Initial Environmental Examination

December 2021

Cambodia: Integrated Urban Environmental Management in the Tonle Sap Basin Project - Kampong Chhnang Sewerage, Flood Protection and Wastewater Treatment 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 July 2021 available on https://www.adb.org/projects/documents/cam-42285-013-iee-1.

ABBREVIATIONS

ADB	–	Asian Development Bank
AOI	–	Area of Influence
AP	–	affected person
CEMP	–	Contractor's Environmental Management Plan
CITES	–	Convention on International Trade in Endangered Species
CRVA	–	Climate Risk and Vulnerability Assessment
EIA	–	environmental impact assessment
EA	–	Executive Agency
EMP	–	environmental management plan
EHS	–	Environment, Health and Safety
EHSO	–	Environmental, Health and Safety Officer
ESO	–	Environmental Safeguard Office
GRM	–	Grievance Redress Mechanism
GRC	–	Grievance Redress Committee
H&S	–	Health and Safety
IEE	–	initial environmental examination
IESIA	–	initial environmental and social impact assessment
IFC	–	International Finance Corporation
ILO		International Labor Organization
MBBR	-	Moving Bed Biofilm Reactor
MoE	–	Ministry of Environment
MPWT	–	Ministry of Public Works and Transport
MRC	–	Mekong River Commission
O&M	–	operation and maintenance
PDoE	–	Provincial Department of Environment
PDPWT	–	Provincial Department of Public Works and Transport
PMIS	–	project management and implementation support
PIB	–	Public Information Booklet
PIU	–	project implementation unit
PMU	–	project management unit
PAM	–	Project Administration Manual
PSC	–	project steering committee
PPTA	–	Project Preparation Technical Assistance
RCP	–	Representative Concentration Pathway
SPS	–	Safeguard Policy Statement
SES	–	Socio Economic Survey
SWM	–	Solid Waste Management
UNESCO	–	United Nations Educational, Scientific and Cultural Organization
UXO	–	Unexploded Ordnance
WHO	–	World Health Organization
WWTP	–	waste water treatment plant

WEIGHTS AND MEASURES

^{o}C	–	Degrees centigrade
ha	–	hectare/s
km	–	kilometer/s
km^2	–	square kilometer/s
m	–	meter
m^3	–	cubic meters
masl	–	meters above sea level
Mld	-	Million liters per day
mg/l	–	milligram/s per liter

GLOSSARY

Boeung	–	Khmer word for lake
Tonle	–	Khmer word for river

NOTE

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

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EXECUTIVE SUMMARY

A. Introduction

1. This Initial Environmental Examination (IEE) covers a change of scope to the Integrated Urban Environmental Management in the Tonle Sap Basin Project (known as 'the Project'). Two original IEEs were disclosed in 2014. A consolidated IEE was developed and updated to accommodate further project scope changes in 2018-2019, during the detailed design and implementation phase. This IEE, updated with the final engineering design in 2021, covers a new Subproject in Kampong Chhnang. This follows a further major scope change to the Project which now includes:

- Waste water treatment plant (WWTP), sewage collection network and storm water drainage improvements

2. The Subproject will improve urban services in Kampong Chhnang and enhance climate resilience. The town currently has no sewage treatment; sewage is discharged untreated in storm water outfalls across the town. The WWTP site and its access road will be protected from flooding by land raising to an appropriate level given climate predictions. In the urban core, flooding from rainstorms will be reduced through improvements to the storm drainage network. The improvements will include cutting off sewage inflows to the storm water network and providing household connections to the sewerage network.

3. The Subproject is classified as category B for environment as confirmed during the project preparation. The Subproject requires an Initial Environmental and Social Impact Assessment (IESIA) under Cambodian law prior to construction; the IESIA was approved by the Ministry of Environment in September 2021.

B. Key Findings and Mitigation Measures

4. The environmental baseline study confirms that the local communities are the most sensitive receptors in the project area. The installation of the sewer network will impact most significantly on people living and working in the area during construction. The impacts will be localized and short term but will include increased levels of dust, noise and traffic in Kampong Chhnang town centre. This may give rise to community health and safely impacts and restricted access to business and residential properties.

5. The mitigation of these impacts in the Environmental Management Plan (EMP) focuses on good construction practice to ensure the communities' health and safety is not put at risk from trench excavations, and to control dust and noise through water spraying and use of mobile noise barriers to protect local residents and businesses. The EMP also requires good communication with the community to inform them in advance of the construction works and associated traffic disruption.

6. The Subproject also poses occupational health and safety risks to construction workers and operators. In particular for construction work, the EMP includes mitigation measures to ensure the reduction of accidents and incidents, including releases to the environment, are minimized to acceptable levels. This also requires the contractor to put in place measures to protect workers from any potential risks from COVID-19. Similarly, for the operational phase, the EMP requires the operator to consider and plan for Health and Safety including business continuity during the on-going COVID-19 crisis which may re-emerge when the site is operational.

7. The WWTP effluent is discharged into Boeung Tum, a lake adjacent to the site. It is used to a limited extent by residents for household uses and occasional fishing. This lake and the area to the East of the National Road is part of the Tonle Sap Biosphere Reserve. It is in Zone 2, where development activities are allowed, with permission from Tonle Sap Authority. There will be

moderate environmental impacts from the operation of the WWTP. The discharge of effluent during operation which does not meet discharge standards due to operational inadequacies offers the most significant potential risk of the project. The operation of the site will be required to meet design standards throughout its operational life in order to mitigate the environmental impacts of point source effluent discharge. In addition, there will be inherent long-term odor impacts from a WWTP. The design includes comprehensive sludge management, comprising sludge drying beds and composting area within the WWTP site, which will render the sludge harmless and allow it to be put to beneficial use.

8. In summary, short term impacts associated with construction and traffic disruption in an urban area are likely to occur, however the most significant long-term environment risks associated with the Subproject are during the operation phase. The WWTP can cause environmental pollution if it is not managed and maintained effectively. A pollution event either acute or over the long term, and can cause risks to water quality from WWTP effluent discharges or improper sludge disposal from maintenance of the WWTP or sewer and drainage networks. The impacts from poor quality effluent may vary considerably depending on the flood state of the surrounding environment. A comprehensive Operation and Maintenance manual, with Standard Operating Procedures and guidance will be provided by the Project to the operators.

9. The EMP aims to avoid impacts where possible and mitigate those impacts which cannot be eliminated to an acceptable and minimum level. This IEE and its EMP includes detailed requirements for:

- Mitigation and monitoring measures;
- Institutional arrangements and project responsibilities;
- EMP budget for implementation
- Capacity building and training requirements
- Public consultation and information disclosure
- GRM including clearly defined timescale and responsibilities

10. This IEE recognizes that its scope is for an additional Subproject, within the wider existing on-going Project. As such, the GRM for the Subproject is based on that which is already functioning for the Project's other Subprojects. In addition, the training and capacity building requirements build on that which have already been given and provides for refresher training for project staff, as well as ensuring any new GRM access points are fully trained in their responsibilities.

C. Conclusion

11. The main project risks relate to environment include: (i) low institutional capacity for environmental management and the possibility that the Project Management Unit (PMU) and Implementing Agency or operator will not adequately monitor the environmental impacts and implement the EMP during the construction and operation of the project; (ii) the PMU and Implementing Agency omit to implement corrective actions as issues arise during project implementation (iii) inadequate budget is allocated for maintenance of the sewerage and drainage network, WWTP meaning the environmental benefits are not realized.

12. This IEE was undertaken to determine the environmental issues and concerns associated with the Subproject and was updated with the detailed engineering design. As a result of understanding the environmental baseline, receptors and project activities, an EMP is developed also based on the detailed engineering design. The EMP, if implemented effectively, will mitigate impacts on the natural environment and affected people to an acceptable level.

13. Overall, the project is anticipated to bring environmental benefits to Kampong Chhnang and will provide long term environmental improvements and health benefits for residents and visitors.

I. INTRODUCTION

A. Background and introduction

1. This Initial Environmental Examination (IEE) covers a change of scope to the Integrated Urban Environmental Management in the Tonle Sap Basin Project (known as 'the Project'). Two original IEEs were disclosed in 2014 for Kampong Chhnang1 and Pursat.[2]

2. A consolidated IEE was developed and updated to accommodate further project scope changes in 2018-2019 during the detailed design and implementation phase. This consolidated IEE was disclosed in ADB's website in July 2020.[3] Changes in the consolidated IEE in 2018-2019 included:

- Changes to approach for Pursat waste water treatment and network location;
- Removal of landfill closure from project scope;
- Removal of Pursat riverbank erosion protection; and
- Removal of Kampong Chhnang embankment from project scope.

3. This IEE covers a new Subproject in Kampong Chhnang. This follows a further major scope change to the Project which now includes:

- Waste water treatment plant (WWTP), sewage collection network and storm water drainage improvements.

4. In July 2021, this IEE was updated based on the final Detailed Engineering Design (DED) for the Subproject. A separate draft Environmental Management Plan (EMP) was prepared for the procurement process which also incorporated the final DED. In December 2021, this version of the IEE and the corresponding EMP were updated based on the findings and recommendations of the national Environmental Assessment process. This latest IEE version supersedes all other previously disclosed versions.

5. As set out in the Project Administration Manual (PAM), the Project will contribute to increased economic activities and environmental protection in towns in the Tonle Sap Basin. It responds to the need of municipal governments for integrated urban environmental management in urban areas around Tonle Sap Lake.

6. The Project is located in the two secondary cities of Pursat town, Pursat Province and Kampong Chhnang town, Kampong Chhnang Province. The Project outputs are:

- Output 1: Kampong Chhnang Urban Area Environment Improvements
  - 1a. improved solid waste management (SWM) collection, and disposal by controlled landfill.
  - 1b. waste water treatment, sewage network and storm water drainage.

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[1] Kingdom of Cambodia. Ministry of Public Works and Transport. 2014. *Initial Environment Examination: Kampong Chhnang Urban Area Environment Improvements* (prepared by ADB). Available here: www.adb.org/projects/documents/integrated-urban-environmental-management-tonle-sap-basin-kampong-chhnang-iee

[2] Kingdom of Cambodia. Ministry of Public Works and Transport. 2014. *Initial Environment Examination: Pursat Urban Area Environmental Improvements* (prepared by ADB) Available here: www.adb.org/projects/documents/integrated-urban-environmental-management-tonle-sap-basin-pursat-iee

[3] Kingdom of Cambodia. Ministry of Public Works and Transport. 2020. *Initial Environment Examination: Pursat and Kampong Chhnang Urban Area Environmental Improvements* (prepared by ADB)

- Output 2: Pursat Urban Area Environment Improvements
  2a. improved SWM collection, and disposal by controlled landfill.
  2b. waste water treatment, sewage network and drainage.
- Output 3: Community Mobilization and Environment Improvements.
- Output 4: Strengthened Sector Coordination and Operations.
- Output 5: Strengthened Capacity for Project Implementation, Operation and Maintenance.

B. ADB and Domestic Environmental Due Diligence

7. The project classification of environment category B has been confirmed during project preparation. This IEE and corresponding Environmental Management Plan (EMP) is updated, based on the detailed design phase and the updated EMP will be included in the bidding documents for the Project. The IEE has been undertaken in accordance with ADB Safeguards Policy Statement (SPS) 2009.

8. **Scope of IEE.** This IEE covers Project Outputs 1b only i.e. the new Kampong Chhnang Subproject and its major physical infrastructure interventions.

9. Output 1a and 2 are covered in the consolidated IEE for the Project. Output 3 is covered by an Environmental Assessment and Review Framework which was developed during the project preparation. Outputs 4 and 5 contribute to effective implementation and operation of Outputs 1 and 2, therefore will contribute to environmental performance.

10. An approved company registered with the Ministry of Environment (MoE) has been engaged to undertake a separate Initial Environmental and Social Impact Assessment (IESIA) for the subproject. The results of the IESIA are incorporated into this version of the IEE and corresponding EMP ensuring that the contractor has one consolidated set of EMP requirements to follow, which meet good international practice standards and national requirements. The Ministry of Environment, approved the IESIA in September 2021. A copy of the Approval Letter in Khmer and English are provided in Annex1.

C. Structure of This Report

11. This IEE report follows the format prescribed in ADB SPS 2009 including:

- The policy legal and administrative framework;
- A description of the project the subproject;
- The environmental baseline for the subproject locations;
- Information on disclosure and consultation for this IEE;
- A Grievance Redress Mechanism for the subproject; and
- Environmental Management Plan for the subproject, updated with the final Detailed Engineering Design (DED).

II. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

A. Environmental Assessment Requirements

12. **ADB Requirements.** Safeguard requirements for all projects funded by ADB are defined in SPS 2009 which establishes an environmental review and assessment process to ensure that projects funded through ADB loans are environmentally sound; are designed to operate in compliance with applicable regulatory requirements; and are not likely to cause significant environmental, health, or safety hazards. SPS 2009 is underpinned by the ADB Operations Manual, Bank Policy (OM Section F1/BP, October 2013). The policy also promotes adoption of international good practice as reflected the World Bank Group's Environmental, Health and Safety (EHS) Guidelines. This IEE is intended to meet SPS 2009 requirements.

13. SPS 2009 environmental assessment requirements specify that:

- At an early stage of project preparation, the borrower/client will identify potential direct, indirect, cumulative, and induced environmental impacts on and risks to physical, biological, socioeconomic, and cultural resources and determine their significance and scope, in consultation with stakeholders, including affected people and concerned nongovernment organizations. If potentially adverse environmental impacts and risks are identified, the borrower/client will undertake an environmental assessment as early as possible in the project cycle;
- The assessment process will be based on current information, including an accurate project description, and appropriate environmental and social baseline data;
- Impacts and risks will be analyzed in the context of the project's area of influence;
- Environmental impacts and risks will be analyzed for all relevant stages of the project cycle, including preconstruction, construction, operations, decommissioning, and post-closure activities such as rehabilitation or restoration; and
- The assessment will identify potential transboundary effects as well as global impacts.

