

Environmental Management Plan

December 2021

Cambodia: Integrated Urban Environmental Management in the Tonle Sap Basin Project

Pursat Controlled Landfill Subproject

Prepared by the Ministry of Public Works and Transport for the Asian Development Bank. This is an updated version of the draft originally posted in March 2019 available on <https://www.adb.org/projects/documents/cam-42285-013-emp-0>.

CURRENCY EQUIVALENTS

(as of 8th November 2021)

Currency unit	–	riel (KR)
KR 1.00	=	\$ 0.000245
\$1.00	=	KR 4,066

ABBREVIATIONS

ADB	–	Asian Development Bank
AP	-	Affected People
BOD	–	Biochemical Oxygen Demand
CEMP	–	Construction Environmental Management Plan
C-EHSO	–	Contractor Environmental Health and Safety Officer
COD	–	Chemical Oxygen Demand
EA	–	Executing Agency
EIA	–	Environmental Impact Assessment
EMP	–	Environmental Management Plan
GRM	–	Grievance Redress Mechanism
IA	–	Implementing Agency
IEE	–	Initial Environmental Examination
IEIA	–	Initial Environmental Impact Assessment
MoE	–	Ministry of Environment
MPWT	–	Ministry of Public Works and Transport
PDoE	–	Provincial Department of Environment
PIC	–	Project Implementation Consultants
PIC-I/NES	–	PIC-International and National Environment Specialists
PIU	–	Project Implementation Unit
PIU-ESC	–	PIU Environmental Safeguards Counterpart
PMU-ESO	-	PMU Environmental Safeguards Officer
PMU	–	Project Management Unit
PDPWT	-	Provincial Department of Public Work and Transport
PSC	–	Project Steering Committee
SPS	–	Safeguards Policy Statement
TSS	–	Total Suspended Solid
VO	-	Variation Order
WHO	–	World Health Organisation

WEIGHTS AND MEASURES

dB(A)	–	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

NOTE

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

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1. INTRODUCTION

1.1. Purpose

1. This document is the environmental management plan (EMP) for the controlled landfill subproject in Pursat city, Pursat Province subproject for the Integrated Urban Environmental Management in The Tonle Sap Basin Project (IUENTSP). The EMP for the subprojects 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 subprojects in order to prevent, reduce, or mitigate adverse impacts.

2. This EMP is prepared for construction of a controlled landfill and was updated as follows, based on detailed engineering designs: 1) August 2021 to integrate COVID-19 requirements and a contract Variation Order (VO1) adding a wetland and a second cell to the project design and 2) November 2021 to include VO2 adding a weighbridge and waste picker facilities to the project design. The other subprojects under IUENTSP will have individual EMPs. The integrated Initial Environmental Examination (IEE) that covers all the subprojects is a separate document. The IEE was correspondingly updated to reflect VO1 and VO2.

1.2. Budget

3. The costs for EMP implementation comprise:

- Training and Capacity Building: \$10,000 (See Table 4)
- Household mitigation measures: \$12,000 maximum (See Table 5)
- Environmental Quality Monitoring: Pre-Construction \$8,000 (Included in domestic IEIA), During Construction per year \$23,800 (see Table 8) (included in Bill of Quantities).

4. Other aspects of the EMP including mitigation measures, reporting, affected people consultation and EMP monitoring are included in other budgets depending on the organization responsible for the aspect e.g. PMU operational budget or included in contractor's bid price. VO1 and 2 have not caused the EMP implementation budget to change.

1.3. Outline of Technical Approach

1.3.1. Landfill technology outline

5. A controlled landfill standard facility is to be provided. This is considered to be the appropriate standard of intervention as it provides the best balance between capital cost and operating difficulty compared with environmental controls and sustainability. The landfill includes the following features:

- Full perimeter fence to be constructed in phases;
- Buildings for the gatehouse, generator where required and office buildings and ablution facilities;
- Two artificially lined cells (asphalt) with sufficient life for 16 years operation (Phase 1);
- Cell base raised above groundwater level;
- A leachate collection system;
- Internal access roads (asphalt)
- Appurtenant works such as solar power lighting, septic tanks, generators;
- Equipment including a multipurpose tractor

1.3.2. Landfill Construction

6. The project will include the following investments

- Earthworks for the site construction;
- Buildings;
- Administration building
- Generator building
- Gatehouse
- Parking area
- Roads, dikes, hardstanding;
- Site infrastructure
- Lighting (solar)
- Water tank
- Septic tank
- Leachate pumping station
- Groundwater monitoring wells x 2
- Water supply well x1
- Leachate lagoons (aerated x 1, sedimentation x 1)
- Sludge drying bed for sludge from WWTP

7. Variation Order (VO1) includes:

- Wetland for further polishing and evaporation of leachate;
- Increased solid waste cells, from 1 to 2, extending the design life of the project constructed cells, from 7 years to 16 years;
- Increased depth of leachate ponds to facilitate gravity flow from cells;
- Additional wetland for further polishing and evaporation of leachate overflow from the treatment ponds as the planned design could not be implemented;
- Minor reductions in access road quantities;
- Minor increases in leachate collection infrastructure and boundary fencing.

8. Variation Order (VO2) includes:

- Installation of a weighbridge;
- Waste picker facilities including toilets, washing facilities, resting area, material storage area;
- Minor addition in quantities for the internal access road and construction of a new monument board.

2. SUMMARY OF POTENTIAL RECEPTORS & IMPACTS

9. The impacts of the project are influenced by the presence of receptors in the subproject area. Without receptors, there will not be any impacts. The receptors are summarised in Table 1.

10. In addition to these site specific receptors, housing, businesses and access requirements are also considered impact receptors. The impact of VO1 and VO2 on receptors is unchanged from the original contract as works are of a comparable scale and within the same construction footprint.

Table 1 Receptors in Subproject Area

City	Subproject	GPS	Surface Water Receptors	Socio-Economic & Cultural Receptors	Land Cover/ Ecological Receptors	Protected Area Status
Pursat	Landfill	12°30'59.28"N, 103°58'37.21"E	Groundwater and flood water Surface water drainage 12°31'11.09"N, 103°58'34.43"E Pond (agriculture) 12°31'3.20"N, 103°58'50.39"E	Houses along access road and East and West of landfill site	Farm land	None

11. A summary of 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, and earth works.
- **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.
- **Surface Water.** There is no irrigation canal or stream in the project site. The area is largely flat and will be subject to storm water flow towards national road No. 5. Short term construction impacts may be seen in terms of increasing turbidity of any water flowing across the site. Ponds used for agriculture are intermittent throughout the area, the largest adjacent to the access road is approximately 150m from National Road No.5 at 12°31'29.89"N, 103°58'51.66"E
- **Groundwater.** The geotechnical study confirmed that at some locations groundwater is found at a depth of 0.5 in a number of boreholes on site. The site is known to flood during the wet season combining rising groundwater with surface water run off.
- **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.

