

22. A training program is set out in Table 4 which addresses the safeguard reporting and implementation requirements during construction, and the environmental and social risks from operations.

23. The engagement of a National Environmental Specialist for 10 months spread throughout implementation 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 Environment Safeguards Officer (PMU-ESO) in order to ensure safeguards are implemented and monitored.

24. **Training for EMP implementation.** The proposed training required for project implementation is set out in Table 4. For budgeting purposes, refer to Feasibility Report Volume 5, Institutional Strengthening and Capacity Building. Specifically, the training requirements for the project set out in the relevant Terms of Reference include:

- ▶ Train PIUs, contractors, municipalities, and other relevant stakeholders on the implementation of EMPs;

25. **Training for investment sustainability.** The importance of training in landfill operations and management should be emphasized if the investment in landfills is to be sustainable and adequate operations are maintained as per the landfill design. This is also relevant to STP operations. Therefore, the Feasibility Studies for the landfills and STP include details on operator training. For budgeting purposes, refer to Feasibility Report Volume 5, Institutional Strengthening and Capacity Building. Specifically, the training requirements for the project set out in the relevant Terms of Reference include:

- ▶ Develop an operation and maintenance manual for each landfill and wastewater plant and collection system, and a training program on the operations manual provisions;
- ▶ Train operators on plant equipment at the wastewater treatment plant and landfill sites;
- ▶ Train operators on achievement of, and compliance with, regulatory standards and monitoring of the performance of the facilities;
- ▶ Train landfill operators on controlled landfill recycling and disposal operations

Table 4. Capacity Building and Training Requirements

Subject / Content	Participants	Trainer/ Organisation	When/ Frequency	Duration (days / event)	# of participants	Cost (\$) USD
EMP adjustment and implementation - Development and adjustment of the EMP, roles and responsibilities, monitoring, supervision and reporting	PMU, PIU, contractors	I/NES of Project Mgmt Consultant	Twice - Once prior to, and once after 6 months of construction	2	10	For costs and details see: Feasibility Report Volume 5, Institutional Strengthening and Capacity Building
Grievance Redress Mechanism – roles and responsibilities	PMU, PIU, contractors, Commune Councils	I/NES of Project Mgmt Consultant	Twice - Once prior to, and once after 6 months of construction	1	10	
Environmental protection Pollution control on construction sites (air, noise, wastewater, solid waste)	PMU, PIU, contractors	I/NES of Project Mgmt Consultant	Once (during project implementation)	2	10	
Environmental monitoring - Monitoring methods, data collection and processing, reporting systems	PMU, PIU, contractors, Operators of Landfill and STP,	I/NES of Project Mgmt Consultant & MoE (environmental analyst)	Once (at beginning of project construction)	2	10	
Landfill Management	Included as part of the solid waste management investment training budget					
STP Management	Included as part of the STP investment management training budget					

Source: IEE Preparation Team.

4. MITIGATION MEASURES PLAN

26. Comprehensive mitigation measures are set out for all projects in Table 5. In addition, sub-project specific mitigation measures are set out in Table 6 and Table 7.

27. **Construction Environmental Management Plans.** The Contractor is expected to develop specific Construction Environmental Management Plans (CEMP) which are detailed plans which set out the contractor's approach to mitigating the highest risks, as identified by the Environmental Impacts section of the IEE or those impacts which are best addresses through provision of a detailed map.

Table 5. EMP Mitigation Measures for All Sub-Projects

Sub-Project Activity	Environmental Impact / Issue	Mitigation measures	Implemented by	Supervised by	Cost (\$)
Pre-Construction Phase					
National IEIA Approval	All	1. Ensure IEIA approvals are in place for all sub-projects and include baseline environmental surveys as required by MoE	PMU	MoE	Included in project cost
UXO survey, & removal	Injured worker or public	2. Ensure national military is consulted to confirm all relevant areas are clear from UXO. This include: a) All land to which is used for resettlement purposes (for people/businesses/farml and) b) All construction sites including 50 m either side of any access roads c) All associated areas including borrow sites. 3. Military to clear areas where necessary and provide evidence of clearance to PMU in advance of construction.	Military	PMU	To be confirmed as required
Disclosure and engagement of community through consultation	No community impacts	4. Initiate Information Disclosure and Grievance Redress Mechanism of IEE 5. Consultation of community based on final detailed designs	PMU-ESO / PIU-SFP	EA	Included in PMC cost package
Final Design	Flooding / Climate Change	6. Final design to incorporate adequate cross drains on all facility access roads to ensure any roads raised above natural flood level do not cause ponding or further flooding elsewhere.	PMC	EA	Included in consultancy contract price

Sub-Project Activity	Environmental Impact / Issue	Mitigation measures	Implemented by	Supervised by	Cost (\$)
Final Design	Emergency Response Plan	7. Ensure the operational and maintenance plan for each facility includes an emergency response plan considering flooding.	PMC	EA	Included in consultancy contract price
IEE and EMP Updated	All	8. Update IEE and EMP to reflect final detailed design and assess impacts of associated facilities not identified during preliminary design (quarries, borrow and spoil disposal areas, access roads and material sources) and integrate further environmental protection measures, as necessary.	I/NES	PMU	Included in project cost
Incorporate environment requirements in bid and contract documents	All	9. Ensure EMP and Particular Conditions for Bidding Documents (see Annex 4) are included in the bid and contract requirements.	I/NES	PMU	Included in project cost
Construction EMP (CEMP)	All	10. The contractor(s) will develop a Construction EMP that includes individual management sub-plans for: A. Materials Spoil and Borrow Site Management; B. Solid and Liquid Waste Management; C. Community and Occupational Health and Safety and Emergency Response; D. Construction Workers Camp Management (if required). 11. The CEMP will include a map of each construction site, showing as a minimum: Access routes, storage areas for waste, storage area for chemicals such as fuels, refuelling locations for vehicles, concrete mixing, stockpile storage areas (on & off site), first aid kit and equipment used in emergency response, location of worker camps (if required) and borrow sites. 12. Develop Method Statement for well drilling (groundwater observation wells, and water supply well landfill site only).	Contractor (C-EHS)	PMU	Included in bid price

Sub-Project Activity	Environmental Impact / Issue	Mitigation measures	Implemented by	Supervised by	Cost (\$)
Obtain permits and licenses	Prevent or minimize impacts	13. Contractors to comply with all statutory requirements set out by Government for use of construction equipment and plant 14. Contractor to ensure all required permits including materials extraction permits are in place prior to construction.	Contractor	PMU	Included in bid price
Construction EMP (CEMP) Approvals	All	15. Approval of CEMP including site maps as required by CEMP.	PMU	EA	Included in project cost
GRM	Dissemination	16. Erect sign boards with project details and GRM procedures/contact details at the entrance to each construction site/camp. 17. PMU to provide contractor with GRM contact details which the contractor will use to print 'GRM Contact Cards' for its staff to hand to complainants and will keep cards with all vehicles, machinery and site managers/foremen. 18. Contractor to raise awareness of all workers on how to respond when an affected person or member of the public has a complaint i.e. direct the person to the most senior site manager present at the time and provide a 'GRM Contact Card'.	Contractor	PMU	Included in bid price
Construction Phase					
Civil works	Air quality	19. Asphalt and concrete batching facilities will be located at least 500m downwind from the nearest dwellings in order to reduce the impact of fumes on humans and to be fitted with necessary equipment such as bag house filters to reduce fugitive dust emissions. 20. Water will be sprayed for construction sites, material handling areas, and borrow pits where fugitive dust is generated. 21. Trucks carrying dry construction materials such as earth will be covered with tarpaulins or other suitable cover. 22. Construction vehicles and machinery will be maintained to a high standard to minimize emissions.	Contractor	PMU	Included in bid price

Sub-Project Activity	Environmental Impact / Issue	Mitigation measures	Implemented by	Supervised by	Cost (\$)
Civil Works	Noise	23. Maintain all exhaust systems in good working order; undertake regular equipment maintenance; 24. Restrict construction activities using heavy machinery work between 8am-6pm; 25. Provide advance warning to the community on timing of noisy activities. Seek suggestions from community members to reduce noise annoyance, particularly related to noise sensitive activities at receptors such as periods of worship for pagodas 26. Public notification of construction operations will incorporate noise considerations; information procedure of handling complaints through the Grievance Redress Mechanism will be disseminated. 27. Ensure noise monitoring is undertaken near sensitive receptors, particularly dwellings when construction machinery is operational; 28. All construction workers will use appropriate Personal Protective Equipment (PPE) including ear defenders when operating machinery; 29. Ensure a mobile noise barriers is available for use in populated areas where excavations are taking place	Contractor	PIU/PMU	Included in bid price
Civil Works	Flora	30. All trees over 3m in construction sites to be protected from construction activities if they are not required to be removed; 31. Where possible, material from existing licensed borrow and quarry sites will be used. If new sites are needed, they will be subject to due diligence and approval by ADB and the relevant PDoE to ensure that sensitive habitats are avoided and that an appropriate restoration plan using native species is agreed following re-contouring	Contractor	PIU/PMU	Included in bid price
Civil Works	Water Quality and Access	32. Provision of adequate short-term drainage away from construction sites to prevent contaminated run off entering water bodies including canals. 33. Installation of temporary storm drains or ditches for construction sites to manage and control the flow and direction of surface water run off	Contractor	PIU/PMU	Included in bid price