14. Other requirements of SPS 2009 include:

- Alternatives analysis. SPS 2009 states that this is only required for projects which have ''significant adverse environmental impacts that are irreversible, diverse, or unprecedented'' i.e., category A projects. This does not apply to this category B IEE
- Environmental management plan. The borrower/client will prepare an EMP that addresses the potential impacts and risks identified by the environmental assessment.
- Consultation and participation. The borrower/client will carry out meaningful consultation with affected people and other concerned stakeholders, including civil society, and facilitate their informed participation.
- Information disclosure. Environmental information on the project, including the IEE and other safeguards information will be disclosed in accordance with ADB's Public Communications Policy (2011) and SPS (2009). In addition: (i) The EMP will be translated into Khmer language and be made available at each provincial department of public works and transport (PDPWT); (ii) The IEE will be disclosed on ADB's project website (www.adb.org);
- Grievance redress mechanism. The borrower/client will establish a mechanism to receive and facilitate resolution of affected people's concerns, complaints, and grievances about the project's environmental performance.
- Monitoring. The borrower/client will monitor and measure the progress of implementation of the EMP.

15. As stated in the "Guidelines for Climate Proofing Investments in the Water Sector: Water Supply and Sanitation, Climate Impacts", ADB (2016) there may be impacts from climate change on waste water treatment. Warmer temperatures can mean: (i) Increased operating challenges to

biological and chemical processes of treatment facilities; (ii) Increased temperatures and increased evaporation in receiving water bodies, changing chemical balances and increased eutrophication; (iii) Reduced capacity to meet waste water treatment requirements and standards. More frequent and/or intense extreme weather events can lead to: (i) increased risk of direct flood damage to treatment plant, pumping and conveyance, and outfall; and (ii) Increased risk of untreated sewage overflows contaminating water supply sources.

16. These climate change risks are assessed in the project Climate Resilience Vulnerability Assessment for the Project (April 2018) and are reflected where appropriate in this IEE and the final project designs.

17. **Domestic EIA Requirements**. Environmental assessment in Cambodia is governed by the Sub-decree on EIA Process No. 72 (No. 72 ANKR. BK 1999). This law provides the detailed guidelines for implementation of the EIA Process and the types of projects requiring the conduct of IESIA or EIA. The law applies to both private sector and Government projects.

18. This sub-decree was updated in February 2020 by Prakas on Environmental Impact Assessment Classification for Development Projects (No, 021 PRK.BST 2020). The Appendix to Prakas No. 021 specifies the projects which require an EIA, IESIA or a Contract on Environmental Protection. The classification is depending on the scale of the project. Section 6 'Infrastructure Sector' specifies the following, in the MoE English translation:

- #187 Natural/stabilization pond-based sewage water treatment and Drainage System facilities – IESIA required
- #172 Automatic / mechanical sewage water treatment and drainage system facilities – EIA required

19. The project has completed an MoE approved IESIA (approved September 2021, See Annex 1).

20. Further national EIA guidance is found in the Declaration on Guideline for Conducting IEIA and EIA Reports No. 376 (2009). This Declaration specifies the basic contents of IESIA/ESIA Reports, which should include: (i) introduction; (ii) legal framework; (iii) project description; (iv) description of the existing environment; (v) public participation; (vi) assessment of, and mitigation measures for, significant environmental impacts; (vii) environmental management plan; (viii) cost-benefit analysis; and (ix) conclusion and recommendations.

21. The Ministry of Environment (MoE) through its EIA Department regulates and monitors the EIA Process. The MoE is responsible for: (i) review and approval of IESIA/ESIA reports in collaboration with other relevant ministries and (ii) monitoring the EMP implementation of Project Proponents/Owners throughout the different project phases. MoE operates at the municipal and provincial levels through its Provincial Department of Environment (PDoE).

22. The project owner (public or private) is required to submit the necessary project document (IESIA/ESIA report) to MoE for review and approval. After submission of IESIA/ESIA report, it should take a maximum of 30 working days for a decision.

B. National Environmental Policy and Legislation

1. Legal Framework for Environmental Management

23. The hierarchy of legislation in Cambodia is:

- Royal Decree signed by the King;
- Sub-decree signed by the Prime Minister;
- Ministerial Decision signed by a Minister; and
- Regulation issued by a Ministry.

24. A Royal Decree ratifies laws passed by parliament. These can be supplemented by "Prakas" or ministerial decisions. These laws allow sub-decrees and regulations to be passed which can stipulate procedures and standards to be met in order to ensure compliance with the law. Many sub-decrees and standards have been drafted but have not yet been ratified by parliament.

2. Policies and legal instruments

25. Cambodia's main legal framework for addressing environmental protection, management of natural resources and public consultation is the Law on Environmental Protection and Natural Resource Management ('the Environment Law'), which was adopted in 1996.

26. The Environment Law has the following objectives:

- Protect and upgrade environmental quality and reduce pollution;
- Assess the impacts of proposed projects before approval;
- Ensure rational and sustainable use of the Kingdom's resources;
- Encourage public participation in environmental protection and natural resource management; and
- Reduce activities which impact negatively on the environment.

27. Specific regulations and standards for environmental quality are contained in the following sub-decrees:

- Sub-decree on Water Pollution Control (1999); and
- Sub-decree on Air Pollution Control and Noise Disturbance (2000)

28. A summary of legislative and policy instruments relevant to the project is presented in Table 1. The key environmental quality standards applied to the EMP for this IEE are listed in Table 2 and the key effluent standard is presented in detail in Table 3. The most stringent limit (national or international) shall apply.

Table 1 Relevant Laws, Regulations and Guidelines in Cambodia

Law/Regulation/Guideline	Year	Brief Description
Royal Decree on the Protection of Natural Areas	1993	Classifies the 23 protected areas in Cambodia into four categories, namely: (i) natural parks; (ii) wildlife sanctuaries; (iii) protected landscapes; and (iv) multiple-use areas. Designated the Tonle Sap (316,250 ha) as a multiple-use area or area necessary for the stability of the water, forestry, wildlife and fishery resources, for entertainment/ tourism, and for conservation of long-term existing natural resources with a view to assure sustainable economic development.
Royal Decree on the Establishment and Management of Tonle Sap Biosphere Reserve (Royal Decree No. NS/RKT/0401/070)	2001	Establishes the Tonle Sap Biosphere Reserve (TSBR) in accordance with the statutory framework of the World Network of Biosphere Reserves. Divides the TSBR into 3 zones: (i) core areas; (ii) buffer zone and (iii) flexible transition zone.
Protected Areas Law (Royal Decree No. NS/RKM/0208/007)	2008	Defines the framework of management, conservation & development of protected areas to ensure the conservation of biodiversity, & sustainable use of natural resources in protected areas. It divides the protected area into 4 zones namely, core zone, conservation zone, sustainable use zone & community zone.

Law/Regulation/Guideline	Year	Brief Description
		Article 36 strictly prohibits all types of public infrastructure in the Core Zone & Conservation Zone; & allows development of public infrastructures in the Sustainable Use Zone & Community Zone with approval from the Royal Government at MoE's request. Article 41 provides for the protection of each protected area against destructive/harmful practices, e.g., destroying water quality in all forms, poisoning, using chemical substances, disposing of solid and liquid wastes into water or on land.
Law on the Protection of Cultural Heritage (NS/RKM/0196/26)	1996	Regulates the protection of national cultural heritage and cultural property in general against illegal destruction, modification, alteration, excavation, alienation, exportation or importation. Its Article 37 stipulates that in case of chance find of a cultural property during construction, work should be stopped and the person who found the property should immediately make a declaration to the local police, who shall, in turn, transmit the property to the Provincial Governor without delay.
Law on Land	2001	Provides that: (i) unless it is in the public interest, no person may be deprived of ownership of his immovable property; and (ii) ownership deprivation shall be carried out according to legal forms and procedures and after an advanced payment of fair and just compensation. (Article 5)
Law on Water Resources Management	2007	Requires license/permit/written authorization for the: (i) abstraction & use of water resources other than for domestic purposes, watering for animal husbandry, fishing & irrigation of domestic gardens and orchards; (ii) extraction of sand, soil & gravel from the beds & banks of water courses, lakes, canals & reservoirs; (iii) filling of river, tributary, stream, natural lakes, canal & reservoir; and (iv) discharge, disposal or deposit of polluting substances that are likely to deteriorate water quality and to endanger human, animal and plant health. (Articles 12 & 22) Its Article 24 stipulates that MOWRAM, in collaboration with other concerned agencies, may designate a floodplain area as flood retention area.
Expropriation Law	2010	Defines the principles, mechanisms, and procedures of expropriation, and defining fair and just compensation for any construction, rehabilitation, and public physical infrastructure expansion project for the public and national interests and development of Cambodia.
Sub-decree on Sub-Decree No. 235 on the management of drainage system and waste water treatment system	2017	This sub-decree aims to improve the management of drainage and waste water treatment system in terms of efficiency, transparency and accountability to ensure safety, public health and biodiversity conservation. Under Article 11, municipal and district administrations are tasked to manage drainage and waste water treatment systems within their jurisdiction
Sub-Decree on Demarcation of 647,406 Hectare Flooded Forest Domain in Six Provinces adjacent to Tonle Sap Lake (Sub-decree No. 197 ANKR/BK)	2011	Stipulates a zoning system for the area between the national highways and the Tonle Sap Lake system and the nature of agriculture activities that are permitted and banned in each zone.
Sub-decree on Water Pollution	1999	Regulates activities that cause pollution in public water

Law/Regulation/Guideline	Year	Brief Description
Control (Sub-decree No. 27 ANKR/BK)		areas in order to sustain good water quality so that the protection of human health and the conservation of biodiversity are ensured. Its Annexes 2, 4 and 5 provide the industrial effluent standards, including effluent from waste water stabilization ponds and waste water treatment plants, water quality standards for public waters for the purpose of biodiversity conservation, and water quality standards for public waters and health, respectively.
Sub-decree on solid waste Management (Sub-decree No. 36 ANKR/BK),	1999	Regulates solid waste management to ensure the protection of human health and the conservation of biodiversity. Annex I of standard classifies sludge waste from WWTPs as hazardous.
Sub-decree on Control of Air Pollution and Noise Disturbance (Sub-decree No. 42 ANKR/BK	2000	Regulates air and noise pollution from mobile and fixed sources through monitoring, curb and mitigation activities to protect the environmental quality and public health. It contains the following relevant standards: (i)) ambient air quality standard (Annex 1 of standard); and (ii) maximum allowable noise level in public and residential areas (Annex 6 of standard).
Sub-decree No. 235 on the management of drainage system and waste water treatment system	2017	This sub-decree aims to improve the management of drainage system and waste water systems efficiently, transparently and accountably to ensure the safety of public health and biodiversity.

Table 2 Key National and International Standards

Environmental Issue	National Standard	International Standard
Ambient air quality	Annex 1 of standard, Ambient Air Quality Standard, of Sub-decree on Control of Air Pollution and Noise Disturbance, 2000	WHO Air Quality Guidelines, global update 2005
Noise	Annex 6 of standard, Max. Standard of Noise Level Allowable in the Public and Residential Areas, of Sub-decree on Control of Air Pollution and Noise Disturbance, 2000	WHO Guidelines for Community Noise, 1999
Groundwater quality (for drinking)	Drinking water Quality Standards, 2004	WHO Guidelines for Drinking-water Quality, Fourth Edition, 2011
Groundwater (ambient)	Ministry of Handicrafts and Industry Groundwater Quality Standards	Groundwater Directive (GWD, 2006/118/EC
Surface water quality	Annex 4 of standard, Water Quality Standards for Public Waters for the Purpose of Biodiversity Conservation, and Annex 5, Water Quality Standards for Public Waters and Health, of Sub-decree on Water Pollution Control, 1999	United States Environmental Protection Agency National Recommended Water Quality Criteria and Quality Criteria for Water (1986) UK Water Framework Directive Standards (Defra 2014) Mekong River Commission (MRC)_ Technical Guidelines for the Protection of Aquatic Life MRC Technical Guidelines for the Protection of Human Health
Effluent quality (including leachate)	Annex 2 of standard, Effluent standard (Discharged waste water to public water areas or sewers), of Sub-	Environment Agency (2019) Waste water treatment works: treatment monitoring and compliance limits

Environmental Issue	National Standard	International Standard
	decree No. 27 on Water Pollution Control, 1999	IFC (International Finance Corporation) EHS (Environment Health and Safety) General Guidelines and Guidelines for Water and Sanitation

29. In accordance with sub-decree No. 27 on Water Pollution Control, the effluent standard required is shown in the second row of Table 3: Sub-decree No.27 (1999) Annex 2, Discharged waste water to *Public Water Areas or sewers*[4]. The table also compares national standards to IFC guidelines. IFC General EHS Guidelines and IFC EHS Guidelines for Water and Sanitation both specify that compliance with national standards is required, if they exist, or IFC standards if none are available nationally or locally. Note that while the applicable standard is *Public Water Areas or sewers*, it is expected that the WWTP performance will be able to achieve the *Protected Public Water Area* standard, which is comparable to IFC guidelines with key parameters of BOD, COD and nutrients.

Table 3 National and International Effluent Standards

Standard	Parameter*							
	COD	BOD	TSS	NO_3	PO_4	NH_3	PH	Oil /Grease
National Standard Sub-decree No.27 (1999) Annex 2, discharge to *Protected Public Water Area*	<50mg/l	<30mg/l	<60mg/l	<10mg/l	<3mg/l	<5mg/l	6-9	<5
National Standard Sub-decree No.27 (1999) Annex 2, Discharged waste water to *Public Water Areas or sewers*	<100mg/l	<80mg/l	<80mg/l	<20mg/l	<6mg/l	<7mg/l	5-9	<15
IFC[5] Indicative Values for Sanitary Sewage Discharges	125	30	50	TN 10	TP 2	-	6-9	10
*COD-Chemical Oxygen Demand, BOD – Biological Oxygen Demand, TSS-Total Suspended Solids, TN-Total Nitrogen, TP-Total Phosphorous, NH_3 –Ammonia, PH-acidity/alkalinity scale, NO_3- Nitrate, PO_4-Phosphate.								