12. The location of the landfill and receptors is shown in Figure 1. The layout of the landfill is shown in Figure 2.

Figure 1 Landfill Site Location & Receptors

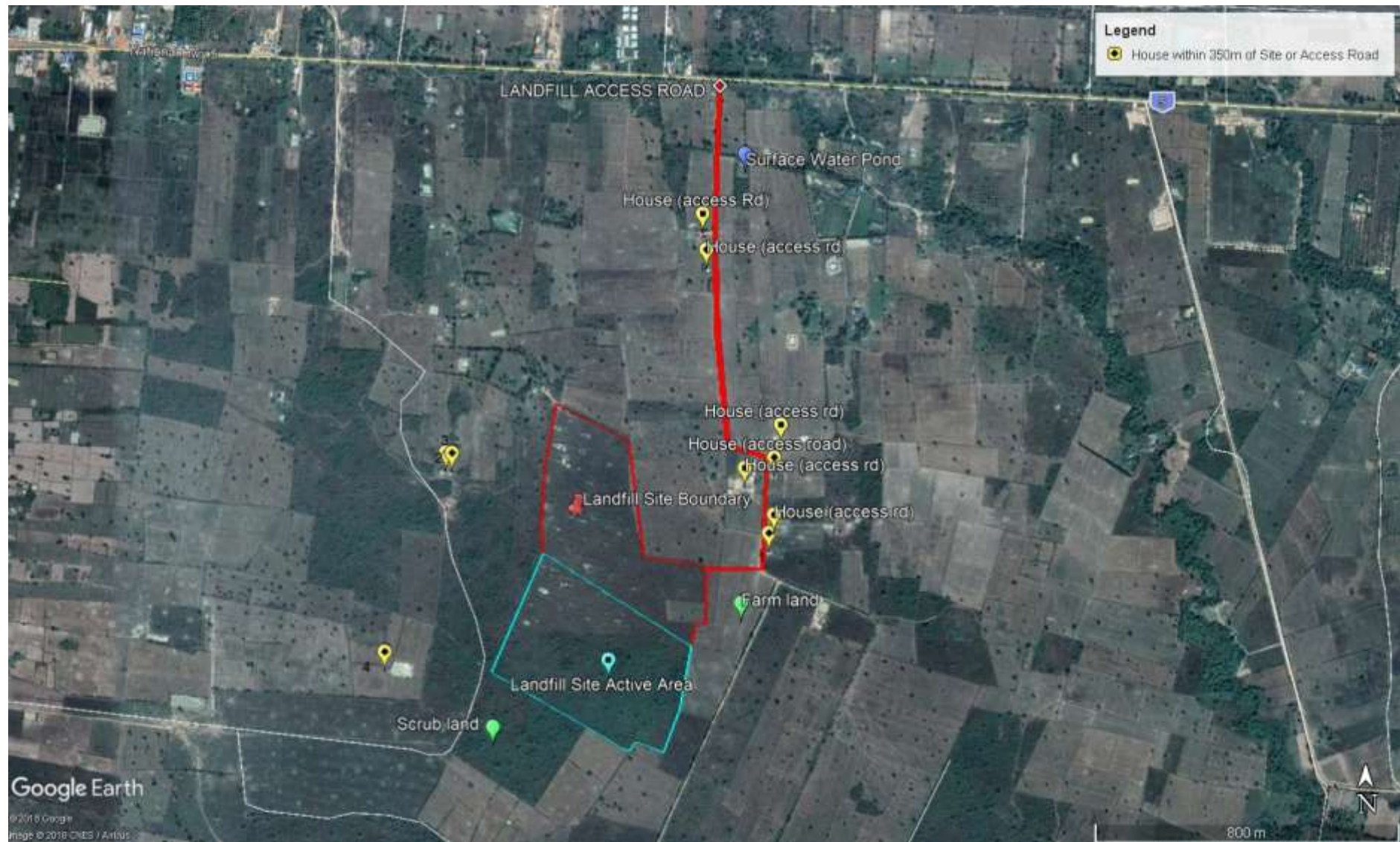
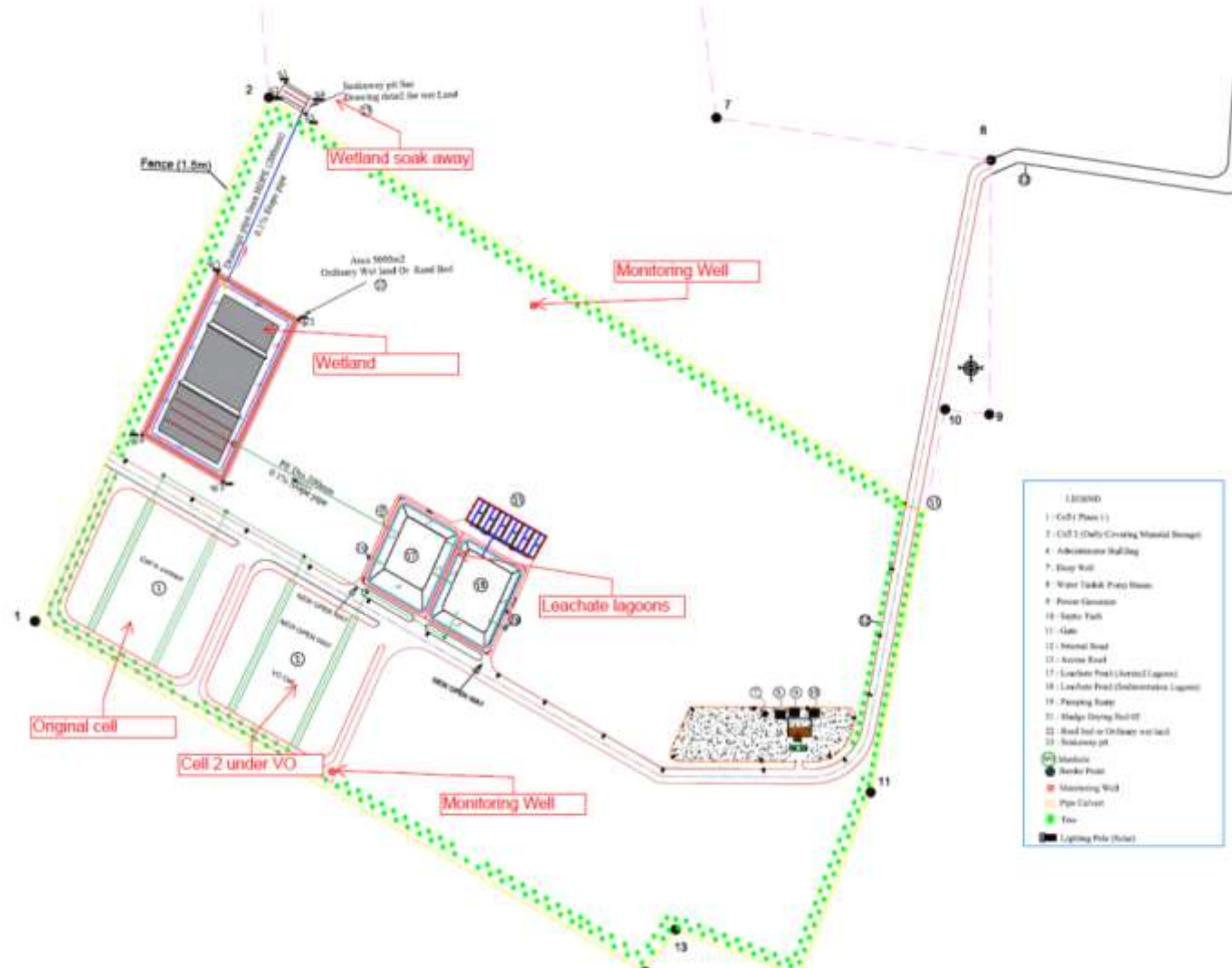


Figure 2 Landfill Site Layout (original including VO1)



3. INSTITUTIONAL ARRANGEMENTS & RESPONSIBILITIES

13. The key institutions, organizations and stakeholders relevant to environmental safeguards are set out below.

14. 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 has established 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 subproject city. The PDPWT has established a Project Implementation Unit (PIU) in each province, comprising relevant provincial government representatives including the Provincial Department of the Environment.

15. A summary of the key functions for project implementation and environmental safeguards is presented in Table 2 and detail on the responsibilities of each function is in Table 3:

Table 2: Key Functions 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	PMU-ESO	Phnom Penh within PMU	Existing MPWT staff seconded/assigned to the PMU for the environmental management of the Project EMP compliance across the subprojects for environmental safeguards – Full Time
Project Implementation Unit	PIU	Provinces within PDPWT	Responsible for subproject implementation
PIU Environmental Safeguard Counterpart	PIU-ESC	Provinces within PIU	Nominated person responsible for subproject environmental monitoring and support to PMU-ESO
Contractor Environmental, Health and Safety Officer	C-EHSO	Construction Site	Mitigation measure implementation and reporting
Project Management and Implementation Support Consultants	PMIS	Phnom Penh	Project final design and implementation, support and capacity development Engineering supervision for all construction and reporting
International and National Environment Specialists	PMIS -I/NES	Phnom Penh within PMIS 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