Sub-Project Activity	Environmental Impact / Issue	Mitigation measures	Implemented by	Supervised by	Cost (\$)
		34. .Stockpiles and materials will be stored at least 50m from surface waters with drainage directed away from the irrigation canals or drainage channels 35. .All construction fluids such as oils, and fuels should be stored and handled on a bunded impermeable surface; a bund will be provided around any above ground fuel storage tanks with a capacity of 110% of the largest single tank. 36. .No washing or repair of machinery within 50m of surface waters including irrigation canals. 37. Pit latrines (for workers camps if required) to be located at least 200m from surface waters, and in areas of suitable soil profiles and above the groundwater levels. 38. Refuelling only in designated areas which are to be 50m from a water course and drip trays to be used when refuelling or topping up / changing machinery fluids. 39. Maintenance of irrigation water supplies for agriculture during dry season works within or around irrigation canals. Seek suggestions from water users if supply may be affected.			
Civil Works	Power and Water Supply Interruption	Based on the pre-construction assessment of power and water supply locations, if the contractor identifies a risk to supplies from construction activities, the contractor will: 40. Liaise with power or water supplier to identify an approach to minimise inconvenience to residents 41. Provide advance warning to residents (minimum 2 weeks in advance) that power/water supplies will be interrupted 42. Provide alternatives for residents if the supply interruption exceeds 2 days for water	Contractor	PMU	Included in bid price
Implementation of Materials Spoil and Borrow Site Management Sub-Plan A	Soil and land resources	Site specific materials, spoil and borrow site management plan will be developed and approved by the relevant Municipal authority which will include as a minimum; 43. Assess source and impacts of all materials proposed for construction. 44. A map of all borrow sites and top soil piles will be developed and maintained with copies held by the Contractor and PIU;	Contractor	PMU	Included in bid price

Sub-Project Activity	Environmental Impact / Issue	Mitigation measures	Implemented by	Supervised by	Cost (\$)
		45. Define & schedule how materials are extracted from borrow pits, transported, and handled & stored at sites. 46. Measures to rehabilitate the borrow sites include contouring of the slopes within each site and replanting sites with native species. 47. Retention of topsoil - top soil present on construction sites will be removed and stockpiled in a labelled area for use on rehabilitation of the site post-construction or rehabilitation of borrow sites. 48. Criteria for spoil disposal including levels of contamination and location for spoil disposal (to be approved by municipal authorities). 49. No disposal of spoil or dredged material on agriculturally productive land or within 50 m of a water course.			
Implementation of Solid and Liquid Waste Management Sub-Plan B	Resource use and natural resource contamination	Measures to be included in the management sub-plan will include measure to explain how the contractor will: 50. Follow the waste hierarchy and demonstrate how waste will be prevented and recycled and will show effective management of materials on site through good house-keeping and work planning 51. Clear arrangements for storage and transportation of all hazardous and non-hazardous waste to an authorised and approved disposal point (approved by Provincial Department of Environment). 52. Recyclables to be separated at source and given/sold to recycler (plastic, metal, card, paper as a minimum) 53. No waste will be stored within 20m of a water course including irrigation channels and all solid waste to be stored in containers with lids. 54. Prohibit burning of waste at all times; 55. Provide all vehicles/drivers with plastic bags for waste collection and prevent any unauthorized waste disposal with particular attention paid to prevention of waste entering water ways including irrigation canals.	Contractor	PIU/PMU	Included in bid price
Implementation of Community	Human health and safety	56. Community H&S measures to be included in the management sub-plan will include:	Contractor	PIU/PMU	Included in bid price

Sub-Project Activity	Environmental Impact / Issue	Mitigation measures	Implemented by	Supervised by	Cost (\$)
and Occupational Health and Safety and Emergency Response Sub-Plan C		• Details of appropriate fencing, protective barriers, and buffer zones which will be provided around all construction sites including barriers where needed on access roads and populated. • Details of Safety measures, if required, to prevent access by members of the public and livestock to any borrow site excavations • Details of Warning signs which will be set up if mud is likely on public roads. Mud will be removed at the end of each day. Other spillages on public roads will be removed immediately. • Details of signage and speed controls if public roads are to be affected by construction traffic. • Details of sufficient signage giving community dangers / warnings and information disclosure outside all construction sites, include example warnings. 57. Occupational H&S measures to be included in the management sub-plan will include: • Assurance that all workers are equipped with, and use Personal Protective Equipment (PPE). • Specifications for the PPE to be used on site and the contractors' approach to enforcement of its use by workers • Sufficient signage giving occupational health and safety warnings and information disclosure within all construction sites – sub-plan to include example warnings. • Details of worker education and awareness seminars for construction hazards will be given. A construction site safety program will be developed and distributed to workers. • Details of daily toolbox meetings (safety briefings) • Details of the site accident record book which will be maintained where all major or minor accidents and incidents are recorded with actions taken.			

Sub-Project Activity	Environmental Impact / Issue	Mitigation measures	Implemented by	Supervised by	Cost (\$)
		- An Environment Health and Safety qualified engineer will be engaged for the contract and adequate first aid equipment made available on site. - Warning signs will be set up if mud is likely on public roads. Mud will be removed at the end of each day. Other spillages on public roads will be removed immediately - Provision will be made for safety precautions when using 220 to 240V Electric Power tools if the workers are likely to be working within wet or flooded environments. 58. The Emergency Response Plan will set out detailed Preventative Measures for all types of incidents covered in the Emergency Plan. This will include: - Prevention of Injury and Accidents – to include Personal Protective Equipment requirements for construction workers, training requirements - Prevention of Spillage - All construction fluids such as oils, and fuels will be stored on hard standing with sealed drainage with a capacity of 110% of the largest fuel container, will include procedures on refueling and maintaining vehicles. - Prevention of Fire – to include measures for Ignition Sources including prevention of smoking on construction site, management of flammable materials and liquid. - Other Incidents – prevention measures relevant to other issues considered relevant by the contractor 59. The Contractor will develop Emergency Response Procedures prior to construction. The procedures will cover actions to be taken in case of: - Worker injury (e.g. construction or traffic accident) - Spillage (e.g. fuel spillage)			

Sub-Project Activity	Environmental Impact / Issue	Mitigation measures	Implemented by	Supervised by	Cost (\$)
		• Fire (e.g. fuel or chemicals storage area); and • Any other incidents anticipated by the contractor.			
Implementation of Construction Workers Camp Management Sub-Plan D	Contamination of water, soil, waste production and social issues	60. [if required] If a camp for construction workers is required the contractor will set out a management plan which includes: • A map showing camp lay out, welfare facilities, and first aid kit locations. • Accommodation facilities including pit latrines for male and female workers, adequate drainage to prevent flooding, security including a no weapons policy and waste disposal areas. • Schedule of HIV Aids education awareness to be given to workers. • Training on relevant laws for foreign labor (including hunting, fishing and traffic rules); • Plan of how camp areas will be restored to original condition after construction completed. 61. If a construction camp is not required, the contractor will not require a Management Plan but will: • Provide adequate waste disposal facilities including garbage cans for workers. • Provide welfare facilities including water for washing, drinking and include facilities for male and female workers • Provide toilets for male and female construction workers with a cleaning schedule 62. The contractor will give priority to local labor force and retain evidence of how local labor recruitment efforts were undertaken	Contractor	PIU/PMU	Included in bid price
PMC-I/NES	Project Completion	63. Site visit in order to develop Project Completion Report to assess community views on project and EMP implementation overall and state of project at contractor' handover	PMC-NIES	PMU	Part of Contract Cost