30. During MoE's IESIA review (September 2021) for the Kampong Chhnang WWTP, MoE changed the applicable effluent standards specific to the subproject. The WWTP design engineer confirmed that the design is capable of meeting these new effluent standards based on the efficiencies of the selected moving bed biofilm reactor (MBBR) and vertical reed bed technologies. The subproject therefore effectively has to follow the bespoke effluent standards as shown in the table below:

Table 4 Applicable bespoke effluent standards

No.	Parameter	Unit	IESIA effluent standard following MoE review	Effluent Target for WWTP
1	pH	-	6-9	6-7
2	TSS	mg/l	<60	< 20
3	Oil /Grease	mg/l	<5	Operation Parameter - scum

[4] Advice from MPWT in consultation with MoE, 11 December 2020
[5] IFC General EHS Guidelines: Environmental Waste water quality and ambient water quality

				separation unit is provided
4	BOD5	mg/l	<50	< 30
5	COD	mg/l	<80	< 45
6	Detergent	mg/l	<5	Operation Parameter
7	T-N	Mg-N/l	<20	< 6
8	T-P	Mg-P/l	<6	< 0.3
9	NH3	mg/l	<5	< 5

31. In terms of SPS 2009 requirements, during the design, construction, and operation of the project the borrower/client will apply pollution prevention and control technologies and practices consistent with international good practice, as reflected in internationally recognized standards such as the World Bank Group's Environment, Health and Safety Guidelines. These standards contain performance levels and measures that are normally acceptable and applicable to projects. When host country regulations differ from these levels and measures, the borrower/client will achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the borrower/client will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in this document. These Environment, Health and Safety Guidelines are considered throughout the Environmental Management Plan for the subproject.

3. International Agreements

32. Cambodia is party to the following relevant international environmental agreements: (i) UNESCO World Heritage Convention, 1991; (ii) Convention on Biodiversity, 1995; (iii) UN Framework Convention on Climate Change, 1995; (iv) Washington Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), 1997; (v) Ramsar Convention on Wetlands of International Importance, especially as Waterfowl Habitat, 1999; (vi) Basel Convention on the Control of Transboundary Movements of the Hazardous Wastes and Their Disposal, 2001; (vii) Vienna Convention for the Protection of the Ozone Layer and its Montreal Protocol on Substances that Deplete the Ozone Layer, 2001, and all Amendments, 2007; (viii) Climate Change Kyoto Protocol, 2002; (ix) International Tropical Timber Agreement, 2006; (x) Paris Agreement on Climate Change,2016; and (xi) Sendai Framework for Disaster Risk Reduction 2015-2030.

33. Cambodia joined the UNESCO Network of Biosphere Reserves in 1997. It committed to the Millennium Development Goals and subsequently endorsed the Sustainable Development Goals at the UN General Assembly in 2015. At the regional level, it ratified the following ASEAN Agreements: (i) on Transboundary Haze Pollution in 2006; and (ii) on Disaster Management and Emergency Response, which entered into force in 2009. At the sub-regional level, Cambodia, along with Lao PDR, Thailand and Viet Nam, signed the "Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin" (or the Mekong Agreement) in April 1995.

III. DESCRIPTION OF THE PROJECT

A. Rationale

34. The rationale is set out in the Project Administration Manual (PAM)[6], for the Project as a whole. The PAM is disclosed on ADB's website.

35. The PAM identifies that the Project will contribute to increased economic activities and environmental protection in towns in the Tonle Sap Basin. It responds to the need of municipal governments for integrated urban environmental management in urban areas around Tonle Sap Lake. The project will improve urban services and enhance climate change resilience in Kampong Chhnang and Pursat municipalities through urban area environmental improvements; community mobilization and environmental improvements; strengthened sector coordination and operations; and strengthened capacity for project implementation, and operations and maintenance (O&M). The Project follows the Tonle Sap Urban Areas Development Framework and Kampong Chhnang and Pursat municipalities' urban development strategies to 2030.

36. Urbanization in Cambodia is taking place with minimal coordination and regulation, inadequate infrastructure and insufficient regard for the environmental impacts of development. The results include disorganized growth, inefficient land use, damage and loss of natural resources, and inadequate access to urban services. The problems can be attributed to poor urban management, little strategic spatial planning, poor connectivity between urban planning and environmental management, and insufficient investment in infrastructure and community services. Urban planning and investments are needed to (i) accommodate expanding urban populations, (ii) sustain economic growth in medium-sized cities that are moving up the value chain in terms of their production profiles and activities, and (iii) protect the environment.

B. Project Impact, Outcome and Benefits

37. As defined in the PAM, the impact and outcome for the Project are as follows:

- **Impact:** increased economic growth and environmental protection in towns in the Tonle Sap Basin.
- **Outcome:** Improved urban services and climate change resilience in Kampong Chhnang and Pursat municipalities.

38. **Benefits**. The Project will enhance the urban environment, improve public health, and contribute to better quality, coverage and reliability of services to more than 100,000 residents in the two municipalities.

C. Project Outputs

39. Output 1: Kampong Chhnang urban area environmental improvements. Includes construction of a new controlled landfill site at Trapeang Sbov Village (Pongro commune, Rolea Bier district); provision of equipment for solid waste collection, and a new waste water treatment plant, sewage network and storm drain improvements.

40. Output 2: Pursat urban area environmental improvements. Includes construction of primary and secondary drains in the town center with associated road improvements and improved waste water treatment and sewage network; development of new controlled landfill at Toul Mkak village (Roleap Sangkat, Pursat town) and associated access road of about 1,500 meters and provision of

[6] Project Administration Manual: Project Number: 42285 Loan and/or Grant Number(s): L3311/L8295/G0454-CAM

equipment for solid waste collection.

41. Output 3: the community mobilization and environmental improvements (CMEI). Includes improved household sanitation for ID Poor 1 and 2 in the current municipality area; climate change and hygiene awareness and action; and community small-scale infrastructure improvements in pre-identified poor and vulnerable areas in each municipality. Small-scale infrastructure improvements will be prioritized by the communities and will be financed by the project, national government, and community.

42. Output 4: Strengthened Sector Coordination and Operations. Supports MPWT to convene national urban development task force meetings with other ministries and development partners in the urban sector; strengthen climate change regulations; and support the establishment of urban service units for improved delivery and management of decentralized urban services.

43. Output 5: Strengthened Capacity for Project Implementation and O&M. Includes project implementation support services for the project management (PMU) and project implementation units (PIUs) in design supervision; safeguards implementation; project and climate resilience monitoring; gender mainstreaming; community development; accounting and financial management; procurement; disbursement; review and expansion of existing strategies; and skills enhancement and on-the-job training in urban planning and development, solid waste SWM and O&M.

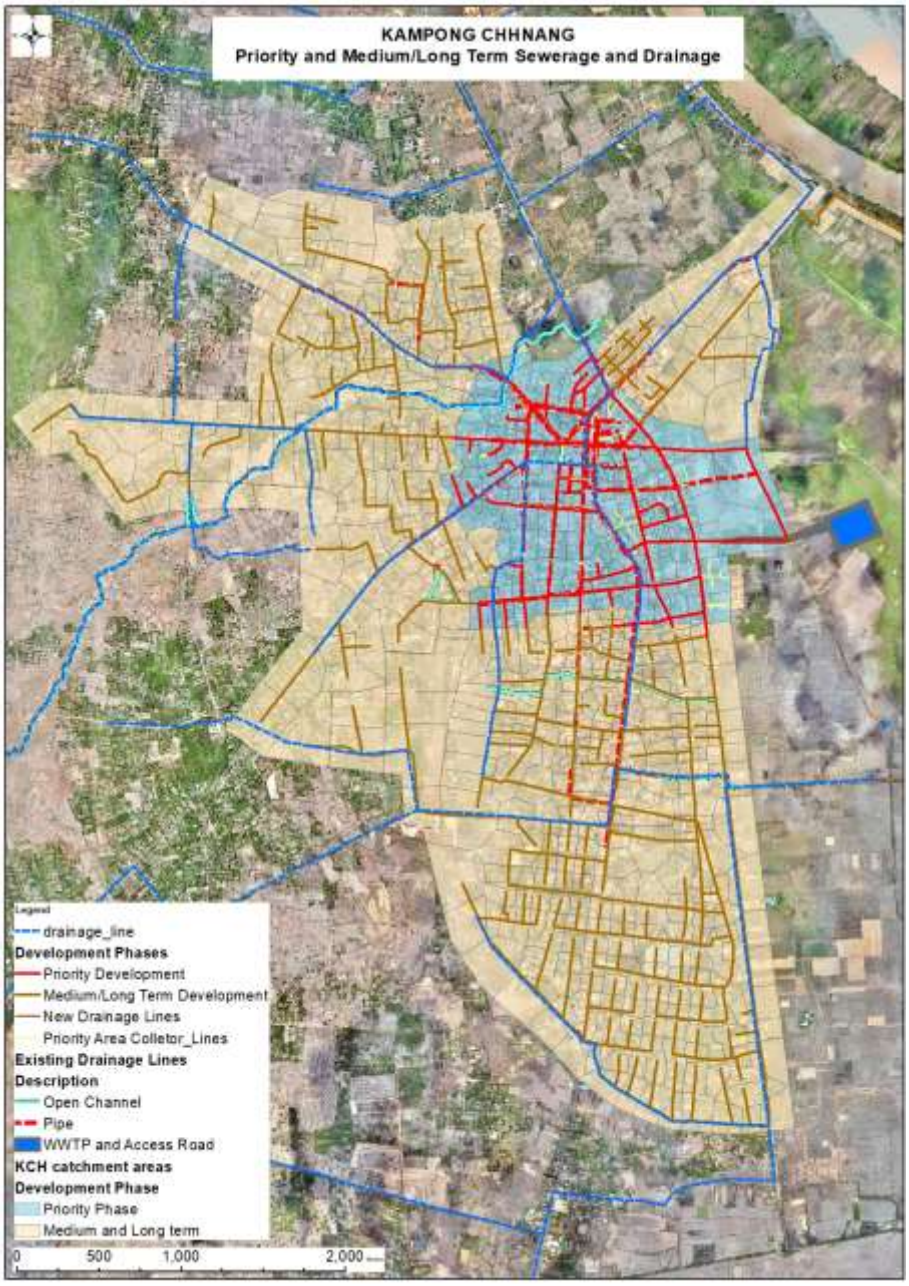
D. Kampong Chhnang Sewerage, Drainage and Waste water Treatment

4. Delineating the subproject area

44. The project will implement a separate sewerage system. Separate sewer lines along with collector lines and laterals are proposed for the town area; the core area of the town will be covered by the sewerage system. Since the funding is not adequate to cover all the envisaged core area, it is proposed to segregate into priority and long-term areas. The total area for sewerage coverage is 1447 ha, of which 247 ha is in priority area, and remaining 1200 ha is proposed long-term area.

45. The total area is classified into six categories based on population densities. The majority (82%) of the priority area is located in the three highest density areas (very high, high and medium density) with the remainder in low and very low density areas, plus 6% in areas under development. This Subproject is the Priority Area see Figure 1.

Figure 1 Priority and medium-long term sewerage and drainage coverage



Source: PMIS Team, DED report, March 2021

46. A detailed map showing the location of the project components (drainage, sewerage, collector lines and WWTP) is shown in Figure 2.

Figure 2 Project sewerage and drainage development

Source: PMIS Team, DED report, March 2021

5. Sewerage system subproject component

47. The system is designed for separate sewage management from each household. The design adopts the following design criteria:

Table 5 Separate sewerage system design criteria

S.No	Description	Unit	Value
1	Per Capita Water Consumption	lpcd	120
2	Percentage of Sewage Volume	%	80
3	Commercial Factor	%	20
4	Ground Water Infiltration Rate	l/s/ha	0.05
5	Design 24 Hours Rainfall	mm/day	91.68
6	Percent of Rainfall into Sewer	%	2.0
7	Minimum Cover to Crown	m	0.60
8	Minimum Half Flow Velocity	m/s	0.60

Source: PMIS Team, DED report, March 2021

48. **Sewage flow rates.** The sewage quantity comprises the return flow from each of the residential, commercial and institutional establishments and infiltration. The return flow depends on the amount of the water consumed; it is assumed that the return flow rate will be 80% of the water supply. The future sewage flow is estimated based on the ultimate residential population as well assumed commercial flow rate proportion to the residential flows. A growth factor of 20% is

included in the commercial flow rates.

49. **Groundwater infiltration.** This is a base flow, influenced by the groundwater table. It is assumed at 0.05 l/s/ha.

50. **Rainfall into sewer**. Rainfall Dependent Infiltration/inflow is the flow of extraneous water into waste water collections systems. It comprises two components:

- Storm water Inflow: rainfall entering the sewer system through direct sources, such as maintenance hole covers, catch basins, downspouts, area drains, and illegal storm water discharge by the residents; and

- Rainfall dependent Infiltration: rainfall that percolates into the subsurface and enters the collection system through joints, defects, house connections, and other infrastructure defects.

51. The sewerage system components are shown in Table 6.

Table 6 Subproject components

Main sewer line pipes (dia in mm)	m	16,436
300	m	10,468
400	m	202
500	m	2,387
600	m	1,546
700	m	175
800	m	840
900	m	218
1000	m	600
Pavement Restoration	sqm	19,398
Collector Lines (Dia in mm)	m	24,900
150	m	5,000
200	m	17,400
250	m	2,500
Sidewalk Restoration	sqm	38,800
House Connection Chambers	No	1,800
RCC Manholes	No	479

Source: PMIS Team, DED report, March 2021

52. **Pipes**. Reinforced concrete pipes (RCC) are proposed for the sewer line, with a minimum diameter of 300 mm. The composition of the priority sewer system can be given as follows. The pipes will be installed at depths between 2 to 7 m.