Table 3 Responsibilities for Environmental Safeguards

Institution	Prior to Construction including Detailed Engineering Design	During Construction	During Operation and Decommissioning
Executing Agency	- Ministry of Public Works and Transport responsible for ensuring the implementation of the mitigation in the EMP and for ensuring compliance with loan covenants - Collaborate with the MoE for the Subproject's compliance with the Government's environmental safeguard requirements on IEIA and EMP implementation		
PSC	- Oversee implementation in conformity with the Project's development objectives and scope - Assist in coordination among government agencies involved in Project implementation including MoE - Ensure coordinated and efficient Project implementation activities including EMP implementation		
DPWT	Collaborate with PDoE & relevant provincial agencies on matters concerning the environmental management of the Subproject.		
PMU / PMU-ESO	- Update IEE & EMP - Coordinate with Design Consultant to ensure the incorporation of updated findings & mitigation measures in design & bidding documents. - Ensure EMP is part of the bidding documents, EMP clauses are incorporated in bidding documents, contracts. - Ensure MoE approval of IEIA Report has been secured prior to awarding of civil works. - Review and approve contractor's Construction EMP (CEMP) against ADB and IEIA requirements - Conduct affected people consultation - Participate in training provided by PMIS - Establish GRM and making affected persons aware of GRM focal points, contacts and procedures'	- Conduct inspections and spot checks to monitor the performance of the Contractor in implementing the CEMP/EMP - Review Monthly Environmental Monitoring Reports (EMRs) of Contractor - Review environmental quality monitoring results. - Prepare the Project's Semi-Annual EMRs for submission to ADB with support from PMIS. - Implement the GRM for environmental issues - Conduct appropriate consultation and monitoring of effect of construction on affected people - Participate in training provided by PMIS	- Review relevant operator monitoring reports. - Prepare the Project's Annual EMR for submission to ADB, until loan closure or as agreed. - Ensure all GRM complaints are closed out to affect person's satisfaction
PIU-ESC	- Coordinate and collaborate relevant provincial agencies, as necessary - Support PMU-ESO - Conduct affected people consultation - Establish health & safety baseline conditions in affected villages. - Establish GRM for Environmental Issues - Participate in training provided by PMIS	- Collate monthly EMRs of Contractor, and submit to the PMU. - Oversee the conduct of the environmental effects monitoring to be managed by the contractor and tested to be conducted by MoE Laboratory. - Prepare the draft Semi-Annual EMR and submit - Implement the GRM for environmental issues - Conduct appropriate consultation and monitoring of effect of construction on affected people - Participate in training provided by PMIS - Spot checks to verify EMP implementation	- Review relevant operator monitoring reports - Support reporting requirements of PMU. - Ensure all GRM complaints are closed out to affect person's satisfaction
PMIS-N/IES	- Provide technical advice/assistance, IEE/EMP update - Review bidding documents, review CEMP against the EMP; confirm subproject readiness. - Ensure environmental considerations included in Detailed Design - Environmental related training for PMU, PIU, contractors and other stakeholders - Incorporate mitigation measures in design & bidding documents	- Provide technical advice/assistance, e.g. preparation of Semi-Annual EMR for ADB, review of results of environmental effects monitoring. - Environmental related training for PMU, PIU, contractors and other stakeholders - Support PMU/PIU with appropriate consultation - Site visits to check on construction, EMP implementation and affected people, in collaboration with PMU	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.

	• Incorporate EMP as part of bidding documents, EMP clauses in bidding documents, contracts • Support PMU/PIU with appropriate consultation		
ADB	• Review and clear updated IEE/EMP and disclose on the ADB Website • Review bidding documents, confirm readiness of subproject.	• Review Project EMRs and disclose on ADB's website. • Carry out review missions	
Contractor	• Prepare a CEMP that addresses as minimum the requirements of the EMP. • Establish and follow COVID-19 prevention and management requirements, defined according to national Ministry of Health protocols.	• Implement mitigation measures & conduct internal EMP implementation monitoring. • Conduct environmental quality monitoring as prescribed in SPS-compliant EMP. (If an independent Licensed Laboratory will not be engaged.) • Prepare Monthly EMRs.	
Operator			• Implement mitigation measures & conduct internal EMP implementation monitoring. • Prepare Monthly and Annual EMRs.
MoE/PDoE	• Review, comment on approve IEIA Report	• Monitor compliance with approved IEIA & EMP.	• Monitor compliance with environmental standards.
Municipality	• Facilitate obtaining the necessary inputs from and/or participation/cooperation of, concerned communes and villages through collaboration with their Commune Councils. • Facilitate (& participate in) GRM dissemination and implementation	• Participate in the monitoring of the performance of Contractor in EMP implementation. • Review EMRs & results of environmental effects monitoring • Facilitate & participate in GRM dissemination and implementation.	
Commune Councils	• Facilitate & participate in GRM dissemination and implementation	• Participate in the monitoring of the performance of Contractor in EMP implementation. • Review EMRs & results of environmental effects monitoring. • Facilitate & participate in GRM dissemination and implementation.	

3.1. Institutional Capacity Review and Needs

16. 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).

17. During the update of this EMP 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. The project will co-ordinate with this existing environmental safeguard office (ESO) in MPWT and will include ESO staff in training and reviews.

18. In addition, through understanding current practices at the Phnom Penh landfill and provincial disposal sites, it is clear that there is limited capacity for effective operation and maintenance of waste disposal sites. 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.

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

20. The PMIS -I/NES will perform key roles in supporting the PMU-ESO in implementing the EMP and ensuring the pre-construction requirements are in place.

Table 4: Capacity building and training requirement

Subject / Content	Participants	Trainer/Organization	When/Frequency	Days / event	# of participants	Cost (\$) USD
EMP development and implementation EMP function Roles and responsibilities, EMP monitoring (Site Visits) Reporting on Environmental Safeguards	PMU, PIU, contractors	PMIS -I/NES	Twice - Once before, and once 6 months after construction starts	2	10	10,000
Consultation with Affected People Consulting during construction, types of consultation, methods	PMU, PIU	PMIS -I/NES	Once before to construction	0.5	6	
Grievance Redress Mechanism – roles, responsibilities and implementation	PMU, PIU, contractors, Commune Councils Village Chief, Municipality	PMIS -I/NES	Twice - Once before, and once 6 months after construction starts	1	20	
Environmental protection Pollution control on construction sites (air, noise, wastewater, solid waste)	PMU, PIU, contractors	PMIS -I/NES	Once (during project implementation)	2	10	
Environmental monitoring -Monitoring methods, data collection and processing, reporting systems	PMU, PIU, contractors,	PMIS -I/NES & MoE (environmental analyst)	Once (at beginning of project construction)	2	10	
Landfill Management	Included as part of the solid waste management investment training budget The project includes an extensive training investment under the Capacity Development Plan 2018-2022, which for solid waste will include training provided by PMIS experts, external experts and training outside Cambodia. The scope of the training is currently under discussion with MPWT and will include Operation and Maintenance of landfills and an exposure visit to an operational site that is working as a controlled or sanitary landfill. The training will include government staff and operators.					

4. MITIGATION MEASURES PLAN

21. Mitigation measures for environmental impacts are shown in Table 5

22. Construction Environmental Management Plans. The Contractor is expected to develop a specific Construction Environmental Management Plan (CEMP) for the subproject, which sets out the contractor's approach to implementing required mitigation measure.