Table 6. EMP Mitigation Measures for Landfill Sub-Project

Sub-Project Activity	Environmental Impact / Issue	Mitigation measures	Implemented by	Supervised by	Cost (\$)
Pre-Construction Phase					
Landfill Operation	Leachate management	64. Engineering design to take into account recommendations made in ADB report <i>Technical Overview – ADB Solid Waste Management Projects in Cambodia and Laos</i> (April, 2018). 65. Landfill operations and maintenance manual to include operational environmental management and monitoring measures as recommended below in 'Operation Phase'			
Landfill design and implementation planning	Occupational health and safety of informal waste pickers	66. Formalise roles of waste pickers and provide safer working environment: - Detailed design to consider options for permanent or mobile shed/shelter to enable access to recyclables whilst reducing exposure to hazardous conditions; - Detailed design to incorporate welfare facilities including potable water, separate toilets and showers for male and female workers and changing areas; - Establish registration system and only permit registered adult waste pickers access to the site; - Provide personal protective equipment (shoes, face masks and gloves); - Prior to construction, provide awareness training on construction activities and potential hazards;	PMC-NIES	PMU	Part of Contract Cost
Construction Phase					
Landfill Operation	Nuisance Impacts	For all households within 500 m of the landfill site: 67. Installation of opening glass window frames and fly screens into a maximum of 8 windows within the house.	Contractor	PIU/PMU	\$800/ affected household

Sub-Project Activity	Environmental Impact / Issue	Mitigation measures	Implemented by	Supervised by	Cost (\$)
		68. Provision of 50 viable tree or shrub saplings (native species, to be determined through consultation) to provide a vegetation screen around the front or back, and sides of the property; the resident is responsible for aftercare.			
Movement of wastes	Air quality	69. Waste pickers and all residential areas within 500m of existing dumpsite will be informed in advance of when waste movements will take place, if appropriate for dumpsite rehabilitation (if required).	Contractor	PIU/PMU	Included in bid price
Occupational H&S	Fire Risk	70. Smoking will be prohibited at existing dumpsites	Contractor	PIU/PMU	Included in bid price
Access Road & Site Development	Cultural Impacts	71. The contractor will ensure awareness of all cultural resources in the area including individual family graves along access roads, cemeteries or other relevant sites. 72. The contractor will fence off any such resources to ensure that they are clearly marked and will not be affected by the construction 73. The contractor will take and store a Pre-Condition photograph of any such resources and make this available to MWPT should any dispute occur.	Contractor	PIU/PMU	Included in bid price
Operation Phase					
Landfill liner/ Membrane	Groundwater protection	74. The operator will ensure that site is operated so as to protect the liner is throughout lifespan of the landfill including prevention of exposure to sun, damage by machinery. 75. Provision of adequate budget for O&M to ensure regular groundwater monitoring	Operator	MPWT	Included in operational costs – O&M Budget
Landfill Operation	Groundwater protection, surface water protection	76. The operator will develop a Working Plan for the landfill site which will detail procedures for the following – as a minimum: • Waste transport • Waste acceptance • Recording waste data	Operator	MPWT	Included in operational costs – O&M Budget

Sub-Project Activity	Environmental Impact / Issue	Mitigation measures	Implemented by	Supervised by	Cost (\$)
		• Site infrastructure (O&M) • Waste placement • Using daily cover • Water balance • Leachate management (see environmental specifications in IEE Annex 8: Leachate Management Details) • Maintenance of slopes, compaction and cover to avoid leachate run-off. Occupational and community health and safety • Emergency and Incident Management • Vehicle maintenance • Odor management • Role and management of waste pickers 77. Environmental Protection and Monitoring. The operator will detail procedures for monitoring: • Groundwater wells • Surface water • Leachate management and treatment of effluent (if appropriate) • Gaseous emissions via flaring • Odor monitoring – boundary and receptor sites • Occupational health and safety • Grievance redress mechanism			
Landfill Operation	Leachate Management	78. Leachate will only be used for irrigation of vegetation within the existing footprint of the landfill site, excluding a 20 m buffer to the boundary. 79. < 10 mm of leachate would be applied per day to any of the external batters, previously worked areas or future landfill cell sites.	Operator	MPWT	Included in operational costs – O&M Budget

Sub-Project Activity	Environmental Impact / Issue	Mitigation measures	Implemented by	Supervised by	Cost (\$)
		80. Irrigation will only occur during dry periods; this means at least one day after it has rained and when the following day is expected to be dry, to avoid run-off. 81. Leachate will be sprayed on site with adequate warning to all site operatives and any other persons at the landfill site. 82. All workers would be provided with training on the safe operation of leachate irrigation system and provided with the requisite PPE such as gloves and masks, as well as waterproof footwear. 83. Areas irrigated with leachate would be considered contaminated and would be unsuitable for growing crops for human consumption			
Landfill Operation	Community Nuisance impact	84. The operator will install a sign board with relevant contact details and operating hours at the entrance to the landfill site. It will state contact details for raising complaints. 85. The contractor will record all public complaints and deal with them within a timeframe agreed with MPWT. 86. The contractor will cover all waste loads and all drivers will follow legal speed limits at all times. 87. Compaction of waste within the day it is deposited at the site and cover the waste weekly 88. Weekly litter collections and removal of any wastes which are not deposited in cells, including waste at the boundary and access roads to the site 89. Washing wheels of vehicles before they leave site if they are muddy from accessing the landfill cells to prevent dust increasing to nearby houses 90. Quarterly meetings with residents and / or their	Operator	MPWT	Included in operational costs – O&M Budget

Sub-Project Activity	Environmental Impact / Issue	Mitigation measures	Implemented by	Supervised by	Cost (\$)
		representatives to identify odor or nuisance issues 91. Maintenance of the tree screen at the site boundary to reduce noise, dust and odors.			
Landfill Operation	Occupational Health and Safety	92. The operator will detail how the health and safety of the staff (including registered waste pickers) at the site will be protected. This will include: - Measures taken during handling of waste including sorting any waste to segregate recyclables - Personal protective equipment provision and enforcement of its use - Health testing (frequency and parameters e.g. for Hepatitis B and tetanus) - Emergency and Incident Management including prompt medical attention for cuts to prevent contact with the incoming loads or feedstock - Good housekeeping measures e.g. Clean and wash with disinfectant the welfare facilities weekly and building and equipment every 4 weeks - Training plans (frequency and duration of training) in safe operations for all aspects of the operation including landfill gas and leachate management and use of heavy equipment.	Operator	MPWT	Included in operational costs – O&M Budget
Landfill Operation	Community Health and Safety	93. The contractor will detail how the health and safety of the public will be protected. This will include: - Measures taken to prevent unauthorized access to the site - Measures taken to prevent scavenging/picking by members of the public	Operator	MPWT	Included in operational costs – O&M Budget

Sub-Project Activity	Environmental Impact / Issue	Mitigation measures	Implemented by	Supervised by	Cost (\$)
Landfill Operation	Community Health and Safety	94. Quarterly meetings with residents and / or their representatives to identify odor, pest dust, litter or other nuisance issues.	Operator/DPWT	MPWT	Included in operational costs – O&M Budget

Table 7. EMP Mitigation Measures for STP Sub-Project

Sub-Project Activity	Environmental Impact / Issue	Mitigation measures	Implemented by	Supervised by	Cost (\$)
Pre-Construction Phase					
Design	Effluent Discharge	Final design to ensure that the absorptive capacity of the receiving waterway is not exceeded and health risks to users of the waterways are minimized ¹ .	PMC-NIES	PMU	Part of Contract Cost
Construction Phase					
Operations Discharge Permits	Legal Compliance	1. Owner of STP to start process of obtaining permit for discharge of effluent.	MPWT	MoE	-
Pipe Network Installation		2. Warning given to residents 4 weeks in advance of any excavations for sewage pipes	PDPWT	PMU	Included in bid price
Pipe Network Installation	Socio-Economic (Accessibility)	3. Adequate pedestrian access to enter buildings across any open trenches 4. Adequate vehicular access to enter properties across any open trenches 5. Restoration of any damage at expense of contractor 6. Consideration and management of potential localised flood impacts.	Contractor	PIU/PMU	Included in bid price
Pipe Network Installation	Community Health and Safety (Traffic)	7. The contractor will develop a traffic management plan in conjunction with the DPWT in order to ensure routes for vehicles are not	Contractor	PIU/PMU	Included in bid price

¹ During the detailed design stage the receiving water should be sampled (preferably minimum three consecutive non-rainfall days) to at least get an indication of the ambient water quality (in particular coliforms, biochemical oxygen demand, nutrients – nitrogen and phosphorus). Based on that, an indicative estimate should be made of the absorptive capacity of the waterway that is commensurate with its primary use (e.g. rice paddies, vegetable farming, ablutions, etc.) and to stay within the safe limits recommended in the WHO guidelines for water quality.