53. **Manholes**. RCC manholes are proposed; 390 of 1500mm diameter and 89 of 1200mm diameter.

54. **Household/building connections**. For every house or building in the service area the possibility will be provided for a connection to the sewer system. This is challenging, due to the density of buildings and the type of existing waste water and drainage water disposal.

- **Medium-low density area**: there is enough open space available around the buildings to allow shifting the waste water connection from the existing onsite disposal facilities to the new sewer collector lines. In the case that houses/buildings have a combined rain water drainage and waste water collection system, the flows should be separated before connecting the waste water disposal to the new sewer lines. Ideally the plumbing should be rearranged by the proprietor, but this is unlikely to happen in the near future, therefore the project will have to install flow separators which will channel to the dry season low waste

water flow to the sewer lines and, during rainfall, the overflow to the drainage lines or street gutters.

- **High-very high density area**: there are two existing types of waste water and drainage disposal.
    - (1) on-site disposal e.g. septic tanks or soak pits, usually at the back of the buildings. There is no open space around the buildings to only way to bring the disposal to the front of the building for connection to the new sewer lines is by cutting a trench through the ground floor of the building, which very few proprietors will accept. Therefore, in the installation of house connection priority will be given to the collection of waste water from the back of the buildings/houses.
    - (2) connection to existing drainage lines, usually combined drainage/waste water. It is unlikely that most of the proprietors will be prepared to make the necessary investment in the required modification of the plumbing to separate rainwater from the waste water collection. Therefore, in disconnecting the existing waste water disposal in the drainage lines, flow separators will be installed.

55. The map below shows the proposed approach to collector line installation at the rear of buildings in high density areas (see yellow lines).

Figure 3 Collector line installation in very high density area

Source: PMIS Team, DED report, March 2021

56. **Collector lines.** Collector lines and laterals will be installed in the sidewalk or road shoulder. The alignments are designed to avoid all encumbrances in the road corridor. Where possible collector lines and laterals will be installed at the back of the buildings/houses for easy connection of the existing waste water disposal facilities.

57. Installation of collector lines behind the buildings will require detailed consultations with all the proprietors. For this purpose, the team for construction supervision will, apart from a resident engineer and site supervisors also include social mobilizers to organize and lead the consultation with the beneficiary/proprietors. Prior to the start of the construction the PMIS consultants will prepare a detailed sanitation inventory of the buildings/house in the service area. This sanitation inventory will include the overall willingness of proprietors to connect to a new sewerage system, the type and location of on-site waste water disposal facilities, existing off-site disposal including

connections to the town drainage lines, possibility and willingness of proprietors to cooperate with installation of collector lines at the back of the buildings/houses. This inventory will guide the final alignment and installation.

58. The DED report identifies the following construction issues, which will be integrated as necessary, into the construction contract, where appropriate these are also reflected in the Environmental Management Plan:

(i) **Utility disruption**. The drain alone has no impact on the existing utilities of telephone and electricity supply but can have impact on the existing water supply connections. Coordination with the water supply service provider is required.

(ii) **Pavement reinstatement**. The existing pavement shall be reinstated as per the trench width which is derived from diameter of the pipe. The reinstatement will be limited to similar pavement existing in the proposed drain works e.g. if the existing pavement is gravel, only gravel will be reinstated to 200 mm thickness.

(iii) **Involuntary resettlement**. The subproject is category B for Involuntary resettlement. The Basic Resettlement Plan will be updated during the detailed measurement survey and a Detailed Resettlement Plan prepared in accordance with Cambodian law and ADB requirements.

6. Waste water treatment plant subcomponent

59. The waste water treatment components are summarized in the table below:

Table 7 WWTP components

Lift Pumping Station (4 submergible pumps)	max. cap.	16.2 mld
Manual Bar Screen (coarse)	No	1
Primary Sedimentation Tank (3 tanks)	Vol. m3	315
Moving Bed Biofilm Reactor (MBBR)		1
First Stage	m3	170
Second Stage	m3	130
Secondary Sedimentation Tank (3 tanks)	Vol.m3	840
Vertical Reed Bed (8 cells)	Area m2	3,600
Gravity Thickner	No	2
Sludge Digester	No	2
Sludge Drying Bed (12 cells)	Area m2	1,356
Channel type UV disinfection system	No	1
Buildings; Administration Building, Equipment/Vehicle Shed, Blower & Equipment Building, Storage Building, , Guard House.	No	7

Source: PMIS Team, DED report, March 2021

60. **Sewage estimate**. The quantity of sewage is based on the population served, the estimates used for the project design are shown in the table below, for the priority area the design flow is 5.40Mld and peak flow is 12.76Mld:

Table 8 Sewage quantity estimate

S.No	Description	Unit	Priority	Total (Priority + Long Term)
1	Rate of Water Supply	lpcd	120	120
2	Sewerage Volume (@ 80%)	lpcd	96	96
3	Total Population	No	42,601	153,425
4	Domestic Flow	l/s	47.33	170.47
5	Commercial factor		20%	20%
6	Total Flow with Commercial Factor	l/s	56.80	204.57
		Mld	4.91	17.67
7	Ground Water Infiltration		10%	10%
8	Groundwater Infiltration Flow (GWI)	l/s	5.68	20.46
9	Total Average Flow with GWI	l/s	62.48	225.02
		Mld	**5.40**	**19.44**
10	Peak Factor		2.50	2.50
11	Peak Sewage Flow	l/s	147.68	531.87
		Mld	**12.76**	**45.95**

Source: PMIS Team, DED report, March 2021

61. **Sewage quality**. The raw sewage characteristics are a function of level of water supply and per capita pollution load. The best way to ascertain the sewage characteristics is to conduct the composite sampling tests at various frequencies. However such data are not available for Kampong Chhnang as there is no separate sewage system at the moment. Therefore estimates are made using published references as shown in the table below:

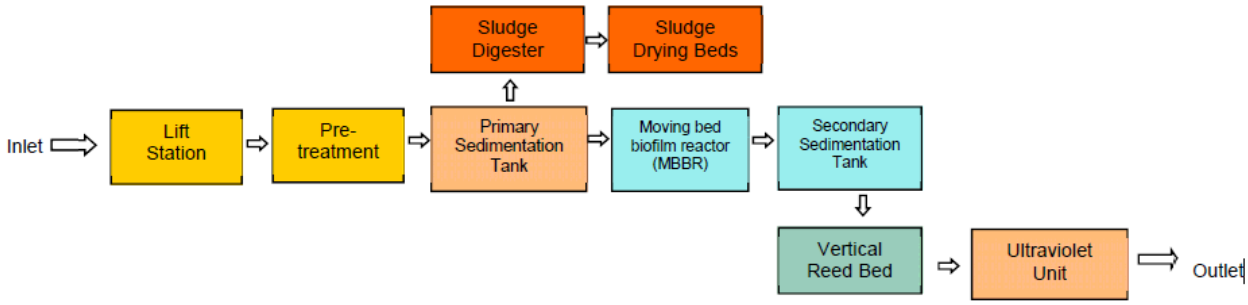
Table 9 Sewage quality estimate

Items	per capita contribution (g/c/d)	Sewerage flow per capacity (lpcd)	Adopted Concentration (mg/l)
BOD	27	96	281.3
COD	45.9	96	478.1
TSS	40.5	96	421.9
Total Nitrogen	5.4	96	56.3
Organic Nitrogen	1.4	96	14.6
Ammonia Nitrogen	3.5	96	36.5
Nitrate Nitrogen	0.5	96	5.2
Total Phosphorus	0.8	96	8.3

Source: PMIS Team, DED report, March 2021

62. **Treatment process**. The treatment process is shown below, and is based on moving bed biofilm reactor (MBBR) and reed bed processes. It is selected because of its footprint, and will benefit from lower operation and maintenance costs for the tertiary treatment. It will also obtain the required effluent treatment standards.

Figure 4 WWTP treatment process



Source: PMIS Team, DED report, March 2021

63. A summary of the waste water treatment approach is given below, as detailed in the DED report.

64. **Lift Station**. This will move incoming sewage to the WWTP level. It will have a capacity of 368 m^3 and will have a coarse screen and four submersible pumps. The discharge per pump is 5.4Mld which will provide a maximum pumping capacity of 16.2Mld.

65. **Pre-treatment**. Mechanical and manual bar screen to trap the floating components, a grit chamber to trap heavy particles e.g. sand and gravel and a grease trap to prevent grease from entering primary sedimentation tank.

66. **Primary Sedimentation Tank.** A rectangular RCC sedimentation tank with a volume 315 m3. Three tanks will be constructed; the third tank will be a standby unit but will be operated as normal unless maintenance is required when only two tanks will operate.

67. **Biological Treatment**. The biological treatment system is designed as moving bed biofilm reactor (MBBR). MBBR has become a popular mode of biological waste water treatment. MBBR uses plastic carriers covered in biofilm to decompose waste. In addition to being an effective means of removing organic substances, MBBR is also an innovative method for nitrification and denitrification. MBBR aeration tanks are open at the top, exposing the water to the open air, which makes this an aerobic process of filtration. Three MBBR tanks are proposed, with one serving as a standby tank.

68. **Secondary Sedimentation Tank**. Three rectangular RCC secondary sedimentation tanks with a volume of 840 m3 are proposed. They will include a pump for sludge to be pumped to the drying beds. the third tank will be a standby unit but will be operated as normal unless maintenance is required when only two tanks will operate.

69. **Vertical Reed Bed Treatment (constructed wetland).** The reed bed will contain gravels and sands which are usually planted with the common reeds. As the effluent passes through the gravels and sands it comes into contact with the thin film of bacteria which grows on the surfaces of the media particles. They are the primary agents that break down the organic matter in the effluent and removes nitrogen. The vertical reed bed comprises 8 cells, each 450m^2.

70. **Ultraviolet disinfection**. The disinfection facility is a unit facility installed to comply with E-coli standard for discharge or reuse purpose from the final effluent. An ultraviolet treatment is proposed which eliminates the need for handling chlorine compounds and also meets the minimum requirement of chlorine in the effluent.

71. A summary of the sludge treatment approach is given below, as detailed in the DED report.

72. **Gravity Thickener**. The sewage sludge is thickened in two gravity thickeners with a diameter of 5m and an area of 12.53 m3 to reduce its overall volume, thus enabling the easy handling of the sludge. The sludge drawn from the sedimentation tank shall pass through

thickening process.

73. **Sludge Digester**. Digestion helps reduce the total mass of solids, while destroying any pathogens present. Anaerobic digestion is proposed to stabilize sludge. As by-product, mainly methane and carbon dioxide gas will be generated. Capture and storage of methane gas for power generation for the WWTP operation could be considered for a future stage

74. **Sludge Drying Beds**. Beds with a total area of 673m^3 will further process the sludge. The volume of sludge generated when the WWTP is operating at full capacity is 20.19m^3. The dewatering, drying and sludge removal cycle will be approximately 10 days.

75. **Sludge Composting and Disposal**. Once the sludge has been effectively dewatered in the sludge drying beds, it is proposed to be further processed for compost fertilizer and stored in bags for sale. For this purpose, a dried sludge composting facility is included in the WWTP.

76. The WWTP will also include the construction of various buildings as shown in the table below:

Table 10 WWTP site buildings

Building	Purpose
Administration Building	Control room, laboratory, office, conference room etc.
Worker Building	cleaning and resting facilities
Blower & equipment Building	blower room, electrical room, mechanical and electrical workshop
Generator Building	-
Guard House	Located at the entrance
Storage Building:	For spare parts, maintenance equipment
Composting Building:	composting and storage of dried sludge
Sludge Digester Building:	sludge recirculation pumps and other pumps for sludge feeding and extraction

Source: Source: PMIS Team, DED report, March 2021

77. A summary of the WWTP site development is given in this section, as defined in the DED report.

- **Land raising** (for flood protection). Total area 6.4ha, raised to 13m above sea level (masl) (currently 4-5masl). 13m is above the 50-year return period flood level of 11.8m7. The site is 250m outside the old embankment developed during the Khmer Rouge period.
- **Timing of soil filling**. February to June when the flood water has receded and the surface layer has dried out.
- **Source of soil**. MPWT approved borrow site, and will include regular checks to ensure soil is contaminant free.
- **Access road**. An area of 0.71ha will be in-filled to 13masl.

78. A map showing the site area is shown in Figure 5, taken by drone in February 2020, when

[7] Modelling of Future Land-Use, Infrastructure & Flood Behaviour across the Cambodian Floodplain, Tonle Sap and The Mekong Delta of Cambodia and Vietnam, MRC February 2018

the site and access road is dry. A site layout map is shown Figure 6.

Figure 5 WWTP site location and access road

**note borrow site on map is used for private in-filling of land to the west (town side) of the old embankment.*

Source: PMIS Team, DED report, March 2021

Figure 6 WWTP site layout

Source: PMIS Team, DED report, March 2021

79. A borrow site has been identified during the DED with suitable fill materials for the subproject requirements, approximately 20km from the WWTP site, south west of the town in a rural area, located in low value scrubland. The location is shown in the map below:

Figure 7 Borrow area location

7. Storm drainage

80. The existing drainage system covers the core areas of the town centre. Secondary roads in the priority area have no drainage system and many are unpaved. In order make the separate sewerage system functional, storm water drainage is essential to avoid that storm water will enter the separate sewerage system which will lead to overloaded and overflowing sewer lines and excessive overflow at the WWTP; therefore the subproject will pave the required dirt roads in the service area to limit the inflow of soil in to the drainage lines.

81. To ensure the proper operation of the new additional drainage lines which will complement the existing drainage system it is essential that the existing system will operate as designed. Therefore, a provision has been included for cleaning of 22 km of pipelines of the existing drainage lines using jet vac equipment.