Table 5: EMP Mitigation Measures

Activity	Potential Impact	Environmental	Mitigation Measures	Cost Estimate (USD)	Responsible Institution	
					Implement	Supervise
PRE-CONSTRUCTION						
Disclosure and engagement with community	-		1. Initiate Information Disclosure and Grievance Redress Mechanism of IEE at Tuol Mkak village	Included in Project cost	PMU	EA
GRM Dissemination	-		2. Establish GRM and clarify roles and responsibilities (see GRM section of EMP) 3. Provide contractor with GRM contact details to be used for: A. GRM sign boards B. GRM Contact Cards for Affected People	Included in Project cost	PMU	PMU
GRM Dissemination	-		4. Erect sign boards at the construction site entrance and on NR#5 at start of access road with: A. project details B. GRM procedures and contact details 5. Print 'GRM Contact Cards' for all workers to give to complainants and keep cards with all vehicles, machinery and site managers/foremen 6. Affected People Training. 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'	Included in Project cost	Contractor	PMU
IEE and EMP Updated	All		7. Update IEE and EMP to include: A. final detailed design B. further necessary environmental protection measures	Included in Project cost	Local licensed Company and PMIS	ADB/ PMU

Activity	Potential Environmental Impact	Mitigation Measures	Cost Estimate (USD)	Responsible Institution	
				Implement	Supervise
		C. approved national IEIA requirements & mitigation measures. D. environmental quality baseline monitoring (water, air, noise) IEIA approved by MoE prior to contract award			
Construction EMP (CEMP)	All	8. The contractor(s) will develop a Construction EMP that includes response to required mitigation measures and individual management sub-plans for: A. Spoil, Solid and Liquid Waste Management; B. Community and Occupational Health and Safety and Emergency Response; C. Construction Workers Camp Management (if required). 9. The CEMP will include a map of each construction site, with copies held by the Contractor and PIU, showing as a minimum: a). Access routes, b). storage areas for waste, c). storage area for chemicals such as fuels, d) concrete mixing, e) stockpile storage areas (on & off site), f) first aid kit and equipment used in emergency response, g) location of worker camps and construction staging area (if required) and h) borrow sites	Included in Project cost	Contractor (C-EHS)	PMU/ PMIS
Well Drilling	Groundwater Pollution	10. Develop Method Statement for well drilling (groundwater observation wells, and water supply well)	Included in Project cost	Contractor	PMU/ PMIS
Obtain and activate permits and licenses	Compliance obligations	11. Contractors to comply with all statutory requirements set out by Government for use of construction equipment and plant 12. Contractor to ensure all required permits including materials extraction permits are in place prior to construction.	Included in bid price	Contractor	PMU
Construction EMP (CEMP) Approvals	All	13. Approval of CEMP including site maps as required by CEMP before construction is allowed to start	Include in Project cost	PMU/ PMIS	EA
Bidding	All	14. Incorporate EMP into the bid and contract requirements, including Particular Conditions for Bidding Documents.			
CONSTRUCTION PHASE					
Household protection measures	Nuisance issues (dust, Odor, pests)	15. For all 15 households 0-500 m of the landfill site that want to accept mitigation measures:	\$12,000	Contractor	PMU

Activity	Potential Environmental Impact	Mitigation Measures	Cost Estimate (USD)	Responsible Institution	
				Implement	Supervise
		a) Installation of opening glass window frames and fly screens into a maximum of 8 windows within the house. b) 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.			
Production, Transport and Use of materials	Air quality Resource use Water Quality	16. 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. 17. Water will be sprayed on material handling areas, and borrow pits where fugitive dust is generated if it will impact on workers or residents. 18. Trucks carrying dry construction materials such as earth will be covered with tarpaulins or other suitable cover. 19. Stockpiles and materials will be stored at least 50m from surface waters with drainage directed away from the irrigation canals or drainage channels 20. Driving on unmade roads, trucks will be limited to 15 kph. Warning sign to inform road users of turning heavy vehicles will be used where trucks cross or turn off National Road. 21. Construction traffic movements will be scheduled to avoid congested and/or sensitive periods 22. borrow site will be sign posted, fenced or contoured to ensure unauthorised/accidental access to any steep sided pits	Included in Bid Price	Contractor	PIU/ PMU
Use of Machinery & Equipment	Noise Water Quality	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 26. Public notification of construction operations will incorporate noise considerations; information	Included in Bid Price	Contractor	PIU/ PMU

Activity	Potential Environmental Impact	Mitigation Measures	Cost Estimate (USD)	Responsible Institution	
				Implement	Supervise
		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. Construction vehicles and machinery will be maintained to a high standard to minimize emissions 29. All construction workers will use appropriate Personal Protective Equipment (PPE) including ear defenders when operating machinery; 30. No washing or repair of machinery within 50m of surface waters including irrigation canals.			
Access road construction	Property damage (vibration) Flooding	31. The contractor will take and store a Pre-Condition photograph of all houses and other structures along the 1500m access road within 30 m of the road shoulder and make the photos available to MPWT should any dispute occur.	Included in Bid Price	Contractor	PMUEA
Landscaping	Flora	32. Follow requirements in Technical Specification regarding tree size, planting and aftercare requirements 33. Native species only to be approved by PDoE	Included in Bid Price	Contractor	PIU/ PMU/ PDOE
Ground Works	Water quality Air quality Cultural heritage/ Chance Finds	34. Provision of adequate short-term drainage away from construction sites to prevent contaminated run off. 35. Installation of temporary storm drains or ditches for construction sites to manage and control the flow and direction of surface water run off 36. Spray water on areas being worked if fugitive dust is generated if it will impact on workers or residents. 37. If groundworks reveal cultural chance finds, the contractor will stop work immediately, fence off the area, and notify the PMU. Work will not commence until MPWT approval is given.	Included in Bid Price	Contractor	PIU/ PMU
Storage and Use of chemicals and fuels	Water quality Soil quality	38. Refuelling only in designated areas which are to be 200m from a water course and drip trays to be used when refuelling or topping up / changing machinery fluids 39. 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. 40. All chemicals and fuels will be labeled 41. Spill control measures will be included in emergency response measures	Included in Bid Price	Contractor	PIU/ PMU

Activity	Potential Environmental Impact	Mitigation Measures	Cost Estimate (USD)	Responsible Institution	
				Implement	Supervise
Implementation of Spoil, Solid and Liquid Waste Management Sub-Plan A	Resource use Natural resources contamination	42. Sub-plan will include measures to explain how the contractor will: a) 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 b) 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). c) Recyclables to be separated at source and given/sold to recycler (plastic, metal, card, paper as a minimum) d) All solid waste to be stored in containers with lids. e) Prohibit burning of waste at all times; f) 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 drainage ditches g) Criteria for spoil disposal including levels of contamination and location for spoil disposal (to be approved by municipal authorities) h) No disposal of spoil on agriculturally productive land or within 50 m of a water course	Included in bid price	Contractor	PIU/PMU
Implementation of Community and Occupational Health and Safety and Emergency Response Sub-Plan B	Human health and safety	43. Community H&S measures to be included in the management sub-plan will include: a) 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. b) Details of Safety measures, if required, to prevent access by members of the public and livestock to any borrow site excavations c) 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. d) Details of signage and speed controls if public roads are to be affected by construction traffic.	Included in bid price	Contractor	PIU/PMU

Activity	Potential Impact	Environmental	Mitigation Measures	Cost Estimate (USD)	Responsible Institution	
					Implement	Supervise
			e) Details of sufficient signage giving community dangers / warnings and information disclosure outside all construction sites, include example warnings. 44. Occupational H&S measures to be included in the management sub-plan will include: f) Assurance that all workers are equipped with, and use Personal Protective Equipment (PPE). g) Specifications for the PPE to be used on site and the contractors' approach to enforcement of its use by workers h) Sufficient signage giving occupational health and safety warnings and information disclosure within all construction sites – sub-plan to include example warnings. i) 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. j) Details of daily toolbox meetings (safety briefings) k) Details of the site accident record book which will be maintained where all major or minor accidents and incidents are recorded with actions taken. l) An Environment Health and Safety qualified engineer will be engaged for the contract and adequate first aid equipment provided on site. m) 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. n) 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. 45. The Emergency Response Plan will set out detailed Preventative Measures for all types of incidents covered in the Emergency Plan. This will include: o) Prevention of Injury and Accidents – to include Personal Protective Equipment requirements for construction workers, training requirements			

Activity	Potential Environmental Impact	Mitigation Measures	Cost Estimate (USD)	Responsible Institution	
				Implement	Supervise
		p) 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. q) Prevention of Fire – to include measures for Ignition Sources including prevention of smoking on construction site, management of flammable materials and liquid. r) Other Incidents – prevention measures relevant to other issues considered relevant by the contractor 46. The Contractor will develop Emergency Response Procedures prior to construction. The procedures will cover actions to be taken in case of: s) Worker injury (e.g. construction or traffic accident) t) Spillage (e.g. fuel spillage) u) Fire (e.g. fuel or chemicals storage area); and v) Any other incidents anticipated by the contractor. 47. COVID-19 Response: The contractor's Occupational Health and Safety plan will incorporate COVID-19 prevention and management protocols, defined according to national Ministry of Health requirements, and in consideration of ADB COVID-19 guidance: https://www.adb.org/publications/safety-well-being-workers-communities-covid-19			
Implementation of Construction Workers Camp Management Sub-Plan C	Contamination of water, soil, waste production and social issues	48. [if required] If a camp for construction workers is required the contractor will set out a management plan which includes: a) A map showing camp lay out, welfare facilities, and first aid kit locations. . It will be at least 50m from the nearest house. b) 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. c) Pit latrines to be located at least 200m from surface waters, and in areas of suitable soil profiles and above the groundwater levels d) Schedule of HIV Aids education awareness to be given to workers.	Included in bid price	Contractor	PIU/PMU