Sub-Project Activity	Environmental Impact / Issue	Mitigation measures	Implemented by	Supervised by	Cost (\$)
		blocked and signage is provided to reduce speeds and show drivers in advance of any changes to road surface or traffic direction 8. Where risks occur given changes to traffic lanes or road closures, additional lighting will be provided to allow visibility of the changes at night.			
Operation Phase					
Operation of STP	All	1. Commissioning phase of STP required to ensure design discharge standards can be met. 2. Discharge to be tested prior to release into the environment 3. Discharge which fails to meet discharged standards to be recirculated 4. Provision of adequate budget for O&M to ensure regular effluent and surface water quality monitoring	Operator	MPWT	Included in operational costs
Operation of STP	Occupational health and safety,	9. The contractor will develop and implement a Health and Safety Manual as part of the Operation & Maintenance (O&M) which will include the following: • A signed commitment from the Operator to a) Understand and b) comply with IFC Environmental Health and Safety guidelines (2007) • Training Programme for workers in workplace safety of STP operation • Provide all operational staff with appropriate personal protective equipment • Prevent public access to the STP and pumping stations with fencing	Operator	MPWT	Included in operational costs – O&M Budget

Sub-Project Activity	Environmental Impact / Issue	Mitigation measures	Implemented by	Supervised by	Cost (\$)
		and appropriate signage. • Conduct safety orientation trainings including regular safety drills for workers. • Provision of appropriate and adequate PPE for workers (including regular training and drills on the use of PPE and other emergency equipment).			
Operation of STP	Community health and safety	10. Coordinate with local public health officials to monitor incidence of water and air-borne sickness or disease in the local community and worker force that could be caused by the operation of STP 11. Cover as much standing water as possible and regularly treat for mosquitoes during seasons of high incidence of mosquito borne diseases such as dengue fever	Operator	MPWT	Included in operational costs – O&M Budget
Operation of STP	land and surface water pollution, occupational health and safety	12. As part of O&M manual provide clear methods and procedures for all aspects of the STP operation, including the following key issues: • Safe handling and storage of planned treatment chemicals defined including spills action plan • Sludge management including treatment, disposal and emergency situations • Monitoring/ testing procedures and schedule for effluent and sludge, with approval by MoE	Operator	MPWT	Included in operational costs – O&M Budget

Sub-Project Activity	Environmental Impact / Issue	Mitigation measures	Implemented by	Supervised by	Cost (\$)
		- Odor Monitoring procedures and schedule including monthly boundary monitoring and procedures for recording and managing complaints from the public - Emergency Procedures including schedule for testing and upgrading procedures - Procedures for storing, transporting and disposing of solid waste generated by operations			
Operation of STP	Odor	13. Quarterly meetings with residents and / or their representatives to identify odor or nuisance issues; 14. Movement of any sludge materials off site on days of low wind speed	Operator	MPWT	Included in operational costs – O&M Budget
Effluent Discharge	Agricultural Yield Impact	15. Provision of effluent and receiving water body monitoring data to Provincial Department of Agriculture.	Operator	PDAg.	Included in operational costs – O&M Budget

5. MONITORING PLAN

28. The project monitoring conducted under the EMP includes:

- (ix) **Project readiness monitoring.** Monitoring to check progress on project readiness and close gaps through corrective actions.
- (x) **Environmental quality monitoring.** To be conducted by a competent authority or person appointed by the Contractor, involving the collection and analyses of air quality, noise and water quality data at designated monitoring locations for assessing compliance with applicable environmental quality and emission standards during construction.
- (xi) **EMP compliance monitoring.** To be conducted by the PMC-NES (contracted via the Project Management Consultants) to verify EMP compliance during project implementation.

- (xii) **Affected People monitoring (consultation).** This is to be conducted by the PIU-SFP via consulting affected people on the impacts during construction.
- (xiii) **Operational monitoring.** This is required as part of the operations of the sub-project and will be undertaken by the relevant government department or a nominated private sector operator.

29. The engagement of a National Environmental Specialist for 10 months will be critical to ensuring the capacity of the PIU staff and to ensuring monitoring is effective and that corrective actions are promptly identified and implemented.

5.1. Project Readiness Monitoring for All Sub-Projects

30. Before construction, the Project Management Consultant (PMC) will monitor the project's readiness on environmental management based on a set of indicators (Table 8) and report it to ADB and PMU. This assessment will formally demonstrate that environmental commitments are being carried out and environmental management systems are in place before construction starts or suggest corrective actions to ensure that all requirements are met.

Table 8. Project Readiness Assessment Indicators

Indicator	Criteria	Are the Criteria met?	If No, What Corrective action is needed?	Date for Corrective Action Completion
		Yes/No		
1. EMP update	EMP updated after detailed design & approved by ADB	Y/N		
2. Compliance with loan covenants	The borrower complies with loan covenants related to project design and environmental management	Y/N		
3. Public involvement effectiveness	Meaningful consultation completed	Y/N		
	GRM established with entry points	Y/N		
4. Environmental supervision and monitoring in place	Recruitment of external staff as set out in the Institutional Arrangements for this EMP	Y/N		
	Nomination of government staff for PMU and PIU roles as set out in the Institutional Arrangements for this EMP	Y/N		
5. Bidding documents and contracts	Bidding documents and contracts incorporate the environmental activities and mitigation measures required by this EMP	Y/N		

Indicator	Criteria	Are the Criteria met?	If No, What Corrective action is needed?	Date for Corrective Action Completion
		Yes/No		
environmental safeguards	Bidding documents and contracts incorporate the Particular Conditions for bidding (see Annex 4)	Y/N		
6. EMP financial support	The required funds have been set aside for EMP implementation including training and capacity building	Y/N		

5.2. Environmental Quality Monitoring

31. During construction, the impact on the sensitive environmental receptors will be monitored and compared against the relevant national standard.
32. During operation, the relevant operator will be expected to maintain an adequate budget to ensure environmental monitoring can be undertaken as specified in Table 9.

Table 9. Environmental Quality Monitoring: Landfill and STP Sub-Projects

Environmental Indicators	Location	Method & Frequency	Responsibility		Estimated Costs (USD)	
			Supervision	Implementation	Per Sample	Total per site/yr
Construction Phase – Landfill Site						
Air Quality -including PM10, CO2, NO2, SOx	Nearest residential receptors (2 locations) (Monitor only when construction activities occur within 250 m)	1 day (24-hr) per 3 months Means in accordance with national standard	CSC/PIU	Contractor	\$1000	\$8000
Noise	Nearest residential receptor (2 locations) (Monitor only when construction activities occur within 250 m)	1 day (day time only) per 3 months Means in accordance with national standard	CSC/PIU	Contractor	\$300	\$3600
Water Quality pH, BOD, COD, TSS, NH4-N, Total Nitrogen, Total Phosphorus, Oil and grease, Coliform	Downstream at nearest water body (canal or river) to construction sites - two samples (Monitor when construction active)	Every 3 months during construction periods Means in accordance with national standard	CSC/PIU	Contractor	\$100	\$800
Construction Phase – STP						
Air Quality -including PM10, CO2, NO2, SOx	Nearest residential receptor (2 locations) (Monitor only when construction activities occur within 250 m)	1 day (24-hr) per 3 months Means in accordance with national standard	CSC/PIU	Contractor	\$1000	\$8000
Noise	Nearest residential receptor (2 locations) (Monitor only when construction activities occur within 250 m)	1 day (day time only) per 3 months Means in accordance with national standard	CSC/PIU	Contractor	\$300	\$3600

Environmental Indicators	Location	Method & Frequency	Responsibility		Estimated Costs (USD)	
			Supervision	Implementation	Per Sample	Total per site/yr
Water Quality	Downstream at nearest water body (canal or river) to construction sites - two samples (Monitor when construction active)	Every 3 months during construction periods Means in accordance with national standard	CSC/PIU	Contractor	\$100	\$800
Operations Phase – Landfill Site						
Groundwater pH, COD, Hardness, TDS, NH4-N, Nitrate, Sulfate, Fe, Pb, Cr, Coliform	All monitoring wells (one up gradient, two down gradient)	Quarterly Means in accordance with national standard	MoE	Operator	Included in operational costs – O&M Budget	
If exceedences are observed in the wells, the wells would be resampled more frequently and for an extended range of parameters as listed below. As above, plus aluminium, PAH, BTEX, cadmium, mercury, selenium, phosphorus scan, chlorinated hydrocarbons, cyanide, phenolic substances.						
Surface Water pH, BOD, COD, TSS, NH4-N, Total Nitrogen, Total Phosphorus, Oil and grease, Coliform	Downstream at nearest water body (canal or river)	Quarterly Means in accordance with national standard	MoE	Operator	Included in operational costs – O&M Budget	
Air & Noise PM10, CO2, NO2, SOx	Nearest residential receptor (02 samples) Site Boundary (02 samples – upwind and down wind).	Every 6 months or as required by local authority or an incident	MoE	Operator	Included in operational costs – O&M Budget	
Odor	Downwind Boundary	Monthly	MoE	Operator	Included in operational costs – O&M Budget	
Leachate pH, BOD, COD, TSS, NH4-N, Total Nitrogen,	Outlet point for leachate treatment (if treatment applicable)	Quarterly	MoE	Operator	Included in operational costs – O&M Budget	