82. The storm drainage and road improvement subcomponents are summarized in the table below:

Table 11 Drainage and road improvement components

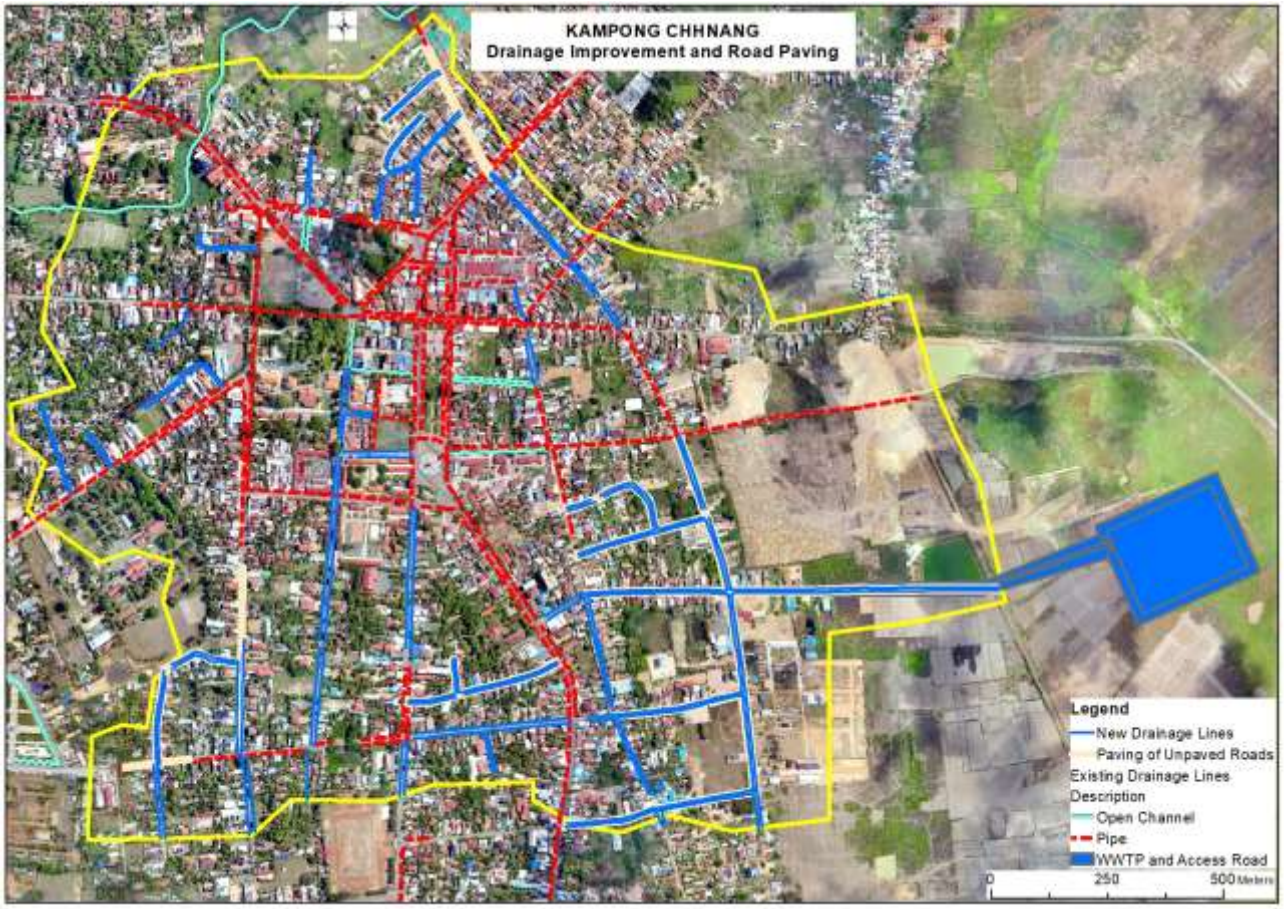
Drainage Improvement		
Maintenance Existing Drainage Lines	m	22,000
Installation New Pipes (dia in mm)	m	19,118
400	m	17,938
450	m	350
500	m	650
600	m	180
Excavation	cum	106,727
Backfilling with sand	cum	108,527
Sidewalk Restoration	sqm	0

Manholes/Rain Inlets	No	899
Improvement Outfall at Spean Thmor Bridge	No	1
Household benefitting from reduced storm water flooding	No	600
Population benefitting from reduced storm water flooding	No	2,700
Commercial establishments benefitting from reduced rain water flooding	No	235
Providing Concrete Pavement for Unpaved Roads	Km	5.8

Source: PMIS Team, DED report, March 2021

83. The figure below shows where new drainage lines are to be installed and where the road pavement will be improved.

Figure 8 Drainage improvements and road paving location



Source: PMIS Team, DED report, March 2021

84. Garbage traps will be installed at all the existing outfalls to avoid that large floating garbage pieces, especially plastics will enter into the flood plan areas around the tourist port and the Boeung Alum lake.

8. Operation and Maintenance

85. The DED notes that an operation and maintenance (O&M) program is required which emphasizes preventative maintenance. It is essential that the Municipality owns combined jet/vacuum and also mobilize the tractors for transporting the debris. In addition, minor tools are needed e.g. tools for opening manhole covers, lights, flow measurement devices, stop clocks, bucket. This equipment shall be procured under separate contract and provided to the municipality.

86. A tractor with trailer will also be provided for transporting debris from cleaning of the manholes and road side drains. This equipment shall be procured under separate contract and provided to the municipality.

9. Costs

87. A summary of the subproject costs is shown in Table 12.

Table 12 Cost summary

Bill No.	Description	Amount (USD)
1	Preliminaries and General	1,586,470.00
2	Gravity Sewer Pipeline	4,302,154.47
3	Collector/Lateral Sewers and Service Connections	3,114,934.50
4	Storm Water Drainage And Road Works	6,001,620.48
5	Wastewater Treatment Works	6,342,905.70
6	Dayworks, Provisional Sum	200,000.00
	A. Subtotal Bill	**21,548,085.15**
	B. Provisional Sum for Contingencies 5% of (A)	**1,077,404.26**
	GRAND TOTAL (A+B)	**22,625,489.41**

Source: PMIS Team, DED report, March 2021

IV. DESCRIPTION OF THE ENVIRONMENT

A. Project Area of Influence

88. The subproject site was visited for the preparation of this IEE, with particular attention paid to identifying:

- Sensitive natural environmental receptors such as water bodies, biodiversity and wildlife habitats;
- Sensitive human receptors;
- Cultural and heritage sites; and
- Potential health and safety issues.

89. According to SPS 2009, the area of influence encompasses:

(i) The primary project site(s) and related facilities that the borrower/client develops or controls. The primary project sites for this Subproject include direct construction sites, pipelines, canals, access roads, borrow pits, disposal areas, and construction camps.

(ii) Associated facilities that are not funded as part of the project whose viability and existence depends exclusively on the project. No associated facilities are anticipated for this project.

(iii) Effects from cumulative impacts from further planned development of the project, other sources of similar impacts. Cumulative impacts are considered where appropriate in the baseline and impact sections.

(iv) Effects from unplanned but predictable developments caused by the project that may occur later or at a different location. As a result of this subproject's raised embankment, it is anticipated that the development of the area protected from flooding by the raised road embankment will continue, leading to further developments around the subproject area.

90. The **Area of Influence (AoI)** is used to describe the extent over which the Project impacts will be realised. The AoI to be assessed can vary depending upon the type of impact being considered and the attributes of the potentially affected receptors and may also extend across administrative or national boundaries. In each case, however, the AoI includes all areas within which **significant** impacts are likely to occur taking into account the:

- physical extent of the proposed works defined by the limits of land to be acquired or used (temporarily or permanently) by the Project; and
- nature of the baseline environment and manner in which impacts are likely to be propagated beyond the project boundary.

91. For the purposes of this IEE, the Project AoI includes the footprint of all Subproject activities and for the sewage and drainage networks it includes the road corridor in which the works take place. It also includes the areas in which a direct or indirect impact on the physical, biological, social or cultural environment might occur, which can vary by topic. Where different areas are used, this is discussed in the respective baseline and impact sections.

92. Local impacts with a narrow AoI are those impacts arising from noise, dust and amenity issues. A wider AoI results from impacts which contribute to global issues such as the embodied carbon associated with the manufacture, supply and use of concrete products, and the carbon emissions associated with material transport. SPS 2009 requires the assessment to identify potential transboundary effects, such as air pollution, and global impacts, such as emission of greenhouse gases. Where these transboundary impacts are assessed as significant, this is discussed in the impact section.

B. Summary of Receptors

93. A table with GPS locations of receptors for the Subproject is shown in Table 13 which includes the WWTP site, access road, and urban core sewage network construction work. A map of receptors is shown in Figure 8. This is based on field work and mapping however additional receptors e.g. schools and health care facilities not specified in this table, are anticipated within the Subproject construction area.

Table 13 Key Subproject Receptors

Type of Receptor	Description	GPS	Protected Area Status
Surface Water	Boeung Tum[8] – wetland and lake to the south east of WWTP site, receiving water body for effluent in dry season		None
	Tonle Sap River – receiving water body for effluent in wet season when river naturally floods Channels connect the lake and river when the river is not in flood		Within Tonle Sap Biosphere Reserve
Socio-Economic	Housing and businesses within Priority Area		None
	Market within Priority Area	12.255744°, 104.669593°	None
Cultural	Multiple places of worship and culture including:		None
	Church 600m west of WWTP site within Priority Area	12.248361°, 104.676300°	None
	Wat Kampong Os Leur- within Priority Area adjacent to mains sewer	12.253303°, 104.674127°	None
Education	High School	12.250280°, 104.667241°	None
Health Care	Provincial Referral Hospital 1km west of WWTP, within Priority Area	12.250796°, 104.669583°	None
Vegetation /landuse	Urban trees in urban core	-	None
	Scrub and rice fields around WWTP Scrub around borrow site	12.247462°, 104.680790° 12.151257°, 104.549233°	None

Source: PMIS Team

[8] Boung Alum on Google Maps, known locally as BoeungTum.

Figure 9 Subproject potential receptors

	Subproject main sewer line		Lateral sewer lines
	Road improvement		WWTP site

C. Physical Environment

10. Geographic Location and Project Context

94. Kampong Chhnang is located approximately 80 km north of Phnom Penh on National Road No.5. It is situated at the southern end of the Tonle Sap Great Lake basin, 35 km south of the main body of the lake. The town sits on the west bank of one of the main channels in the Tonle Sap river. Of the six main urban centers around the Tonle Sap, Kampong Chhnang is by far the best access to the waterfront.

95. The urban area of Kampong Chhnang extends beyond the municipal boundary. The population of the contiguous urban areas is estimated at 47,000. The town has developed along a radial pattern with urban development along radial roads extending from the town center. The population in the urban center of the town is estimated to be about 28,000.

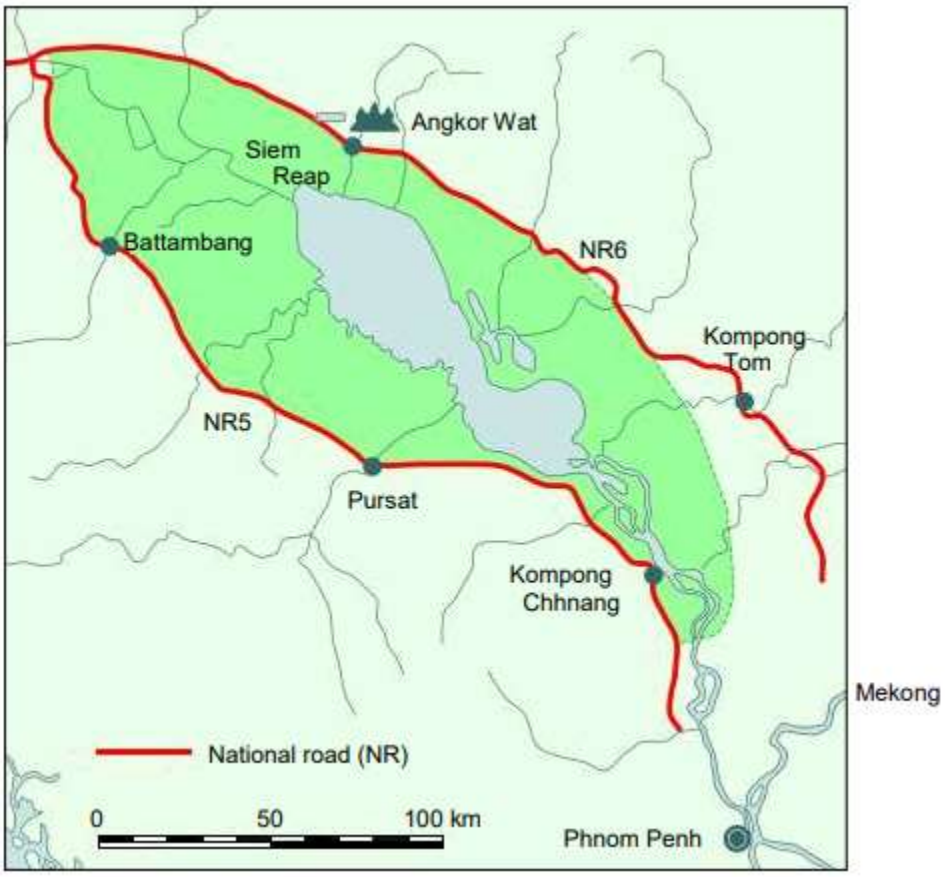
96. The national and provincial roads are all bitumen surfaced, while the municipal roads are a combination of laterite or bitumen surfacing with many unformed roads. The town is in the process of upgrading roads and the Provincial Department of Public Works and Transport (PDPWT) reported that it has introduced cost sharing between the Province and potential road beneficiaries for constructing and surfacing roads with the capital cost split 50:50 between government and beneficiaries.