Activity	Potential Environmental Impact	Mitigation Measures	Cost Estimate (USD)	Responsible Institution	
				Implement	Supervise
		e) Training on relevant laws for foreign labor (including hunting, fishing and traffic rules); 49. If a construction camp is not required, the contractor will not require a Management Plan but will: a) Provide adequate waste disposal facilities including garbage cans for workers. b) Provide welfare facilities including water for washing, drinking and include facilities for male and female workers c) Provide toilets for male and female construction workers with a cleaning schedule 50. The contractor will give priority to local labor force and retain evidence of how local labor recruitment efforts were undertaken			
Construction Staging Area	Contamination of soil and waste disposal	51. If staging area required (not within construction camp area) the contractor will: a) Provide a layout map of staging area and its location which will not be within 20m of any surface waterbody and not in an area liable to flood 52. The site will not be at least 50m from a residential property	Included in bid price	Contractor	PIU/ PMU
Restoration and Rehabilitation	Contamination of soil and waste disposal, community health and safety	53. Topsoil from construction areas will be retained and used for landfill landscaping and rehabilitation 54. The contractor will provide a clear plan of how the following sites will be restored to their original condition following the end of construction; a) Worker camp b) Staging area c) Access roads to landfill site 55. Any damage shall be repaired as per the technical specification in the bidding documents 56. All waste will be removed, and compacted ground restored. 57. Revegetation of sloped areas such as access road slopes with natural grass species to prevent wet season erosion	Included in bid price	Contractor	PIU/ PMU
OPERATION					
Landfill liner	Groundwater protection	58. The operator will ensure that site is operated so as to protect the liner throughout lifespan of the landfill including prevention of exposure to sun, damage by machinery.	Included in operator's O&M costs	Operator	MPWT

Activity	Potential Environmental Impact	Mitigation Measures	Cost Estimate (USD)	Responsible Institution	
				Implement	Supervise
		59. Provision of adequate budget for O&M to ensure regular groundwater monitoring			
Landfill Operation	Groundwater protection, surface water protection	60. The operator will develop a Working Plan for the landfill site which will detail procedures for the following – as a minimum: a) Waste transport b) Acceptable waste types c) Hazardous waste management d) Recording waste data e) Site infrastructure (O&M) f) Waste placement g) Using daily cover h) Water balance i) Leachate management j) Maintenance of slopes, compaction and cover to avoid leachate run-off k) Occupational and community health and safety l) Emergency and Incident Management m) Vehicle maintenance n) Odor management o) Maintenance of landscaping (tree aftercare) 61. Environmental Protection and Monitoring. The operator will detail procedures for monitoring: a) Groundwater wells b) Surface water c) Leachate management d) Gaseous emissions via flaring (following cell closure) e) Odor monitoring – boundary and receptor sites f) Grievance redress mechanism	Included in operator's O&M costs	Operator	MPWT
Landfill Operation	Community Nuisance	62. 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. 63. The contractor will record all public complaints and deal with them within a timeframe agreed with MPWT and their resolution will be recorded.. 64. The contractor will cover all waste loads and all drivers will follow legal speed limits at all times.	Included in operator's O&M costs	Operator	MPWT

Activity	Potential Environmental Impact	Mitigation Measures	Cost Estimate (USD)	Responsible Institution	
				Implement	Supervise
		65. Compaction of waste within the day it is deposited at the site and cover the waste weekly 66. 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 67. Washing wheels of vehicles before they leave site if they are muddy from accessing the landfill cells to prevent dust increasing to nearby houses 68. Maintenance of the tree screen at the site boundary to reduce noise, dust and odors			
Landfill Operation	Occupational Health and Safety	69. The operator will detail how the health and safety of the staff at the site will be protected. This will include: p) Measures taken during handling of waste including sorting any waste to segregate recyclables q) Personal protective equipment provision and enforcement of its use r) Health testing (frequency and parameters e.g. for Hepatitis B and tetanus) s) Emergency and Incident Management including prompt medical attention for cuts to prevent contact with the incoming loads or feedstock t) Good housekeeping measures e.g. Clean and wash with disinfectant the welfare facilities weekly and building and equipment every 4 weeks u) 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.	Included in operator's O&M costs	Operator	MPWT
Landfill Operation	Community Health and Safety	70. The operator will detail how the health and safety of the public will be protected. This will include: 71. Measures taken to prevent unauthorized access to the site 72. Measures taken to prevent scavenging/picking by members of the public 73. Staff training on how to manage unauthorised access e.g. by waste pickers	Included in operator's O&M costs	Operator	MPWT
Landfill Operation	Community Health and Safety	74. Quarterly meetings with residents and / or their representatives to identify odor, pest dust, litter or other nuisance issues.	Included in operator's O&M costs	Operator/D PWT	MPWT
Landfill Operation	Waste picker Health and Safety	75. The operator will, for all waste pickers allowed access to the site, provide:	Included in operator's O&M costs	Operator/D PWT	MPWT

Activity	Potential Impact	Environmental	Mitigation Measures	Cost Estimate (USD)	Responsible Institution	
					Implement	Supervise
			a) Health check-ups and monitoring of children's and adults' health b) Protection from hazards through the use of gloves, footwear, masks and tools to sort waste c) Vaccination against tetanus d) In addition, further measures include: e) Sound landfill operations to reduce pests f) Provision of high-visibility clothing for any waste picker and prevent access to active tipping face.			

5. MONITORING PLAN

23. The project monitoring required by the EMP and its costs is shown in Table 6:

Table 6: Monitoring Type and Cost

Monitoring	Purpose	Estimated Cost or Source of Budget
1. Project readiness monitoring	Monitoring to check progress on project readiness and close gaps through corrective actions See Table 7	No additional cost, part of project activities
2. Project phase 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 See Table 8	\$8,000 (pre-construction) and \$23,800 (construction per year) see TABLE 8 PER YEAR COST
3. EMP compliance monitoring	To be conducted by the PMU and PMIS (I/NES and construction supervisors) to verify EMP compliance during project implementation See Table 9	No additional cost, part of project implementation activities
4. Affected People monitoring	A consultative approach. This is to be conducted by the PIU via consulting affected people on the impacts during construction. See Table 9	No additional cost, part of project implementation activities
5. Operational phase environmental quality monitoring	This is required as part of the operation of the landfill and will be undertaken by the relevant government department or a nominated private sector operator See Table 8	Included in operator O&M costs

24. 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.

25. The selected operators, private sector or government, will bear all environmental monitoring and reporting costs during the operational stage.

5.1. Project Readiness Monitoring for Pursat Landfill

26. Before construction, the PMIS Consultant will monitor the project's readiness on environmental management based on a set of indicators and report it to ADB and PMU, see Table 7. 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 7: Project Readiness Assessment Indicators

Indicator	Criteria	Are the Criteria met? Yes/No	If No, What Corrective action is needed?	Date for Corrective Action Completion
1. EMP update	EMP updated after domestic EIA approval and detailed design & approved by ADB/MoE	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 MPWT staff as set out in the Institutional Arrangements for this EMP	Y/N		
	Nomination of government staff for PIU roles as set out in the Institutional Arrangements for this EMP	Y/N		
5. Bidding documents and contracts with environmental safeguards	Bidding documents and contracts incorporate the environmental activities and mitigation measures required by this EMP	Y/N		
	Bidding documents and contracts incorporate the Particular Conditions for bidding (see Annex 3)	Y/N		

6. EMP financial support	The required funds have been set aside for EMP implementation including training and capacity building	Y/N		
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5.2. Environmental Quality Monitoring

27. During construction, the impact on the sensitive environmental receptors will be monitored and compared against the relevant national standard. During operation, the relevant operator will be expected to maintain an adequate budget to ensure environmental monitoring can be undertaken as specified in Table 8.