Environmental Indicators	Location	Method & Frequency	Responsibility		Estimated Costs (USD)	
			Supervision	Implementation	Per Sample	Total per site/yr
Total Phosphorus, Oil and grease, Coliform		Means in accordance with national standard				
Occupational Health and Safety	-	Annual Health monitoring all staff (landfill site)	Min. of Labor	Operator & Health Professionals	Included in operational costs – O&M Budget	
Operations Phase – STPs						
Effluent Quality: Parameters: pH, Color, Odor, SS, BOD5, COD, total P, N total, Fe, Cu, Pb, Cd, Zn, Oil and Grease, E.coli, Coliform	Effluent outfall	Twice per year or when public complaint arises	MoE	Operator	Included in operational costs – O&M Budget	
Effluent Quality: Parameters: PH, COD, NH4-N	Effluent outfall	Continuous monitoring	MoE	Operator	Included in operational costs – O&M Budget	
Odor	Site boundary (downwind)	Odor boundary monitoring method to be established within Operational Plan	MPWT	Operator	Included in operational costs – O&M Budget	
Receiving Water Body	Upstream and downstream	Quarterly and every time effluent quality failure is recorded	MoE	Operator	Included in operational costs – O&M Budget	
Worker & public injury associated with STP operations	On property of STP	Regular record keeping	Min. of Labor	Operator	Included in operational costs – O&M Budget	

5.3. EMP Compliance Monitoring

33. In order for the EMP to be effective, all its mitigation measures must be monitored to ensure they are implemented. Note this applies to construction only; during operation, it is the responsibility of the appropriate ministry or its line department to ensure monitoring of operational facilities is incorporated in the operations and maintenance manual and carried out routinely. . Compliance monitoring requirements are summarized in *Table 10*.

Table 10. EMP Compliance Monitoring

Environmental Indicators	Location	Method & Frequency	Responsibility		Estimated Costs (USD)
			Verification	Implementation	
Construction Phase – All Sub-Projects					
Air Quality	Civil works sites	Monthly checking against mitigation measures specified in this EMP	PMC-NES	CSC	Included in CSC contract
Noise	Civil works sites	Monthly checking against mitigation measures specified in this EMP	PMC-NES	CSC	Included in CSC contract
Flora	Civil works sites	Monthly checking against mitigation measures specified in this EMP	PMC-NES	CSC	Included in CSC contract
Water Quality	Civil works sites	Monthly checking against mitigation measures specified in this EMP	PMC-NES	CSC	Included in CSC contract
Soil and land resources	Quarries, Borrow and Spoil Disposal Sites	Monthly checking against mitigation measures specified in this EMP	PMC-NES	CSC	Included in CSC contract
Resource use and natural resource contamination	Implementation site of Solid and Liquid Waste Management Sub-Plan B	Monthly checking against mitigation measures specified in this EMP	PMC-NES	CSC	Included in CSC contract
Human health and safety	Implementation of Community and Occupational Health and Safety and Emergency Response Sub-Plan C	Monthly checking against mitigation measures specified in this EMP	PMC-NES	CSC/Contractor H&S engineer	Included in CSC contract

Environmental Indicators	Location	Method & Frequency	Responsibility		Estimated Costs (USD)
			Verification	Implementation	
Contamination of water, soil, waste production and social issues	Implementation of Construction Workers Management Sub-Plan D	Monthly checking against mitigation measures specified in this EMP	PMC-NES	CSC	Included in CSC contract
Community Issues • Environmental impacts of civil works (e.g., solid & liquid waste, erosion, local flooding, pollution). • Any unforeseen impacts caused by accidentally e.g. through spillages • Civil nuisance (e.g., noise, disrupted business & farming activity, social issues, community health and safety). • Impaired use of access roads (e.g. traffic issues and access). • GRM and its procedures & key contacts	At all construction locations	Consultation interview with Affected People Using the form in Annex 2 4-6 weeks after construction starts Every 2 months until end of construction	PMU-ESO	PIU-SFP	Included in PIU staff/travel budget
Construction Phase – STPs					
Socio-Economic (accessibility)	All sites of pipe excavations in urban areas	4-6 weeks after construction starts Every 2 months until end of construction	PMU-ESO	PIU-SFP	Included in PIU staff/travel budget

5.4. Environmental Policy and Standards

34. The construction and operation phases of the projects shall follow relevant environmental quality standards. These are presented in Annex 5 for reference. These quality standards relate to i) air quality, ii) ambient surface water quality, iii) groundwater quality, vi) soil quality, v) effluent quality.

6. PUBLIC CONSULTATION

35. The Consolidated IEE for this sub-project contains details of the consultation undertaken during preparation of these sub-projects. In addition, consultation will take place during implementation. The PIU Safeguard Focal Point (PIU-SFP) will undertake consultation after detailed designs are completed and will conduct consultation interviews within 4-6 weeks of construction starting and then again, every 3 months until the end of construction. This is set out in the Environmental Monitoring Plan provided in the Environmental Management Plan for each sub-project.

36. Informal monitoring interviews with affected people will focus on complaints about community disturbance from construction activities, such as construction noise, dust, solid waste and wastewater, as well as public concerns about ecological protection, soil / land concerns and access issues. A sample Environmental Monitoring Interview Form is given in Annex 2. This will contribute to project monitoring.

37. The IEE for these sub-projects also includes information on consultation undertaken during preparation of this EMP and can be consulted for reference.

7. GRIEVANCE REDRESS MECHANISM

7.1. GRM Objective

38. 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.

7.2. Proposed GRM System

39. In Cambodia, there is currently no existing legally established system to resolve environmental concerns and complaints. The MPWT, as the EA of the Tonle Sap II 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 (PMU-ESO)² will oversee the implementation/observance of the mechanism and will be responsible for keeping the PMU informed. The PIU Safeguards Focal Point (PIU-SFP) will be responsible for ensuring GRM implementation at the sub-project level.

40. The GRM will accommodate both informally and formally lodged eligible, grievances. Informally lodged grievances are those received by the contractor during construction. Formally lodged grievances are those received at District and Commune Council offices or direct to the PIU. Commune Councils evaluate complaints for eligibility and then report to PDPWT. The PDPWT and PMU maintain record of all grievances, informally and formally lodged, eligible and ineligible. The PMU will inform the MPWT, as necessary, and report on the observance/implementation of the GRM in the monthly progress reports and in the periodic Environmental Monitoring Report that will be submitted to the MPWT.

7.2.1. Access to the Mechanism

41. Any person who has environmental issues pertaining to the subproject during detailed design, construction and operation phases will have access to the mechanism free of charge. The PMU, through its 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)

42. The Access Points to the GRM are critical for ensuring it is useable for affected people (APs). The GRM Access points for this project, as set out in this GRM Mechanism will be:

- ▶ The Contractors
- ▶ District and Commune Councils
- ▶ The PIU office
- ▶ The Provincial Department of Public Works and Transport (PDWT)

7.2.2. GRM Steps and Timeframe

43. Grievances raised on environmental impacts are critical to the health and safety of APs. Hence, the proposed mechanism intends to be easily accessible and promptly responsive to APs' complaints.

7.2.2.1. Informal Approach

44. Informally, APs can lodge complaints directly to the contractor during construction. PMU to provide contractor with GRM contact details which the contractor will use to print 'GRM Contact Cards' for its staff to hand to complainants and will keep cards with all vehicles, machinery and site managers/foremen.

² The Environment Safeguards Office will be the focal point for all social and environmental grievances to be brought to the attention of the EA by affected persons. There will be a full fledged Grievance Redress Mechanism set up from commune level to the town and province, up to the EA. This will be detailed in the Resettlement Framework.

45. Contractor to raise awareness of all workers on how to respond when an AP or member of the public has a complaint i.e. direct the person to the most senior site manager present at the time and/or Contractor GRM focal point and prepare a 'GRM Contact Card'.

46. The contractor shall document and assess the complaint immediately. If assessment validates the complaint as within the scope of the GRM/eligible, the contractor shall act on the complaint within three days from receipt of complaint. MPWT shall obtain a written confirmation of satisfaction from the AP after 7 days from completion of resolution by the contractor

47. If assessment invalidates the complaint (i.e., reveals the complaint as ineligible or not associated with the project's environmental performance), the contractor shall direct the AP to the Commune Council and shall report the complaint to MPWT within 2 days from receipt of complaint, stating reasons for ineligibility.