97. Many of the roads do not have roadside drains, while existing drains are often silted up or blocked with waste. The relatively low traffic on the municipal roads means that in general road conditions are reasonable. The main issue is flooding of the roads during the wet season and also dust and mud on unsurfaced roads during respective dry and wet periods. As part of a program to upgrade the National Highway Five (NH5) between Phnom Penh and the Thai border, JICA is also working on the preparation of a proposed new by-pass road for NH5 around five kilometers to the West of the town.

98. **Tonle Sap Biosphere Reserve.** The part of the Kampong Chhnang town between Road No.5 and the river is situated in the Tonle Sap Biosphere Reserve. The reserve covers the lake itself and its surrounding flooded forests. It has a core zone (708 km^2), a buffer zone (5,108 km^2), acting as a buffer to the core areas, and a transition zone (8,997 km^2) which includes the wider flood plain in which many settlements and socio-economic activities such as agriculture occur. The boundary is largely delineated by National Roads 5 and 6 (see Figure 10). [9]

[9] Mekong River Commission (August 2013) Learning from the lakes: IWRM implementation in Tonle Sap Lake of Cambodia and Songkhla Lake Basin of Thailand.

Figure 10 Tonle Sap Biosphere Reserve



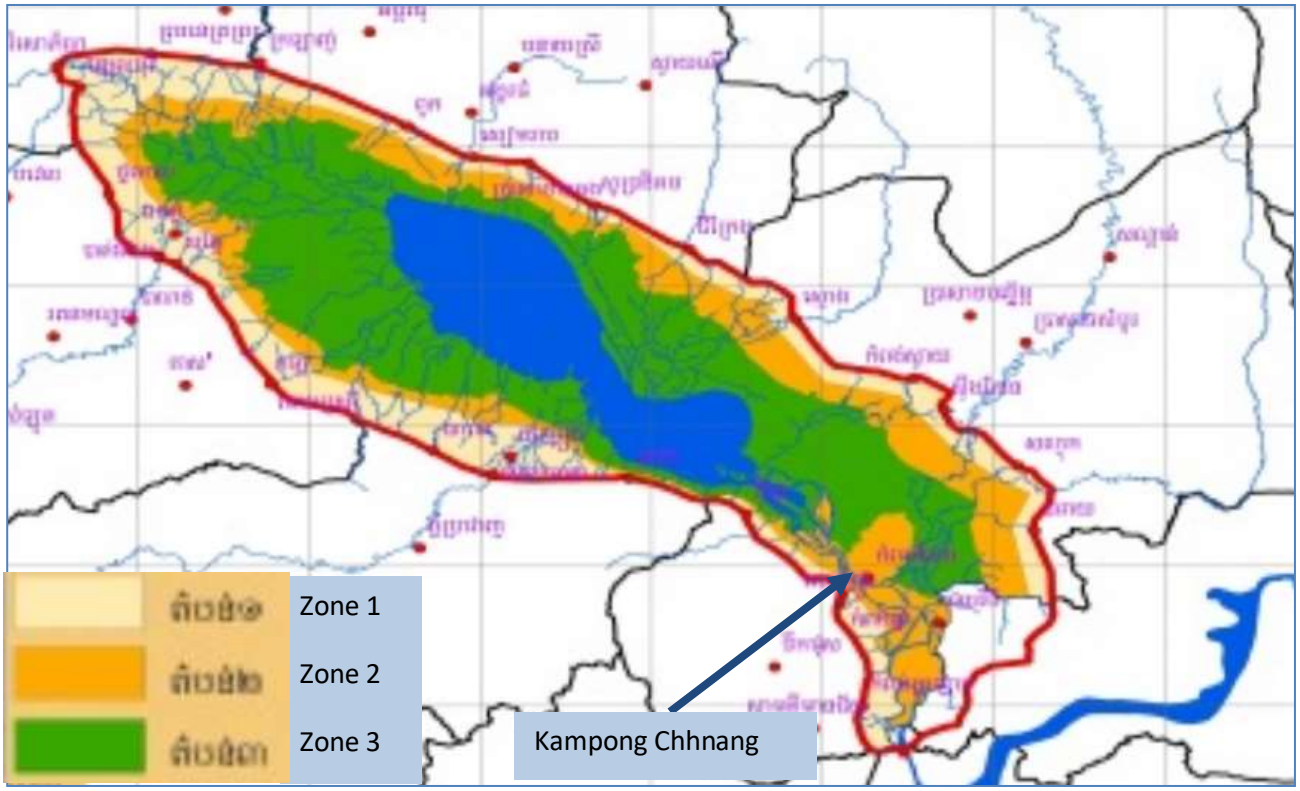
Source: MRC (2013) Learning from the lakes: IWRM implementation in Tonle Sap Lake of Cambodia and Songkhla Lake Basin of Thailand

99. As defined by the Tonle Sap Authority (TSA) the areas surrounding the Tonle Sap Great Lake are divided into three different zones as follows (see Figure 10):

- Zone 1: 395, 587 ha. Generally is a residential area and traditional paddy fields with rain-fed farming.
- Zone 2: 369, 865 ha. A cultivated area for floating, receding and dry season rice and agriculture.
- Zone 3: 647, 406 ha (Zone 3 was defined via Sub-degree No. 197 GNKR/BK of the Royal Government of Cambodia dated on 29 July 2011). An area of flooded forests, fully protected consisting of inundated forest, spare forest, big and small natural lakes and muddy areas.

100. Subproject is in Zone 2, where activities are allowed, with permission from TSA. TSA is responsible for coordinating the management, conservation and development of the Tonle Sap Region and as such is part of the Project Steering Committee for the Project. TSA has agreed to the project and to date the PMIS team is not aware of any particular requests or mitigation measures submitted to the Project by TSA.

Figure 11 Tonle Sap great lake area zones

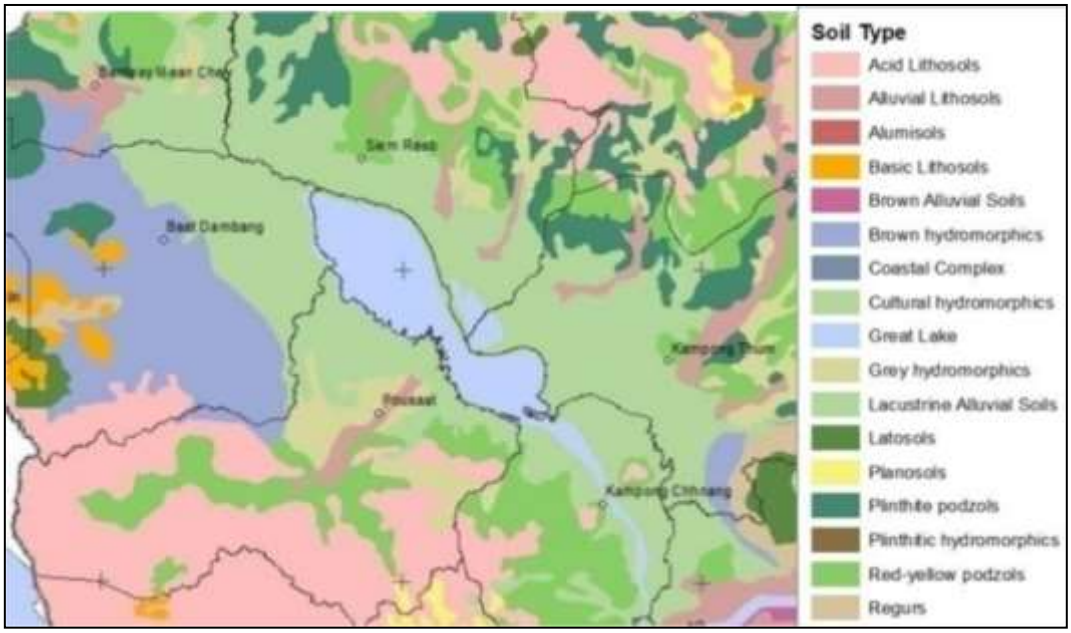


Source: Ministry of Water Resources and Meteorology, Tonle Sap Authority (undated brochure).

11. Geology and Topography

101. Kampong Chhnang is in the Tonle Sap Great Lake basin. The area is dominated by the Tonle Sap lake and this has affected the soil characteristics. As shown in Figure 12 the subproject area are dominated by alluvial soils and lithosols and red-yellow podzols from which minerals such as iron have been leached.

Figure 12 Soil Map of Tonle Sap Basin



Source: Dr Seng Vang Deputy Director, MAFF, presentation 2015, with UN FAO[10]

102. The topography of the area is generally flat, forming part of the Tonle Sap floodplain area. As a result, the subproject is in flat low-lying areas with the WWTP site being 5-10 meters above sea level (masl).

12. Climate

103. Cambodia is situated in a tropical zone, between 10 and 14-degree latitude north of the equator. Its climate is influenced by the monsoon cycle and has two distinct seasons, the dry and rainy seasons. The northeast monsoon brings in the dry season from November to April. The dry season is cooler from November to January when cool air from Siberia flows in, and is dry and hot from February to April. The rainy season is generally from May to October, as southwest monsoon brings in moisture and rains from the Indian Ocean. The rainy season accounts for about 80-90% of the annual rainfall, varying between 1,200 and 2,000 mm across the country. October is the wettest month; January/February has the least rainfall.

104. Average temperature has minimal variations regionally and seasonally. Weather is coolest in January and hottest in April. Relative humidity ranges between 65-70% in March and 85-90% in September. Annual evaporation is from 2,000 to 2,200 mm, i.e. highest in March and April at 200 mm to 240 mm and lowest in September-October at 120 mm to 150 mm[11].

105. The mean wind speed in Cambodia is low at about 2 m/s. December is known as the month of strong steady wind from the north.

106. Monthly rainfall data for Kampong Chhnang are shown in Table 14. This highest rainfall occurred in 2011 and this coincided with the flooding in the town when the existing embankment was overtopped.[12]

[10] Asian Soil Partnership Consultation Workshop on Sustainable Management and Protection of Soil Resources 13-15 May 2015, Bangkok, Thailand.
[11] Cambodia Environment Outlook. Ministry of Environment and UNEP. 2009.
[12] Climate Vulnerability Risk Assessment (Draft version April 2018) for Tonle Sap 1 Project.

Table 14 Monthly and Annual Rainfall, Kampong Chhnang, 2008-2012

Year	Monthly Rainfall (mm)												Total
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
2008	0.0	11.0	2.6	25.0	259.3	97.1	170.6	92.0	326.0	169.2	267.0	0.0	1,419.8
2009	0.0	0.0	64.0	73.5	195.8	164.6	275.6	273.0	299.1	289.0	0.0	0.0	1,634.6
2010	26.2	22.1	148.6	40.5	191.6	80.8	126.5	147.4	147.4	236.8	51.7	0.0	1,219.6
2011	0.0	0.0	73.0	185.0	138.0	249.0	259.7	265.0	301.0	237.0	210.5	11.0	**1,929.2**
2012	94.0	17.0	24.0	96.0	135.4	187.5	318.1	293.5	180.5	269.5	212.3	3.3	1,831.1
											Average		1,606.9
Key	**Lowest Monthly mm**						**Highest Monthly mm**						

Source: Provincial Department of Water Resources and Meteorology of Kampong Chhnang Province

13. Climate Change

107. A Climate Risk and Vulnerability Assessment (CRVA) has been undertaken for the Project (April 2018)[13] based on site visits and climate change projections for the Year 2050 and Representative Concentration Pathway[14] (RCP) 8.5. The CRVA noted that many sites are vulnerable to flooding and as such mitigation measures in the design are required; the most significant climate change risks associated with the subprojects are during operation. WWTPs can be impacted by heavy rain and flooding. Increased temperatures and droughts can reduce potable water supplies which may directly impact the flows into the WWTP. However, if effectively managed, the CRVA notes that new facilities will bring about improvements to the living conditions of the population of the project areas.

108. Table 15 shows the impacts from climate change on the subprojects as identified by the CRVA. These issues are managed through design mitigation measures where appropriate.

Table 15 Impacts from climate change on waste water collection and treatment

Climate Change Factor	Impact
Warmer Temperatures	Increased operating challenges to biological and chemical processes of treatment facilities. Increased temperatures and increased evaporation in receiving water bodies, changing chemical balances and increased eutrophication. Reduced capacity to meet waste water treatment requirements and standards
More Frequent and/or Intense Extreme Weather Events	Increased risk of direct flood damage to treatment plant, pumping and conveyance, and outfall. Increased risk of untreated sewage overflows contaminating water supply sources. Changes in quantity and quality of watershed runoff and in the resulting non-point source pollution loads to receiving waters.

[13] Climate Change Adaptation in Urban Development (Package 2), Integrated Urban Environmental Management in the Tonle Sap Basin Project (Tonle Sap 1) ADB Grant: 0454-CAM. April 2018

[14] RCP = Representative Concentration Pathway. Greenhouse Gas trajectory adopted by IPCC for its 5th Annual Assessment Report which supersedes the Special Report on Emissions Scenarios (2000)

Source: CRVA (2018)

109. The main change in rainfall will occur in the three wettest months of the year, July to September. In low lying areas flooding is generally caused by the rainfall in the wettest months of the year and lasts for several weeks. In such a case, changes in monthly rainfall are of more importance than rain falling over a shorter time period. Projections suggest that there will be little, if any, increase by 2030 but could increase by over 20% by 2070. The CRVA concludes that when comparing predictions under RCP 6.0 and RCP 8.5 there is little difference with regards to changes in future precipitation:

- Annual rainfall may remain unchanged, but rainfall will increase more in the wettest months by being of stronger duration. This will lead to longer dry periods. There may be “mini-droughts” during the wet season.
- Precipitation will increase most in the south-west and decrease in the north-east.
- Both the maximum 5-day and 1-day storms are expected to increase. The projected increases are 10% for 2030, 20% for 2050 and 30% or more for 2070.
- The relative increase in rainfall is heavier for short durations.
- A conservative increase of 20% by 2070 on existing IDF curves will allow for a global temperature increase of 2°C.