Table 8: Environmental Quality Monitoring

Aspects/Parameters to be Monitored	Location	Means of Monitoring	Frequency	Estimated Cost (USD)*	Responsibility	
					Implement	Compliance Monitoring
A. Prior to Construction Phase (INCLUDED IN DOMESTIC IEIA COST)						
1 Ambient air quality PM10, SO2, NO2, CO2, O3, CH4	Site Boundary & Tuol Mkak village	Analytical methods outlined in the guideline of the MoE, or applied by MoE	Once	3,500	PMU/ (licensed Lab)	PMIS
2 Ambient noise levels Lmax, Lmin, Leq	Site Boundary & Tuol Mkak village	Analytical methods outlined in the guideline of the MoE, or applied by MoE.	Once	3,000		
3 Surface water quality pH, COD, BOD, TSS, NH4-N, Total Nitrogen, Total Phosphorus, oil and grease, Coliform	Pond adjacent to access road: 12°31'29.89"N, 103°58'51.66"E	Analytical methods outlined in Cambodia's Drinking Water Quality Standards, 2004	Once	750		
4 Groundwater quality pH, COD, Total hardness, total coliform, NH4-N, Total P, DO, TDS, Fe, As, Pb, Cr.	Tuol Mkak village	Analytical methods outlined in Cambodia's Drinking Water Quality Standards, 2004	Once	750		
5. Mine Clearance and Unexploded ordnance (16ha)	Included in Landfill Bill of Quantities					
Sub-Total (Prior to construction for baseline data)				8,000		
*Costs include laboratory analysis and associated costs of sampling such as transport and accommodation based on MoE quote						
B. Construction Phase						
6. Ambient air quality PM10, SO2, NO2, CO, O3, CH4 (Monitor only when construction activities occur within 250 m of nearest residential receptor)	Site Boundary & Tuol Mkak village nearest residential receptor	Analytical methods outlined in the guideline of the MoE: or applied by MoE.	Every 6 month during construction	7,000	Contractor (licensed lab)	PMU / PMIS
7. Ambient noise levels Lmax, Lmin, Leq (Monitor only when construction activities occur within 250 m of nearest residential receptor)	Site Boundary & Tuol Mkak village nearest residential receptor	Analytical methods outlined in the guideline of the MoE: or applied by MoE.	Once during construction	6,000		
8. Groundwater quality pH, COD, Total hardness, total coliform, NH4-N, Total P, DO, TDS, Fe, As, Pb, Cr.	Borehole drilled on site and Tuol Mkak village e	Analytical methods outlined in Cambodia's Drinking Water Quality Standards; 2004	Quarterly during construction	3,000		

9 Surface water quality pH, COD, BOD, TSS, NH4-N, Total Nitrogen, Total Phosphorus, oil and grease, Coliform	Pond adjacent to access road: 12°31'29.89"N, 103°58'51.66"E	Analytical methods outlined in Cambodia's Drinking Water Quality Standards, 2004	Quarterly during construction	3,000		
10. Field observation from related Ministry or department eg. MoE, DoE	Project location	Using field observation	Every 3 month	4,800 ¹	Contractor	MoE/DoE
Sub-Total (Construction) PER YEAR				23,800		
C. Operation Phase						
11. Ambient air quality PM10, SO2, NO2, CO, O3, CH4	Site Boundary & Tuol Mkak village nearest residential receptor	Analytical methods outlined in the guideline of the MoE, or applied by. MoE.	Every year	Included in O&M cost of Operator	Operator/ (licensed lab)	MPWT
12. Leachate Quality pH, COD, BOD, turbidity, total coliform, Total N, Total P, DO, TSS, Oil and grease, NH3, Nitrate, PO4, SO4, Cl, Pb and Temperature.	2 at sump at lower end of waste cell (where leachate gathers at pump area)	Analytical methods outlined in the guideline of the MoE, or applied by. MoE.	Once, Quarterly			
13. Groundwater quality pH, COD, Total hardness, total coliform, NH4-N, Total P, DO, TDS, Fe, As, Pb, Cr.	2 within site and 1 outside site	Analytical methods outline in Cambodia's drinking water quality standards, 2004	Once, Quarterly			
Waste picker health and safety	Landfill site	Health checks Vaccination records Use of PPE	Annual	Included in O&M cost of Operator	Operator	MPWT/Ministry of Labour and Vocational Training

5.3. EMP Compliance and Affected People Monitoring

28. In order for the EMP to be effective, all its mitigation measures must be monitored to ensure they are implemented, see Table 9. 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.

Table 9: EMP Compliance and AP Monitoring

¹ Budgets for MoE staffs to monitor on environmental problem during construction stage.

Environmental Indicators	Location	Method & Frequency	Responsibility		Estimated Costs (USD)
			Verification	Implementation	
Construction Phase – All Subprojects					
Air Quality	Civil works sites	Monthly checking against mitigation measures specified in this EMP	PMIS -NES	PMIS-CSC	Included in CSC contract
Noise	Civil works sites	Monthly checking against mitigation measures specified in this EMP	PMIS -NES	PMIS-CSC	Included in CSC contract
Flora	Civil works sites	Monthly checking against mitigation measures specified in this EMP	PMIS -NES	PMIS-CSC	Included in CSC contract
Water Quality	Civil works sites	Monthly checking against mitigation measures specified in this EMP	PMIS -NES	PMIS-CSC	Included in CSC contract
Soil and land resources	Quarries, Borrow and Spoil Disposal Sites	Monthly checking against mitigation measures specified in this EMP	PMIS -NES	PMIS-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	PMIS -NES	PMIS-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	PMIS -NES	PMIS-CSC Contractor EHS	Included in CSC contract
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	PMIS -NES	PMIS-CSC	Included in CSC contract
Community Issues - At all construction locations - 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		Consultation interview with Affected People Using the form in Annex 1 4-6 weeks after construction starts Every 2 months until end of construction	PMU-ESO	PIU-ESC	Included in PIU staff/travel budget

5.4. Environmental Policy and Standards

29. The construction and operation phases of the projects shall follow relevant environmental quality standards. These are presented in Annex 4 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 AND PARTICIPATION

30. The Consolidated IEE for this subproject contains details of the consultation undertaken during preparation of these subprojects. For CW06 (Lot 2) Variation Orders 1 and 2, the same geographic scope and type of impacts as the existing sub-project meant no further consultation with affected people on the project design was required

31. In addition, consultation will take place during implementation. The PIU and PMU will collaborate to 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. subproject

32. 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 1. This will contribute to project monitoring.

7. GRIEVANCE REDRESS MECHANISM

7.1. Objective

33. 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 and is free of charge.

34. The GRM is set out here in accordance with the approved approach established during Project Preparation, which remains valid. This is a separate grievance system to that managed by General Department of Resettlement which deals with resettlement issues only.

7.2. Proposed Approach

35. The following roles and responsibilities for the GRM is set out in **Table 10**.

Table 10: GRM Roles and Responsibilities

Role	Responsibilities in GRM
MPWT / Executing Agency	- Establish the GRM - Set up a Grievance Redress Committee (GRC)
Grievance Redress Committee	Members: - Sangkat representative - Village leaders or representative - PIU-ESC - PMU-ESO - Municipality representatives - Provincial representatives Function: - GRM Access Point and Decision Making - Monitor and record complaints
PMU-ESO	- Oversight of GRM implementation and use - Co-ordination with PIU-ESC - GRM Record keeping and document storage of all GRM complaints (Formal or Informal) - Contact with ADB if Affected People appeal the process - GRM reporting
PIU-ESC	- GRM implementation at the town level - Responsible for keeping the PMU informed
Contractor	Entry point for affected people during construction
Local Government Institutions (Village representative, Sangkat representative, Municipal government representative)	Entry point for affected people during construction

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7.3. Access to the Mechanism

36. The PMU-ESO and counterparts in the PIUs, will ensure that:

- the public, especially the residents and business owners, in the main areas of influence of the subprojects, are aware of their rights to access, and will have access to, the GRM free of administrative and legal charges;
- the GRM is fully disclosed prior to construction: (a) in public consultations or social/community events, (b) through posters displayed in the offices of the PMU, PIU, Municipality and concerned Villages/Sangkats and at strategic places within the main areas of influence of subprojects (posters to include names and contact details of the PMU-ESO and PIU-ESC); and (c) sign boards at construction sites.
- Access points will participate in GRM issues and will include:
 - (i) Village representative, e.g. Village Chief
 - (ii) Sangkat representative e.g. from Sangkat Committee
 - (iii) Municipal government representative
 - (iv) PIU-ESC and PMU-ESO

7.4. Communication on the GRM: Project Hotline

37. The GRM will be communicated to the public and affected people as a Project Hotline; this is considered to be more resonant with people than a 'grievance redress mechanism'. This will include a project hotline notice board to be located in each active construction site for all subprojects which must include three locations around the town in for the drainage and sewage network construction and construction camps and staging areas.