7.2.2.2. Formal Approach

48. If complaint is eligible but is not acted on within three days from receipt of complaint, or if AP is not satisfied with the resolution undertaken by the contractor, he/she can access the formal mechanism, as shown in *Table 11*:

Table 11. GRM Steps

Step	Action
Step 1: Lodging a Complaint (Day 1)	AP lodges complaint, by him/herself or with assistance from the village chief or district council, at the access point with the Commune Council. The complaint may also be lodged with the PIU or PDPWT,
Step 2: Documentation & Registration of Complaint (Day 1)	Commune Council, PIU/PMU or PDPWT documents/registers lodged complaint, makes sure these are referenced and provides AP with a copy of referenced complaint. The commune forwards complaint document to the MPWT. A copy of an proposed GRM Complaint Form is in Annex 3 Annex 3 GRM – Complaint Recording Form
Step 3: Assessment and Discussion (Day 1 to 3)	AP shall be informed if the grievance is eligible or ineligible. If it is ineligible, AP shall be directed to the district. If complaint is eligible, AP shall be informed of the expected action timelines as set out in the established mechanism If both of the AP and contractor/operator are available, the complaint shall be immediately reviewed, investigated and discussed. If not, both parties should agree to undertake the review, investigation and discussion within 3 days. The discussion will centre on the cause and action/measure to implement and will engage the PIU/PMU. After review and investigation, agreement on actions and measures and time involved shall be made with the AP. Agreement shall be properly documented and filed; MPWT, PIU/PMU, Commune Council and AP shall have copies
	(Day 3 to Day 4) If complaint is minor, i.e., not requiring further investigation and would be easy to resolve, the contractor/operator

Step 4: Implementing the Agreed Resolution	shall immediately implement agreed on action/resolution. (To be implemented by Day 8)
	If further investigation and/or procurement of supplies/parts would be necessary, the contractor/operator shall: (i) immediately provide the most suitable interim measure to reduce the magnitude of the impact; and (ii) start work on the final measure within 15 days from the day the complaint is lodged.
Step 5: Acceptance of Resolution (1 week after completion of action/measure taken)	If, according to the AP, the impact has been resolved satisfactorily, MPWT shall obtain a written confirmation of satisfaction from the AP. This confirmation will signify closure of grievance and will form part of the grievance documentation. The PIU, Commune Council and AP shall retain their copies of the confirmation.
Step 6: Monitoring and Evaluation (for 1 week after closure of grievance)	The MPWT shall monitor the effectiveness of the resolution for at least a week after closure of grievance (that is, when action implemented has been satisfactorily confirmed in writing by the complainant). Monitoring and evaluation shall be properly documented and included in the Environmental Monitoring Report
Step 7: Appeal for Dissatisfied AP	When dissatisfied (or, in the event the issue/impact persists despite actions undertaken), AP can appeal for assistance from the district in the elevation of his/her complaint to the provincial authority. The provincial authority shall call all parties concerned to review the history of the grievance and resolution process taken and assess the validity of the appeal.

Source: IEE Preparation Team

49. **Appeals.** If appeal is found not valid, the provincial authority shall write the AP and declare the grievance closed. In the event of an appeal, the MPWT shall immediately report to the PMU. The PMU shall ensure that the ADB is immediately informed.

50. If appeal is assessed to be valid, provincial authority and the parties discuss and agree on the quick resolution of the issue. The PMU requires the contractor and operator to implement the agreed resolution. Should the issue continue to persist despite the second action, or the AP remain dissatisfied, the following steps will be taken:

51. **Special Mission or Judicial System.** If the complainant is still unsatisfied, the PMU/EA will inform ADB to convene a special mission to attempt a resolution prior to use of the Cambodian judicial system.

52. **Accountability Mechanism of the ADB.** In addition, affected people may always contact the Complaints Receiving Officer of the ADB via the following addresses which will be included in the sub-project signboard:

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

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

54. Sufficient communication on the GRM including signs containing contact details of the GRM access points will be displayed at strategic locations to sustain the effective implementation of the mechanism.

8. REPORTING

55. Environmental monitoring reports (using ADB's integrated safeguards monitoring report format) will be prepared semi-annually for the EA by the Project Management Consultants in collaboration with PMU-ESO and sent to the MoE and ADB. The reports will table all indicators measured with the monitoring plan of EMP including performance monitoring indicators, and will include relevant national environmental quality standards. *Table 12* gives reporting requirements.

Table 12. Reporting Requirements

Report	Frequency	Purpose	From	To
Contractors' Progress Report	Monthly	EMP Implementation Progress and Monitoring Results	Contractor	PMU
EMP Progress and Compliance Report	Monthly	Confirm Mitigation Measures	National Specialist PIU-SFP Env with	PMU
Environmental Monitoring	Quarterly	Relevant environmental parameters	PMU-ESO	EA
Environmental Monitoring Report (Integrated safeguards monitoring report format)	Semi-Annual	Full EMP Implementation and Adherence to Environmental Covenants/Conditions	PMU	ADB
Landfill Operations	Quarterly	Tonnages collected, Groundwater Quality, operator health and safety	Operator	EA
STP	Quarterly	Effluent quality, sludge disposal, health and safety	Operator	EA

8.1. Mechanisms for Feedback and Adjustment

56. Based on environmental monitoring and reporting systems in place, the PMU shall assess whether further mitigation measures are required as corrective action, or improvement in environmental management practices are required. The effectiveness of mitigation measures and monitoring plans will be evaluated by a feedback reporting system. The PMU will play a critical role in the feedback and adjustment mechanism. If the PMU identifies a substantial deviation from the EMP, or if any changes are made to the project scope that may cause significant adverse environmental impacts or increase the number of affected people, then the PMU shall immediately consult MoE, MPWT and ADB to get approval and identify EMP adjustment requirements.

9. ESTIMATED COST OF EMP

57. The total cost for EMP implementation for the landfill comprises the following:

- ▶ Mitigation measures (Table 5 and Table 6) \$800 per household affected
- ▶ Environmental quality monitoring
- ▶ EMP Compliance Monitoring (including public consultation) (Table 10) No additional cost

58. The total cost will depend on the final chosen landfill site, as the number of households requiring mitigation will vary:

- ▶ Assuming 10 affected households, the EMP will cost \$31,800 per year + \$8000 = \$39,800
- ▶ Assuming 30 affected households, the EMP will cost \$31,800 per year + \$24,000 = \$55,800

59. The total cost for EMP implementation for the STP comprises the following:

- ▶ Mitigation measures (Table 5 and Table 7) Costs to be included in construction contract and operations budget
- ▶ Environmental quality monitoring (Table 9) \$12,400 per year
- ▶ EMP Compliance Monitoring (including public consultation) (Table 10) No additional cost

60. Excluded from the EMP budget as separate items are

- ▶ Measures required as part of good construction practice. This includes measures such as PPE for workers, machinery maintenance and mobile noise barriers.
- ▶ Remuneration and associated costs for Project management consultants and staff within PMU and PIU as this is covered elsewhere in the project budget.
- ▶ Cost for Project Management Consultant which includes a National and International Environmental Safeguards specialist.
- ▶ Training covered elsewhere including landfill and STP operator training which is covered under the feasibility study for each specific sub-project.

61. Contractors will bear the costs for all mitigation measures during construction, including those specified in the tender and contract documents as well as those to mitigate unforeseen impacts due to their construction activities.

62. The selected operators, private sector or government, will bear all environmental monitoring and reporting costs during the operational stage. EMP operational environmental mitigation and monitoring measures will be incorporated in the operations and maintenance manual

10. CONCLUSION

63. The EMP, if implemented as directed, will mitigate impacts on the natural environment and affected people to an acceptable level. The key parties for mitigation measure implementation are the construction contractors and the operators. The implementation of this EMP will be closely monitored and reported on by the relevant stakeholders in the project.

64. The most significant impacts from the project will arise from facility operation, for both the STP and the landfills. As a result, there is a comprehensive training and capacity building component to the project which is essential for ensuring the investment is both financially and environmentally sustainable and beneficial.

65. A robust Grievance Redress Mechanism will be established, as outlined in this EMP. It will ensure that all unplanned impacts which cause grievances for affected people are managed swiftly and a satisfactory outcome brought about.

66. Overall, the project is anticipated to bring environmental benefits to the populations of the project cities. It will serve to improve the current sewage and waste management situation and will provide long term environmental improvements.

Annex 1 Environmental Safeguards Terms of Reference

Project Management Consultants

Key responsibilities for the environment safeguards specialists under the Project Management Consultant (PMC) are listed below. These responsibilities will be executed as part of the TOR of the PMC.

- ▶ Review and update the IEE reports and environment management plans (EMP) prepared during the TA and recommend necessary refinements and improvements based on government and ADB policies and requirement.
- ▶ Ensure that EMPs and related environmental considerations are factored in detailed designs and technical engineering of the urban infrastructure subprojects under the Project.
- ▶ Ensure that environment safeguards measures are adequately considered in the bidding documents and in the evaluation criteria for selection and awarding of contracts for civil works, goods and services
- ▶ Conduct environmental safeguards due diligence assessments. Assist in consultations with project-affected people for drafting safeguard documents.
- ▶ Assess the capacity development needs of EAs, IAs and PMUs in environment measures and recommend appropriate capacity building interventions and training programs.
- ▶ Coordinate with participating Ministries, and local authorities on regulatory and compliance issues related to environment safeguards.
- ▶ Advise EAs, IAs and PMU on environment related concerns that may arise during Project implementation and recommend appropriate action plans.
- ▶ Assist in monitoring implementation of environmental safeguards, including the impact environmental measure on urban sector development.