110. A Provincial Climate Change Adaptation Strategy around Tonle Sap was issued in December 2019. Similarly, to the CRVA it examines climate related extremes using the RCP of 8.5. The overall conclusion of the Climate Change Adaptation Strategy is that annual precipitation around Tonle Sap will rise slowly, if at all. Changes in monthly rainfall are of more importance than rain falling over a shorter time period. Projections suggest that there will be little, if any, increase by 2030 but could increase by over 20% by 2070, which is the same conclusion as the CRVA.

111. Conclusions relating to the Project and climate change noted that design criteria may need to be adjusted. The report’s recommended measures, developed before the final designs, include:

- Civil works
  A. Increased height of access road above flood levels
  B. Raise embankment on lagoons boundaries
  C. Modification of side slope ratios to avoid soil loss in heavy rain
- Drainage design
  D. Additional waterway opening at bridge sites
  E. Additional cross-culvert capacity
  F. Debris defectors and energy dissipaters
  G. Install Debris Deflectors
  H. Sub-drainage systems
  I. Turf surfaces on side slopes.
- Maintenance
  J. Regular inspection and repair of drainage systems
  K. Regular cleaning of culverts and side ditches
  L. Regular cleaning of box and pipe culvert systems
  M. Quick restoration of items following major flood events

112. Specific Recommendations from MPWT. The report also notes that MPWT have produced a series of Design Guide Recommendations that incorporate climate resilience. Relevant to the subproject the recommendations include:

- Road elevation: For access roads the crest level should be a minimum height of the water level of floods with a recurrence interval of 1 in 10 years plus 0.25 meters.

113. In terms of integration of these measures into the WWTP design, specifically the elevation of the access road and WWTP site itself are designed to account for flood levels. The drainage

and WWTP design takes into account the potential implications of rainfall changes over the life of the facility, as for other subprojects in the Project. For maintenance, understanding the importance of implementing a regular inspection programme for all infrastructure is incorporated into the training/capacity development elements of the project.

14. Hydrology

114. The hydrology of the Tonle Sap ecosystem is mostly determined by the over 4 000 km long Mekong river. The Tonle Sap lake is connected to the Mekong river through approximately 100 km long Tonle Sap river. The discharge of the Mekong reflects the pattern of the rainfall distribution throughout the year and follows the monsoon seasons. Consequently, the flow patterns display predictable cyclical changes. The maximum water level in the Mekong in Kratie (North Cambodia) is reached in September-October. The river flow decreases rapidly until December, and then slowly during the dry period, reaching minimum levels in late April.

115. From May as the rising water level in the Mekong reaches 7 metres above mean sea level, overland flow begins and the flow in many tributary rivers is reversed. The high velocity of the water at the beginning of the flood increases the carrying capacity and consequently reduces the clarity of the water by five to ten times compared with the dry season. The sediment load of the Mekong is low compared with other major rivers, and decreases downstream.[15] however the sediment laden water does bring essential nutrients to the floodplain necessary for plant growth[16].

116. Flow reversal also occurs in the Tonle Sap river. By the end of May, the water level of the Mekong in the confluence with the Tonle Sap river reaches sufficient height (9 m) to start pushing water from the Tonle Sap drainage area back in the channel. This results in an accumulation of water from the Mekong in the Tonle Sap lake and extensive flooding, increasing the surface area of the lake from about 2 500 km^2 to over 10 000 km^2. Maximum depth is reported to vary between less than 2 m in the dry season and up to 14 m at the peak. In October, the water level in the Mekong has sufficiently subsided for the flow in the Tonle Sap channel to reverse and the lake and the thousands of square kilometres of floodplain to be drained.

117. This flow reversal and natural ‘flood pulse’ of the Tonle Sap lake drainage area contributes to the natural flooding in Kampong Chhnang, including the floodplain on which the WWTP is constructed. The natural flood is largely found within the two National Roads which delineate the Tonle Sap Biosphere Reserve. Built over the last two decades, these elevated, all-year roads connect the provincial towns around the lake, while at the same time, inevitably, intercepting parts of the active flood plain.[17] An example of a raised road is shown in Figure 13 (a and b) which is the WWTP access road will join, already elevated to allow access during the wet season. Although these roads are not high enough to completely prevent all-natural flood movement, they are examples of many raised roads around the Tonle Sap region which impact on the natural flood plain.

[15] Mekong Committee, 1992 cited in UNFAO (2001) Tonle Sap Fisheries: A Case Study on Floodplain Gillnet Fisheries Tonle Sap Ecosystem, Part 1

[16] UNDP/GEF (2006) An assessment of exotic species in the Tonle Sap Biosphere Reserve and associated threats to biodiversity

[17] Mekong River Commission (August 2013) Learning from the lakes: IWRM implementation in Tonle Sap Lake of Cambodia and Songkhla Lake Basin of Thailand.

Figure 13 Raised road at site of WWTP access road


a.

b.

Source: PMIS Team

15. Surface Water

118. Tonle Sap is the river running between the Tonle Sap lake and the Mekong. The confluence with the Mekong is approximately 80km in Phnom Penh city. At Kampong Chhnang the Tonle Sap river has multiple channels with islands in between. At the Subproject location, the nearest channel is approximately 2.3 km and the main channel is approximately 4 km, to the east.

119. Boeung Tum occupies an area which is approximately 12 km long, depending on the season (Figure 14). It is a permanent water body, which is 1-1.5m deep in the dry season, 3-4 m deep in the wet season. A few fishers use the lake, but the primary use is for dry season rice, covering about 2000 ha. Also, some people use the area to grow lotus. Boeung Tum is entirely separate from the Tonle Sap River in dry season. Along the bank between the Boeung Tum wetland area and the nearest branch of the Tonle Sap river is a road, exposed in dry season, lined with stilted houses. In the wet season the two water bodies of Boeung Tum and Tonle Sap river will join as the river floods.

120. There are no water quality data available for the lake, however as shown in Figure 14, storm water, sewage and solid waste is seen flowing from the urban core through outfalls that lead to the lake. Therefore, it is anticipated that some level of contamination is present in the lake. This location approximately equates to the Surface Water sampling location SW1 in the IESIA, see IESIA surface water sampling locations Figure 15.

Figure 14 Towards Boeung Tum at WWTP proposed site

Source: PMIS Team

121. The IESIA team conducted surface water quality sampling at two points near the WWTP

site: SW1at Sangkat Phsar Chhnang (X: 464969; Y: 1354463); SW2 at Sangkat Kampong Chhnang (X: 465503; Y: 1354111) (UTM Zone 48N co-ordinates) in November 2020. The sampling locations and the results are below:

Figure 15 IESIA surface water sampling locations

Source: SBK Research and Development Co. Ltd IESIA, and PMIS Team

Table 16 IESIA surface water quality sampling results

	Parameters	Unit	SW1 Result	SW2 Result	National Standard
1	pH	-	6.87	6.66	6.5 - 8.5
2	TSS	mg/L	21	42	< 60
3	(BOD)5	mg/L	23.68	1.6	< 30
4	(COD)Cr	mg/L	38	3.24	< 50
5	Oil and Grease	mg/L	**7.4**	4	< 5
6	Ammonia (NH3)	mg/L	**9**	**5.2**	< 5
7	Detergent	mg/L	2.06	0.04	< 7
8	Total Nitrogen (TN)	mg/L	**11.97**	0.88	< 6
9	Total Phosphorus (TP)	mg/L	**1.33**	0.05	<0.5
10	Total Coli form	MPN/100	**1100000**	430	500-2500

Source: SBK Research and Development Co. Ltd IESIA, September 2021

122. The table above shows that sample SW1 did not meet the national standard for five parameters (oil, ammonia, nitrogen, phosphorous and coliforms) indicating that the water is contaminated, particularly with coliforms, as expected given the lack of WWTP in the town. It is noted that there are significant differences between the two samples for coliforms; SW1 is at an existing drainage outlet which is used locally to discharge wastewater from informal household connections. The project's implementation is anticipated to improve these local conditions.

16. Air Quality and Noise

123. Field visits indicate that air quality and noise baseline levels in the Kampong Chhnang is good, as the WWTP subproject is located in a relatively rural area and even within the town, there are no significant industrial/commercial zones to cause air quality degradation. Typically, in Cambodia, outside Phnom Penh or town centers there are few industrial pollution sources for noise or air and the volume of vehicular traffic is relatively low, however construction noise contributes to the noise baseline in many towns.

124. The IESIA team conducted air quality sampling at the WWTP site (one sample X: 465382; Y: 1354145 UTM Zone 48N co-ordinates) in November 2020. The sample location and results are as follows:

Figure 16 IESIA air quality sampling locations

Source: SBK Research and Development Co. Ltd IESIA, and PMIS Team

Table 17 IESIA air quality sampling results

	Parameter	Unit	National Standard	WHO Ambient Air Quality Standard	Results	Notes
1	CO	mg/m3	20 (8hr av)	-	1.29	
2	NO2	mg/m3	0.1 (24hr av)	0.04 (24hr Av)	0.043	
3	SO2	mg/m3	0.3 (24hr av)	0.02 (24hr av)	0.055	
4	Ozone (O3)	mg/m3	0.2 (1hr av)	0.1 (8hr av)	0.05	
5	TSP	mg/m3	0.33 (24hr av)	-	0.068	
6	Pb	mg/m3	0.005 (24hr av)	-	ND	No Detection
7	CH4	mg/m3	-	-		
8	PM 10	mg/m3	0.05 (24hr av)	0.05 (24hr av)	0.048	
9	PM 2.5	mg/m3	0.025 (24hr av)	0.025 (24hr av)	**0.037**	Many heavy trucks passed by the monitoring point

Source: SBK Research and Development Co. Ltd IESIA, September 2021

125. The results above show only one sample did not meet the national limits (PM2.5); the IESIA attributed this result to the passage of heavy vehicles during the sampling.

126. The IESIA team conducted noise sampling at the WWTP site (one sample X: 465382; Y: 1354145 UTM Zone 48N co-ordinates) in November 2020. The sample location is the same as for Air Quality, and results are as follows:

Table 18 IESIA noise sampling results

Time	National Standard dB(A)	Result, dB(A)		
		LAeq	Lmax	Lmin
6:00 – 7:00	70	45.8	51.2	36.3
7:00 – 8:00	70	45.3	48.5	38
8:00 – 9:00	70	44	48.6	35.4
9:00 – 10:00	70	45.2	59.6	36.8
10:00 – 11:00	70	45.9	54	37.7
11:00 – 12:00	70	45.3	52.9	32.6
12:00 – 13:00	70	47	51.4	37
13:00 – 14:00	70	40.7	52.8	26
14:00 – 15:00	70	46	52.6	35.4
15:00 – 16:00	70	46.9	54.2	35.5
16:00 – 17:00	70	46.7	53.8	35.5
17:00 – 18:00	70	45.9	51.6	36.2
18:00 – 19:00	65	44.6	51.8	33
19:00 – 20:00	65	44	52.1	31.9
20:00 – 21:00	65	44.1	51.3	32.9
21:00 – 22:00	65	43.3	51.2	31.3
22:00 – 23:00	50	40.8	46.5	31
23:00 – 00:00	50	37.5	41.5	29.5
00:00 – 01:00	50	38.6	40	31.9
01:00 – 02:00	50	40.2	41.2	31.9
02:00 – 03:00	50	39.6	42.8	33.6
03:00 – 04:00	50	38.2	42.4	32.8
04:00 – 05:00	50	38.2	40.2	32.1
05:00 – 06:00	50	42.4	47.5	33.2
Average in 24h		43.1	62.3	36.8

Source: SBK Research and Development Co. Ltd IESIA, September 2021

127. The results above show baseline noise levels are within the national standard.

17. Natural Hazards

128. Storms and typhoons are not usually considered a major problem in Cambodia however storms do occasionally affect the country, with most storm-related damage being caused by localized floods associated with heavy rain. Tropical storms can also affect the level of Mekong River flooding experienced in a given year. Greatest damage occurs when these storms arrive during September and October when the seasonal discharge of the Mekong River is already high, and a second significant peak to the annual flood is generated. Also, wind damages property, agricultural produce and ecological systems.

Table 19: Natural Hazards in Kampong Chhnang Town (1996-2018)

Hazards	Deaths	Injured	Houses Destroyed	Houses Damaged	Victims	Evacuated
Flood	1	0	2	7	21739	1413
Fire	1	11	14	5	0	0

Storm	0	0	2	8	0	0
Lightening	1	0	0	0	0	0
Total	3	11	18	20	21739	1413

Source: National committee for disaster management, 2018

129. There are two major types of flood in Cambodia: (i) Mekong River flood and (ii) flash floods. Mekong River flood causes the Tonle Sap River to reverse its flow. This event is increased with heavy rains around the Tonle Sap Lake which affects Kampong Chhnang town and the wider province. This event is most severe when heavy rains coincide with a tropical depression and storm.

130. Flash flood results with repeated heavy rainfall in the mountainous areas. Flash flood lasts for only a few days but often cause severe damage to crops and infrastructure, particularly in tributaries around the Tonle Sap Lake.

D. Biological Environment

18. Flora and Fauna

131. The subproject sites and their main areas of influence are not habitats for rare species of flora and fauna.[18] In particular for the Tonle Sap region, the project is not in areas of flooded forest or other notable habitat. In addition, biodiversity screening in both project cities using IBAT[19] was carried out for the Second Urban Environmental Management in the Tonle Sap Basin Project. The IBAT tool indicated that the project area does not contain any protected areas or habitats of particular biodiversity value. This was confirmed with subsequent site visits to the Subproject area which shows it is in a highly disturbed environment dominated by agricultural and urban land use.

132. A specific biodiversity or ecological survey for flora and fauna has not been undertaken for this IEE, or the IEE for other Subprojects under the Project. A field assessment of ecological receptors has been made and is supported by desk-based research.