38. The project hotline notice board will include the following information and will require a designated telephone number which is for the project and not personal to individual members of staff

Project Hotline

Project: Construction of [drainage and sewage network / Wastewater Treatment Plant / or landfill] in [town]

For suggestions, questions or problems related to the project, please contact any of these phone numbers: Call, SMS or Telegram

Name	Role or Company	Phone Number
	Project Management Office, Ministry of Public Works and Transport, Phnom Penh,	
	Project Implementation Office, Phnom Penh, Department of Public Works and Transport, [Town]	
	Sangkat [town]	
	Village Chief, [village]	
	Construction Contractor, [company name]	
	Construction Site Supervisor, Project Management and Implementation Consultants	

You can also contact ADB directly:

ADB, Phnom Penh Office:

[Name] and [Phone Number] and [email address]

ADB Southeast Asia Department of ADB, Manila, Philippines:

[Name] and [Phone Number] and [email address]

7.5. Recording Project Hotline or GRM issues: Steps and Timeline

39. Complaints should be managed centrally by the PMU-ESO. Records should be kept of complaints made to the other access points, and the date they were passed to PMU for investigation but the main burden of recording detailed information should be on the PMU-ESO. All complaints should be compiled centrally by PMU-ESO to ensure none are missed and trends are identified. This should include all formal and informal complaints and their resolution.

40. For comments, suggestions or minor issues that can be managed within the construction area, the Hotline Access Point will record the following information, and will inform the PMU:

Table 11: Project Hotline Informal Contact with Affected People

TIMING	For Hotline Access Point Person	
Day 1	Date of Contact to Hotline [or verbal contact with GRM access point]	Example: 25-08-19
	Name of Person & Contact Details [If Given]	K. Srey, 012 90129901
	Construction Site / Project Activity [relevant to person]	Wastewater treatment site
	Suggestion / Comment / Complaint: [give detail]	Suggestion: Contractor moves broken concrete pile away from path to improve access
	Date PMU (Phnom Penh) Informed:	26-08-19
	Name of Person in PMU Informed:	T. Pheap, PMU-ESO
Day 2	Action Taken: [for suggestions / comments, for questions, for complaints]	Site Supervisor informed. Concrete moved the next day.
	For PMU: Follow Up	
Day 4	Follow Up with Affected Person [date of call, site visit, evidence e.g. photograph from AP or Hotline Access Point]	Called K. Srey. Confirmed concrete moved and access is clear
	Further action or resolved? [describe if the problem is solved or action needed]	Resolved

41. For issues that cannot be resolved on site, by discussion with the contractor, the PMU will use the following table to record and resolve the issue.

Table 12: Project Hotline Formal Contact with Affected People

TIMING	For Hotline Access Point Person	
Day 1	1. Date of Contact to Hotline [or verbal contact with GRM access point]	<i>Example 22-02-19</i>
	2. Name of Person & Contact Details [If Given]	<i>D. Than, 092 90129901</i>
	3. Construction Site / Project Activity [relevant to person]	<i>Drain excavation</i>
	4. Suggestion / Comment / Complaint: [give detail]	<i>Complaint: Contractor has cut off water supply to house</i>
	5. Date PMU (Phnom Penh) Informed:	<i>22-02-19</i>
	6. Name of Person in PMU Informed:	<i>T. Pheap, PMU-ESO</i>
Day 2	7. Action Taken: [for suggestions / comments, for questions, for complaints]	<i>Site Supervisor informed. Contractor disagrees.</i>
	For PMU: Follow Up	
Day 4	8. Follow Up with Affected Person [date of call, site visit, evidence e.g. photograph from AP or Hotline Access Point]	<i>Called D. Than. Confirmed water supply not restored</i>
	9. Further action or resolved? [describe if the problem is solved or action needed]	<i>Not resolved Contractor disagrees. Water supply was never connected.</i>
	For PMU if Complaint Not Resolved:	

Day 5	10. Complaint Screening: [explain why it is valid/not valid]	<i>Valid complaint. All houses in the road have a water supply.</i>
	11. Date Person informed of Screening [tell affected person if PMU considers the complaint valid]	<i>26-02-19</i>
Day 6-7	12. Investigation & Agreement [discuss on site with PMU, PIU, Contractor and others as required. Identify a solution]	<i>Meeting on site. Contractor will replace the PVC water pipe. Agreed on 28-02-19</i>
	13. Date for implementing resolution [to be completed within 15 days of initial complaint]	<i>30-02-19</i>
Day 16	14. Implementation Follow Up [Contact PIU/Contractor/Site Supervisor and get evidence from site e.g. photographs of completed works]	<i>PIU photos via Telegram of completed pipe work. Discussed with contractor by phone</i>
Day 20	15. Solution Satisfaction Follow Up [Contact Affected Person, obtain signed letter of satisfaction that complaint resolved]	<i>Call to D. Than. Water supply restored. Letter is signed. PIU sent copy via Telegram</i>

42. Informal Approach (minor issues). Informally, an affected person (AP) can give a suggestion, comment, question or complaint through:

- Directly to the Contractor during construction;
- Directly to any other Access Point such as village chief; or
- Use the project hotline contact numbers.

43. During operation the affected people will be required to contact the operator as the project hotline approach and PMU, as an office, will no longer be operating.

44. The contractor will initially ensure its worker /staff member hands a GRM Contact Card (required by this EMP) to the complainant. The contractor will also immediately inform the PMU of the comment/question/complaint.

45. For minor issues, if possible the contractor, will rectify the problem within one day of any complaint or implementable suggestion. For more significant issues, that may require changes to construction practices, project design or additional budget, the PMU will use the formal approach to managing the affected persons comments/complaints.

46. Formal Approach (significant issues). If the issue cannot be resolved informally or the affected person is not satisfied with the resolution so far, the PMU will be required to screen the complaint and engage with other stakeholders as needed to find a solution. As set out in Table 12 the steps to be followed by the PMU are:

- **Complaint Screening.** Screening to check the complaint is valid i.e. is as a result of the project activities. Affected Person is immediately informed of the screening results. If the complaint/issue is screened as non-Project-related and/or invalid, the affected person will be advised that he/she can raise his/her complaint to the second stage of the complaint process; and the PMU-ESO will formally forward the complaint to the District Office
- **Investigation & Agreement.** PIU, Contractor and affected person will discuss the complaint at the site within 2 days of screening. Agreement on actions and measures and a date for implementation of resolution will be agreed. Agreement will be documented using Table 12 and filed by PMU-ESO; PIU, AP, Contractor/Operator will have copies.
- **Implementation Follow Up.** PMU-ESO will follow up to check the implementation of the resolution. The PMU-ESO will obtain evidence on implementation through, site visit and /or photographs and will contact the contractor, PIU and Site Supervisor.
- **Solution Satisfaction Follow Up.** Four days after implementation of the solution the PMU-ESO will contact the affected person to confirm that the solution is working. PIU will secure

a written confirmation of satisfaction from the affected person and will forward this to the PMU-ESO.

7.6. Managing Unresolved Complaints

47. District Level. For actions not taken within the agreed timeframe and when affected person is dissatisfied with the action taken at the First Stage, the person can raise a complaint to the District Office GRC Representative. The District Office has 15 days within which to resolve the complaint to the satisfaction of all concerned. If the complaint cannot be solved at this stage, the District Office will bring the case to the Provincial Grievance Redress Committee representative.