PMU Safeguards Officer

- ▶ Review Contractor response to EMP requirements and assess suitability based on previous experience and response to site EMP request
- ▶ Ensure Site EMP is prepared by the Contractor and cleared by the Construction Supervision Contractor
- ▶ Ensure that environment safeguards measures are adequately considered in the bidding documents and in the evaluation criteria for selection and awarding of contracts for civil works, goods and services.
- ▶ Support PIU Safeguard Focal Points (PMU-SFP) to ensure regular site inspections are undertaken to check on implementation of mitigation measures in the EMP. Record results of site inspections and submit to the relevant authorities and project stakeholders as part of progress reporting (Monthly EMP Progress and Compliance Report).
- ▶ Contribution to Quarterly Monitoring Report to the Executing Agency and Semi-Annual Environmental Monitoring Report to ADB.
- ▶ Co-ordinate with PMU-SFP to ensure consultation is undertaken regularly with affected people in all project locations in accordance with IEE (Public Consultations during Implementation)
- ▶ Ensure Grievance Redress Mechanism (GRM) is implemented and functioning throughout project implementation.

Qualifications

- ▶ Bachelor's degree in environmental science, environment management and engineering or equivalent academic qualification
- ▶ At least 5 years' experience of environmental safeguards on similar projects.
- ▶ Knowledge and experience in the application of the ADB Safeguards policy would be an advantage.
- ▶ Fluency in English writing and communication skills is an advantage.

Annex 2 Affected Person Monitoring Form

Consultation / Interview Form

Date of Interview		Interviewer Name	
Interview Site: <i>Where is the interview held? In school, on the road, in shop</i>		Stakeholder Name & Status: <i>Full name, status is business owner, school teacher, religious leader, resident</i>	
Construction Site & Date Construction Started <i>Which road, GPS location if available</i>		Has this stakeholder been interviewed before? <i>Yes (when were they interviewed) No</i>	

Interview Discussion Points:

1. NOISE	Record of Discussion
Before the project started, was the person disturbed by noise? If yes, explain how and when. <i>Where did the noise come from? E.g. traffic, machinery, people, music</i> <i>When did it disturb the person? E.g. all day, at night, intermittently</i>	
During the construction, is the person disturbed by noise from the project? If yes, explain how and when. <i>What type of noise and where did the noise come from? All day, at night, intermittently?</i>	
If noise from construction is a problem, what changes does the person suggest are made?	
2. AIR QUALITY	Record of Discussion
Before the project started, was the person affected by air pollution or dust? If yes, explain how and when. <i>Where did the pollution or dust come from? E.g. traffic, machinery, construction, burning garbage, cooking stoves</i> <i>When was the dust or pollution a problem? E.g. all day, at night, intermittently</i>	
During the project, is the person disturbed by dust or pollution? If yes, explain how and when. <i>What type of noise and where did the noise come from? E.g. increased traffic congestion, construction machinery, construction workers, burning construction garbage etc</i>	

When did it disturb the person? E.g. all day, at night, intermittently	
If dust or air pollution from the construction is a problem, what changes does the person suggest are made?	
3. VEGETATION AND LAND USE	Record of Discussion
Before the project started, what was the vegetation like in the project area? <i>E.g. pasture land, trees, shrubs, rice fields.</i>	
During the project, has the person found the vegetation situation has changed? If yes, explain how and when.	
If impact on vegetation is unacceptable, what changes does the person suggest are made?	
4 COMMUNITY SAFETY	Record of Discussion
Before the project started, can you describe the community safety situation in the project area? <i>E.g. no problems, some accidents, difficulty crossing the roads</i>	
During the project, has the person found the community safety situation has changed? If yes, explain how and when. <i>Slower traffic so easier to cross the roads, construction vehicles are making a crossing harder / easier, more accidents / less accidents, construction site dangers</i>	
If change in road safety is unacceptable, what changes does the person suggest are made?	
5. WATER QUALITY	Record of Discussion
Before the project started, was the person affected by poor water quality? If yes, explain how and when. <i>Ground water ? Surface Water ? which Water source ? How was it polluted ?</i>	
During the project, is the person affected by water pollution? If yes, explain how and when. <i>Ground water ? Surface Water ? which Water source ? How is quality being affected ?</i>	
If water quality from the construction is a problem, what changes does the person suggest are made?	
6. ACCESS	Record of Discussion
During the project, is the person affected by reduced access to their business, home or land ? Access to what is limited, and how ?	
If access limitations are not acceptable, please suggest changes which can be made ?	
7. OTHER ISSUES	Record of Discussion

Any other issues about the construction sites that the person wants to discuss?	
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E.g. wastewater concerns, waste disposal, Other concerns, labour force,

Annex 3 GRM – Complaint Recording Form

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

Annex 4 Particular Conditions (For Bidding Documents)

67. The following clauses shall be added to the Bidding Document, Section 8 Particular Conditions in relation to the Environmental Safeguards for the Project:
68. The contractor will undertake to develop and submit to the PMU/CSC for approval, a site-specific Construction Environmental Management Plan with the following management sub-plans:
 - A. Spoil and Borrow Site Management;
 - B. Solid and Liquid Waste Management;
 - C. Community and Occupational Health and Safety and Emergency Response;
 - D. Construction Workers' Camp Management (if required).
69. The management sub-plans will be sufficiently detailed as to allow a clear understanding of the approach the contractor will take to mitigate environmental impacts during construction. The contractor will adhere to the management sub-plans at all times unless prior agreement has been given by the PMU under extenuating circumstances.
70. The Contractor will commit to ensuring a full time environmental health and safety officer on site who is competent, nominated to manage health and safety risks, and who can implement the EMP requirements for occupational health and safety and ensure relevant health and safety legislation is followed.
71. The Contractor will commit to enabling the project staff or consultants tasked with monitoring, full access to all information and data required in order that the Environmental Management Plan can be fully monitored.

Annex 5 Environmental Quality Standards

(1) Ambient Air Quality Standards

Source: Sub-decree **No. 42 ANRK.BK** on Air Pollution Control and Noise Disturbance, MoE 2000 and WHO. Ambient Air Quality Guidelines (2005).

Parameter	Averaging Period	No. 42 ANRK.BK		WHO Ambient Air Quality Guidelines (2005)	
		Unit	Value	Averaging Period	Value / Unit
Nitrogen Dioxide (NO ₂)	24 hours	mg /m ³	0.1	1 hour	200 µg/m ³
Sulfur Dioxide (SO ₂)	24 hours	mg /m ³	0.3	1 hour	20 µg/m ³
Carbon Monoxide (CO)	24 hours	mg /m ³	20		
PM 2.5	24 hours	-	-	24 h	25 µg/m ³
PM 10	24 hours	-	-	24 h	50 µg/m ³

(2) Ambient Noise Standards

Source: Sub-decree **No. 42 ANRK.BK** on Air Pollution Control and Noise Disturbance, MoE , 2000 and WHO Community Noise Guidelines (1999).

Time Period (24 hours)	No. 42 ANRK.BK	Areas Specified for WHO Guidance	WHO Noise (1999) Community Guidelines
	Value / Unit		Value / Unit
Day time (from 6:00am to 6:00pm)	70.0 dB(A)	Outdoor Living Area - serious annoyance - moderate annoyance	55 dB(A) 50 dB(A)
Evening Time (from 6:00pm to 11:00pm)	65.0 dB(A)	Inside dwellings - moderate annoyance	35 dB(A)
Night time (from 11:00pm to 6:00am)	50.0 dB(A)	Inside dwellings - sleep disturbance	30 dB(A)

(3) Surface Water Quality Standard

Referring to Sub-decree **No. 27 ANRK.BK** on Water Pollution Control, MoE, 1999, the standards of water quality are divided as follows:

Annex 2 of Sub-decree on Water Pollution Control

Effluent standard for pollution sources discharging wastewater to public water areas or sewer

No	Parameters	Unit	Allowable limits for pollutant substance discharging to	
			Protected water area	Public water area and sewer
1	Temperature	0C	< 45	< 45
2	pH		6 – 9	5 - 9
3	BOD5 (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	< 5.0	< 15
8	Detergents	mg/l	< 5.0	< 15
9	Phenols	mg/l	< 0.1	< 1.2
10	Nitrate (NO3)	mg/l	< 10	< 20
11	Chlorine (free)	mg/l	< 1.0	< 2.0
12	Chloride (ion)	mg/l	< 500	< 700
13	Sulphate (as SO4)	mg/l	< 300	< 500
14	Sulphide (as Sulphur)	mg/l	< 0.2	< 1.0
15	Phosphate (PO4)	mg/l	< 3.0	< 6.0
16	Cyanide (CN)	mg/l	< 0.2	< 1.5
17	Barium (Ba)	mg/l	< 4.0	< 7.0
18	Arsenic (As)	mg/l	< 0.10	< 1.0
19	Tin (Sn)	mg/l	< 2.0	< 8.0
20	Iron (Fe)	mg/l	< 1.0	< 20
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	< 0.2	< 1.0
25	Chromium (Cr)+6	mg/l	< 0.05	< 0.5
26	Copper (Cu)	mg/l	< 0.2	< 1.0
27	Lead (Pb)	mg/l	< 0.1	< 1.0
28	Mercury (Hg)	mg/l	< 0.002	< 0.05

29	Nickel (Ni)	mg/l	< 0.2	< 1.0
30	Selenium (Se)	mg/l	< 0.05	< 0.5
31	Silver (Ag)	mg/l	< 0.1	< 0.5
32	Zinc (Zn)	mg/l	< 1.0	< 3.0
33	Molybdenum (Mo)	mg/l	< 0.1	< 1.0
34	Ammonia (NH ₃)	mg/l	< 5.0	< 7.0
35	DO	mg/l	>2.0	>1.0
36	Polychlorinated Byphenyl	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	<3
48	Chloroform	mg/l	<1	<1
49	1,2 Dichloro ethylene	mg/l	<2.5	<2.5
50	Trichloro ethylene	mg/l	<1	<1
51	Trichloro benzene	mg/l	<2	<2
52	Hexachloro cyclohexene	mg/l	<2	<2

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

Annex 4 of Sub-decree on Water Pollution Control

Water Quality Standard in public water areas for bio-diversity conservation

Source: Sub-decree **No. 42 ANRK.BK** on Water Pollution Control, MOE, 1999.

a) River

Parameter	Standard	
	Unit	Value
pH	mg/l	6.5 – 8.5
BOD5	mg/l	1 – 10
Suspended Solid	mg/l	25 – 100
Dissolved Oxygen	mg/l	2.0 - 7.5
Coliform	MPN/100ml	< 5000

b) Lakes and Reservoirs

Parameter	Standard	
	Unit	Value
pH	mg/l	6.5 – 8.5
COD	mg/l	1 – 8
Suspended Solid	mg/l	1 – 15
Dissolved Oxygen	mg/l	2.0 - 7.5
Coliform	MPN/100ml	< 1000
Total Nitrogen	mg/l	1.0 – 0.6
Total Phosphorus	mg/l	0.005 – 0.05

Annex 5 of Sub-decree on Water Pollution Control:

Water Quality Standard in public water areas for public health protection

Source: - Ground water quality monitoring MoE, 2016.

- The CNDWQS Standard is National Standard of the Ministry Industry and Handicraft.

No	Parameter	Unit	Standard Value
1	Carbon tetrachloride	µg/l	< 12
2	Hexachloro-benzene	µg/l	< 0.03
3	DDT	µg/l	< 10
4	Endrin	µg/l	< 0.01
5	Dieldrin	µg/l	< 0.01
6	Aldrin	µg/l	< 0.005
7	Isodrin	µg/l	< 0.005
8	Perchloroethylene	µg/l	< 10
9	Hexachlorobutadiene	µg/l	< 0.1
10	Chloroform	µg/l	< 12
11	1,2 Trichloroethylene	µg/l	< 10
12	Trichloroethylene	µg/l	< 10

13	Trichlorobenzene	µg/l	< 0.4
14	Hexachloroethylene	µg/l	< 0.05
15	Benzene	µg/l	< 10
16	Tetrachloroethylene	µg/l	< 10
17	Cadmium	µg/l	< 1
18	Total mercury	µg/l	< 0.5
19	Organic mercury	µg/l	0
20	Lead	µg/l	< 10
21	Chromium, valent 6	µg/l	< 50
22	Arsenic	µg/l	< 10
23	Selenium	µg/l	< 10
24	Polychlorobiohenyl	µg/l	0
25	Cyanide	µg/l	< 0.005

(4) Groundwater Quality Standard

No	Parameter	Standard	
		Unit	Value (CNDWQS Standard)
1	pH	-	6.5-8.5
2	Turbidity	NTU	5.0
3	Dissolved Oxygen (DO)	mg/l	NV
4	Total Suspended Solid (TSS)	mg/l	NV
5	Chloride (Cl-)	mg/l	250
6	Nitrate (NO3)	mg/l	50
7	Phosphate (PO4)	mg/l	NV
8	Sulphate (SO4)	mg/l	250
9	(BOD)5	mg/l	NV
10	(COD) Mn	mg/l	NV
11	Aluminum (Al)	mg/l	0.2
12	Arsenic (As)	mg/l	0.05
13	Copper (Cu)	mg/l	1.0
14	Iron (Fe)	mg/l	0.3
15	Lead (Pb)	mg/l	0.01
16	Manganese (Mn)	mg/l	0.1
17	Mercury (Hg)	mg/l	0.001
18	Zinc (Zn)	mg/l	3.0
19	Total Coli form	MPN/100mlml	0

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(5) Effluent Quality Standard

(Effluent from WWP and from Leachate Treatment Facility at the controlled disposal facility)

Source: Sub-decree **No. 42 ANRK.BK** on Water Pollution Control, MOE, 1999.

No	Parameter	Standard (Allowable limits for pollutant substance discharging) to		
		Unit	Value (Protected water area) public	Value (Public area water and sewer)
1	Temperature	0C	< 45	< 45
2	pH		6 – 9	5 - 9
3	BOD5 (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	< 5.0	< 15
8	Detergents	mg/l	< 5.0	< 15
9	Phenols	mg/l	< 0.1	< 1.2
10	Nitrate (NO3)	mg/l	< 10	< 20
11	Chlorine (free)	mg/l	< 1.0	< 2.0
12	Chloride (ion)	mg/l	< 500	< 700
13	Sulphate (as SO4)	mg/l	< 300	< 500
14	Sulphide (as Sulphur)	mg/l	< 0.2	< 1.0
15	Phosphate (PO4)	mg/l	< 3.0	< 6.0
16	Cyanide (CN)	mg/l	< 0.2	< 1.5
17	Barium (Ba)	mg/l	< 4.0	< 7.0
18	Arsenic (As)	mg/l	< 0.10	< 1.0
19	Tin (Sn)	mg/l	< 2.0	< 8.0
20	Iron (Fe)	mg/l	< 1.0	< 20
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	< 0.2	< 1.0
25	Chromium (Cr)+6	mg/l	< 0.05	< 0.5
26	Copper (Cu)	mg/l	< 0.2	< 1.0

27	Lead (Pb)	mg/l	< 0.1	< 1.0
28	Mercury (Hg)	mg/l	< 0.002	< 0.05
29	Nickel (Ni)	mg/l	< 0.2	< 1.0
30	Selenium (Se)	mg/l	< 0.05	< 0.5
31	Silver (Ag)	mg/l	< 0.1	< 0.5
32	Zinc (Zn)	mg/l	< 1.0	< 3.0
33	Molybdenum (Mo)	mg/l	< 0.1	< 1.0
34	Ammonia (NH ₃)	mg/l	< 5.0	< 7.0
35	DO	mg/l	>2.0	>1.0
36	Polychlorinated Byphenyl	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	<3
48	Chloroform	mg/l	<1	<1
49	1,2 Dichloro ethylene	mg/l	<2.5	<2.5
50	Trichloro ethylene	mg/l	<1	<1
51	Trichloro benzene	mg/l	<2	<2
52	Hexachloro cyclohexene	mg/l	<2	<2

(6) Soil Quality Standard

Source: Cambodia National Quality Standards for agriculture, Ministry of Agriculture, Forest, and Fishery (MAFF).

Parameter	Standard	
	Unit	Value
pH		
Salinity	ppt	6-8
Oil & Grease	mg/kg	-
Chloride	mg/kg	-

Petroleum Hydrocarbons		
Kerosene hydrocarbons (c10-c14)	mg/kg	-
Diesel hydrocarbons (c15-c28) (mg/L)	mg/kg	-
Heavy oil hydrocarbons (c29-c36) (mg/L)	mg/kg	-
BTEX		
Ethylbenzene	mg/kg	0.018
Benzene	mg/kg	0.0068
Toluene	mg/kg	0.08
Xylene	mg/kg	2.4
Metals		
Nickel	mg/kg	50
Copper	mg/kg	63
Zinc	mg/kg	200
Arsenic	mg/kg	12
Cadmium	mg/kg	1.4
Lead	mg/kg	70
Iron	mg/kg	-
Chromium	mg/kg	64
Mercury	mg/kg	6.6