48. Provincial Level Appeal. If the affected person remains 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.

- Within 30 days of the submission of the grievance, the Provincial GRC representative must make a written decision and submit copies to the MPWT, GRC members and the affected person.
- If appeal is found not valid, the provincial authority shall write the affected person and declare the grievance closed. In the event of an appeal, the MPWT shall immediately report to the PMU. The PMU shall inform ADB immediately.

49. ADB Intervention. If a resolution is not found, affected people should be encouraged to contact the i) ADB Cambodia Resident Mission or ii) the Southeast Asia Department of ADB in Manila. Finally the Accountability Mechanism of the ADB can be used. The Affected Person should contact the Complaints Receiving Officer of the ADB via the following addresses:

Complaints Receiving Officer, Accountability Mechanism

Asian Development Bank

ADB Headquarters, 6 ADB Avenue, Mandaluyong City 1550, Metro Manila, Philippines

(+632) 632-4444 loc. 70309

(+632) 636 2086

amcro@adb.org

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

50. ADB 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

51. The Project's GRM should not impede access to the country's jurisdiction or administrative remedies. Accessing the country's legal system and GRM can be done at the same time. If efforts to resolve disputes using the grievance procedures remain unresolved or unsatisfactory, the AP has the right to directly discuss his/her concern/complaint with ADB.

52. The PMU-ESO will record all complaints, suggestions, comments including those dealt with within the project site and those elevated to the GRC. This will include all resolutions and satisfaction of affected people.

53. The number of grievances recorded and resolved, and the outcomes will be displayed at the offices of PIU, PMU and Municipality and reported in the monthly progress reports, semi-annual monitoring reports during construction and annual monitoring reports during operation, submitted to ADB.

54. All costs involved in resolving complaints (meetings, consultations, communication and reporting/information dissemination) will be borne by the PMU. In cases where affected people do not have the writing skills or are unable to express their grievances verbally, they may seek third-party assistance.

8. REPORTING

55. Environmental monitoring reports will be prepared semi-annually for the EA by the Project Management and Implementation Support consultants in collaboration with PMU's Environmental Safeguard Officer and sent to MPWT's Environmental Safeguard Office, 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 13 gives reporting requirements.

Table 13. Reporting Requirements

	Report	Frequency	Purpose	From	To
1	Contractors' Progress Report	Monthly	Environment, Health and Safety Progress include COVID-19 issues	Contractor	PMU
2	CSC EMP Monitoring Report	Monthly	EMP Implementation Progress	CSC	PMU/PMIS
3	Site Visit report	Monthly	Verify EMP implementation Confirm EMP and GRM are working (consultation and observation)	National Env Specialist with PIU-ESC (PMU verify)	PMU/PMIS
4	Environmental quality Monitoring	Varies - as per monitoring table in EMP	Relevant environmental parameters,	Contractor (or laboratory)	PMU (PMU-ESO to send to EA)
5	Environmental Monitoring Report (Integrated safeguards monitoring report format)	Semi-Annual	Full EMP Implementation and Adherence to Environmental Covenants/Conditions	PMU	ADB
6	Landfill Operations	Quarterly	Tonnages collected, Groundwater Quality, operator 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 or update the IEE.

9. CONCLUSION

57. 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.

58. The most significant impacts from the project will arise from landfill operations. As a result, there is a comprehensive training and capacity building component to the project which is essential for ensuring the investment is financially and environmentally sustainable and beneficial.

59. A robust Grievance Redress Mechanism will be established. It will ensure that all unplanned impacts which cause grievances for affected people are managed swiftly and a satisfactory outcome brought about.

60. Overall, the project is anticipated to bring environmental benefits to the city and its residents. It will serve to improve the current waste management situation and will provide long term environmental improvements.

Annex 1 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> <i>When did it disturb the person? E.g. all day, at night, intermittently</i>	
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? <i>E.g. wastewater concerns, waste disposal, Other concerns, labour force,</i>	

Annex 2 GRM – Complaint Recording Form

PIU Staff Responsible: (name and role)	
Date: (of this record)	
Date of Complaint:	
Date Resolution Required by (5-10 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 3 Particular Conditions (For Bidding Documents)

61. The following clauses shall be added to the Bidding Document, Section 8 Particular Conditions in relation to the Environmental Safeguards for the Project:

62. 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).

63. 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.

64. 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.

65. 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 4 Environmental Quality Standards

(1) Ambient Air Quality Standards

Source: Sub-decree **No. 42 ANRK.BK** on Air Pollution Control and Noise Disturbance, MoE 2000.

Parameter	Averaging Period	Standard	
		Unit	Value
Nitrogen Dioxide (NO ₂)	24 hours	mg /m ³	0.1
Sulfur Dioxide (SO ₂)	24 hours	mg /m ³	0.3
Carbon Monoxide (CO)	8 hours	mg /m ³	20
PM 2.5 (use WHO value in Cambodia)	24 hours	mg /m ³	0.025
PM 10 (use WHO value in Cambodia)	24 hours	mg /m ³	0.05

(2) Ambient Noise Standards

Source: Sub-decree **No. 42 ANRK.BK** on Air Pollution Control and Noise Disturbance, MoE , 2000 and WHO. Bold highlights most stringent standard to be followed.

Areas	Time Period (24 hours)	Standard	
		National Standard (dB(A))	WHO Community Noise (dB(A))
RES: Residential Area MIX: Mixed Residential and Small Industries Area I&C: Industrial and Commercial	Day time (from 6:00am to 6:00pm)	RES: 60 MIX: 75	RES: 55 (serious annoyance) RES: 50 (moderate annoyance) I&C: 70 (hearing impairment)
	Evening Time (from 6:00pm to 10:00pm)	RES: 50 MIX: 70	RES: 55 (moderate annoyance) I&C: 60 (hearing impairment)
	Night time (from 10:00pm to 6:00am)	RES: 45 MIX: 50	RES: 45 (moderate annoyance) I&C: 60 (hearing impairment)

(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 public water area	Public water area and sewer
1	Temperature	OC	< 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 (NO ₃)	mg/l	< 10	< 20
11	Chlorine (free)	mg/l	< 1.0	< 2.0
12	Chloride (ion)	mg/l	< 500	< 700
13	Sulphate (as SO ₄)	mg/l	< 300	< 500
14	Sulphide (as Sulphur)	mg/l	< 0.2	< 1.0
15	Phosphate (PO ₄)	mg/l	< 3.0	< 6.0
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
BOD ₅	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 (ground and surface water) in public water areas for public health protection (not non-potable water)

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 (for drinking) from Ministry of Handicrafts and Industry Based on WHO (2003) Standards

Parameter	Standard	
	Unit	Value
pH	-	6.5-8.5
Turbidity	NTU	5.0
Chloride (Cl ⁻)	mg/l	250
Sulphate (SO ₄)	mg/l	250
Aluminum (Al)	mg/l	0.2
Copper (Cu)	mg/l	1.0
Iron (Fe)	mg/l	0.3
Manganese (Mn)	mg/l	0.1
Zinc (Zn)	mg/l	3.0
Total Coli form	MPN/100ml	0
Mercury (Hg)	mg/l	0.001
Lead (Pb)	mg/l	0.01
Arsenic (As)	mg/l	0.05
Nitrate (NO ₃)	mg/l	50
Nitrite (NO ₂)	mg/l	3

(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 public water area)	Value (Public water area and sewer)
1	Temperature	0C	< 45	< 45
2	pH		6 – 9	5 - 9
3	BOD ₅ (5 days at 200 C)	mg/l	< 30	< 80
4	COD	mg/l	< 50	< 100

5	Total Suspended Solids	mg/l	< 50	< 80
6	Total Dissolved Solids	mg/l	< 1000	< 2000
7	Grease and Oil	mg/l	< 5.0	< 15
8	Detergents	mg/l	< 5.0	< 15
9	Phenols	mg/l	< 0.1	< 1.2
10	Nitrate (NO ₃)	mg/l	< 10	< 20
11	Chlorine (free)	mg/l	< 1.0	< 2.0
12	Chloride (ion)	mg/l	< 500	< 700
13	Sulphate (as SO ₄)	mg/l	< 300	< 500
14	Sulphide (as Sulphur)	mg/l	< 0.2	< 1.0
15	Phosphate (PO ₄)	mg/l	< 3.0	< 6.0
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