133. The Subproject is located in a highly modified environment. Site visits and drone imagery for the Subproject (Figure 17) show the city's vegetation to be dominated by trees, which are primarily located within the middle of blocks, or within residential compounds, outside the right of way. The WWTP site and access road is in an area dominated by rice agriculture and Figure 17 (d) shows the scrub then cultivated lotus ponds leading to Boeung Tum.

[18] PPTA IEE. 2013.

[19] IBAT is a central database for globally recognized biodiversity information including Key Biodiversity Areas and Legally Protected Areas https://www.ibatforbusiness.org/.

Figure 17 Subproject area flora

a. Urban trees in residential blocks

b. WWTP Access road, rice fields

c. WWTP site rice, rice fields

d. Scrub vegetation towards WWTP site

Source: PMIS Team

134. **Aquatic flora**. UNFAO notes that cultured crops comprise a part of the macrophyte vegetation around the Tonle Sap lake ecosystem, such as maize, rice, lotus and beans, and the same is true of the seasonally inundated area around the Tonle Sap river. The natural flora of Boeung Tum has been modified extensively through dry season rice cultivation.

135. The Tonle Sap lake and river ecosystem includes a number of invasive alien species[20]. A dominant species in the Tonle Sap river and lake ecosystem is water hyacinth *(Eichhornia crassipes*). An invasive weed it grows in large mats on the river surface, depleting oxygen levels and restricting navigation and fishing. Giant Mimosa (*Mimosa pigra*) is also an invasive alien species which is commonly found on drainage channels, canals and is rapidly spreading amongst the Tonle Sap river ecosystem where it will quickly invade open disturbed habitats.

136. **Fish Species**. Cambodia is rich in fish biodiversity with at least 500 fish species recorded in the Cambodia's Mekong River and nearly 300 fish species in Tonle Sap Lake. During the preparation of a pre-feasibility study IEE[21] in the Project cities of Pursat and Kampong Chhnang, interviews were held in with local people regarding their understanding of fish species in the project area; the subproject urban areas correspond to those for this project. The results were similar for both towns. As an example, in Kampong Chhnang, 31 species were named, with the most common being (including Khmer name) Trey Riel, *Henicorhynchus s*p (carp); Trey Andaing Toun, *Clarias macrocephalus* (catfish); Trey Phtuok/Raws, *Channa striata* (snakehead); Trey Kranh, *Anabas testudineus* (climbing perch); and Trey Kamphlienh *Trichogaster trichopterus* (Three spot

[20] UNDP/GEF (2006) An assessment of exotic species in the Tonle Sap Biosphere Reserve and associated threats to biodiversity

[21] TA-8556 REG: CDIA- Pre-feasibility studies for Second Tonle Sap Integrated Urban Management Project

gourami). It is noted that these species listed are not threatened, critical or endangered. Appendix 1 contains a detailed list of fish species observed by local people.

137. **Bird Species**. Cambodia has a number of protected bird habitats, including Prek Toal Core Zone of the Tonle Sap Biosphere Reserve on the Tonle Sap lake. This core zone will not be impacted upon by the project. As with fish species, the pre-feasibility study IEE[22] in the subproject cities of Pursat and Kampong Chhnang undertook consultation with people resident in all the subproject areas in 2016 to identify bird species which are observed by local people. The people interviewed identified approximately 25 species in Kampong Chhnang observed in their local area. The pre-feasibility study team noted that *Heliopais Personata (*Masked Finfoot, an aquatic bird) is the only endangered species mentioned by the people resident in the subproject area. It is classified as endangered due to degradation of wetland and riverine lowland forest habitats in Asia. The favored habitat is well vegetated wetlands, including swamps and lake edges; these types of habitat are not within the area of influence for the project; the closest most recent sighting of the species around the Tonle Sap is at Boeung Chma (in 1998), a protected area which is 70 km from Kampong Chhnang town. The Kampong Chhnang WWTP is adjacent to a wetland area but the habitat is largely devoid of natural vegetation due to agricultural activities including lotus and rice farming. Appendix 1 contains a detailed list of bird species observed by local people.

E. Socio-Economic Environment

138. An important function of the town is as a port, for agricultural and fisheries products, as well as passenger ferries. Associated with this, an extensive fishing community lives on boats, floating houses and stilted houses in the channel adjacent to the town river frontage. The riverfront is also more and more developing as a tourist attraction. In 2015 the Provincial Government adopted a 5-year plan for the beautification of the riverfront area with the main objective to develop the tourism potential of this area. In general Kampong Chhnang province has been earmarked by Government as having significant tourism potential with the traditional crafts, natural environments and the fishing villages as potential attractions as well as the town's pottery craft, the river frontage, and eco-tourism to the west and across the Tonle Sap river.

19. Infrastructure and Development

139. There is a sewerage system in the town center that was built in the 1960s and extended in the 1980s. The system receives both rainwater and waste water from houses and storm water from roadside inlets (manholes), although it is unclear whether the system was originally designed for the latter. The system has multiple outfall-points in the flood plain area of Tonle Sap River east of the town area where some of the waste water is used in the dry season for irrigation. The system consists of about 9 km of pipelines with various diameters and 3 km of unlined surface drains. The central market has its own sewer and outfall. Many of the road-side inlets to the sewers seem to be blocked with waste and sediments. PDPWT has an operational sludge pump for cleaning manholes but no jetting equipment for cleaning pipes. It is estimated that only around 10 to 20 per cent of the town is connected to the sewerage system despite a free connection charge as the system's coverage is limited.

140. A by-pass road is proposed to the southwest of the urban area linking the northern and southern sections of Road No.5. This will have the benefit of taking through-traffic out of the town center.

141. Approximately 11km west of the town center is an airport on which construction was started during the Khmer Rouge era but never finished. The Government has announced that this will be developed into an international airport by 2025.

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142. Located within the Greater Mekong Subregion Southern Economic Corridor, the town can expect continued economic development and expansion. Several industries (such as garment drinks manufacturers) are located to the south of the municipality.

20. Physical Cultural Environment

143. The Subproject is located in an urban area with several pagodas which play a significant role in the town and culture of Cambodia. Other places of worship include a church which is within the Subproject construction area for the sewage network. No sites of archaeological heritage are known within the Subproject AoI.

21. Socio-Economic Survey Analysis

144. The Project Preparation Technical Assistance (PPTA) team undertook a detailed Socio-Economic Survey (SES) within 94 households in Kampong Chhnang town, in July 2013. No such detailed survey has been undertaken since then however the results are still anticipated to be valid. Table 20 summarizes the SES findings.

Table 20 Kampong Chhnang town SES urban infrastructure findings

Urban Infrastructure	Detail
Water Supply	38% sourced drinking water from boreholes; 19% from piped water supply connected to their houses; 14% from rivers/streams/springs; 10% from protected dug wells; 6.4% from piped water supply in their compounds. The rest reported as using rain water or purchasing water
Sanitation	66% had flush/pour flush toilets; 6.4% had pit latrines with septic tank; 7.4% had pit latrines without septic tank; 1% had dry pit latrines without slab; and 14% had no latrines, were using other's latrine. The remaining 5% had other form of sanitation facility or disposal method.
Drainage	77% did not have access to drains; 18% had access to earth drains; and the remaining 5% had access to closed and cement-lined open drains. 87% said their communes would flood during heavy rains and/or during river overflow. Of those served by drains, 12% reported drains to be too small; and about 10% reported their drains as clogged with sediment and/or solid waste
Solid Waste Collection	25% had access to solid waste collection services. The majority burn their garbage, the remainder bury or throw garbage anywhere.

Source: PPTA Team

145. Regarding employment in Kampong Chhnang town, the majority of the SES respondents were self-employed (77%). Employed respondents represented approximately 10%. About 3% of the respondents were unemployed; while 7% were retired. Of the households surveyed in the SES, 20% were female-headed; 11% were headed by disabled persons; and 11% were headed by an elderly person over 65 years old.

146. Housing quality in the town varies with a more basic construction seen associated with the edges of the town, particularly along the Tonle Sap river. These traditional stilted houses offer little protection from the impacts of construction such as noise, vibration and dust. Figure 18 shows

typical housing located a few meters from the northern end of the priority area and one typical of the town which is adjacent to the wetland area west of the WWTP site.

Figure 18 Example housing construction

Source: PMIS

V. ANTICIPATED IMPACTS AND MITIGATION MEASURES

A. Environmental Impact Screening and Assessment Methodology

147. The following discussion on environmental impacts screens the potential impacts according to the following factors and recommends mitigating activities on this basis:

- **"Receptor"**: the resource (human/natural environment/economic/social) which is potentially going to receive and have to cope with an impact.
- **"Sensitivity"**: ability to cope with an impact and/or its importance to the country of Cambodia. It is generally accepted that human health is always a high sensitivity receptor, however in terms of environmental/natural resources, the sensitivity varies according to the receptor e.g. scrubland with no significant biodiversity is considered less sensitive than a mature forest which supports ecosystems and livelihoods.
- **"Magnitude"**: the size of the potential impact. Impacts may be short term and considered low magnitude (e.g. noise or temporary reduction of income during a short construction project) or high magnitude (e.g. the poor disposal of large quantities of hazardous waste into a water course).

148. Where an impact may occur, if there is no receptor on which is potentially going to receive the impact, then mitigating actions will not be required. This follows the source-pathway-receptor model, whereby in order for there to be an impact, the pollutant or issue (source) needs to be present, the pathway to a receptor is needed (such as fissures in rocks, or water for human consumption) and a receptor must be present to receive the impact, such as humans, flora or fauna.

149. **Potential impact significance.** The following matrix was used during the screening process to anticipate the potential significance of impact, in order to identify the most significant likely impacts to be addressed in the Environmental Management Plan.

		MAGNITUDE OF IMPACT		
		LOW	MODERATE	HIGH
RECEPTOR SENSITIVITY & IMPORTANCE	LOW	Low	Low	Moderate
	MODERATE	Low	Moderate	High
	HIGH	Moderate	High	High

150. **Residual impact significance.** The residual significance of the impact is the potential impact that remains following mitigation. This more accurately describes the impacts of the project as it is anticipated that the requirements of the EMP will be followed and impacts satisfactorily mitigated.

151. The Impact Assessment is based on the impact of likely activities i.e. the source of impacts, required to construct and operate the Subproject. This approach is also designed to support the construction contractor who will plan construction works and therefore plan mitigation measures, in

terms of completion of specific construction activities or phases. For construction, the activities identified are as follows:

- Ground works.
- Production, transport and use of materials.
- Use of machinery & equipment.
- Trench excavations.
- Earthworks.
- Storage and use of chemicals and fuels.
- Spoil, solid waste and liquid waste management.
- Community health and safety (H&S) and urban access
- Occupational H&S and Emergency Response.
- Construction workers and camp management.
- Temporary land take.
- Restoration and rehabilitation.
- Utilities movement.

152. The activities above are assessed in terms of impacts on:

- Air quality
- Noise and vibration
- Soils
- Surface water and groundwater
- Materials (resource) use
- Flora and fauna
- Cultural heritage
- Socio-economics i.e. impacts on people and their business activities, including labor conditions.

B. Positive Impact and Environmental Benefits

153. The subproject will improve the urban environment and climate change-resilience, significantly contributing to a qualitative improvement in the lives of residents in Kampong Chhnang Town. The project includes household connections means the environmental benefit of the sewerage connections will be realized.

Table 21 Positives Impacts and Outcomes

Benefit	Positive Impact	Outcome
Improved storm water management	Relief from flooding in the urban core Reduced health and safety hazards Improved, safe mobility in the rainy season	Improved urban environment Improved health of residents Safe, climate-resilient communities and town Cleaner urban environment and rural surroundings
Improved waste water collection and treatment	Improved sanitation Reduced environmental pollution from untreated sewage Reduced health and safety hazards	

Source: PMIS Team

C. Impacts and Mitigation Measures Relative to siting, design and planning

154. During the project planning, the project has taken into consideration the locations of the

available sites and adapted the designs accordingly in order to reduce the environmental and social impacts and particularly to promote the operational sustainability of the subprojects. The key major design to mitigate environmental risk is as follows:

- Flood protection of the WWTP site by land raising and embankment raising the level to 12 masl, which allows a freeboard of 0.2m based on a one in 50-year flood return period.

155. The final design and procurement documents also incorporate measures to mitigate environmental impacts which are appropriate to this type of project. Examples include:

- Tree screens will be part of the basic WWTP design requirements, to screen the town from noise, odor and the visual impact of the WWTP site.
- Requirements and standards for the reinstatement of pavements and roads.
- Requirements for sound waste disposal practices.
- Requirements for use of approved borrow sites for land raising.
- Requirements for correcting damage to public or private property.

156. The WWTP is located in an active floodplain and is currently part of the Tonle Sap Great Lake natural flood plain. The Subproject will encroach on the floodplain which, as noted in the Baseline (hydrology) section, is being impacted by encroachment throughout the Tonle Sap area, in between the National Roads No. 5 and No. 6. The Subproject will provide a barrier to flood water for approximately 3km. In-fill behind the raised road is anticipated, and WWTP site will be raised and in-filled by the Subproject. Given the scale of the development around the Tonle Sap, particularly in secondary towns such as Kampong Chhnang which has significant areas of in-fill to the north of the town, the impact from the WWTP site on the flood plain is considered minor although contributing to a cumulative loss of natural flood plain around the Tonle Sap Great Lake.

157. Pre-Construction. During the planning and preparation for construction phase, relevant mitigation measures are also included in the EMP which relate to:

- Community consultation – this has already been started during this IEE phase and will continue during the DED phase and project implementation.
- GRM establishment and dissemination for this Subproject – this requires training for the PMU, GRM stakeholders to ensure they are able to establish and participate in an effective GRM.
- EMP and IEE updates – this IEE contributes to ensuring the safeguard documents accurately reflect the project design and the EMPs will be updated during project design if required. The IEE and EMP will also be updated with any required mitigation measures or design considerations as a result of the national EIA requirements.
- Review of contractor provided site specific construction EMPs.

158. These mitigation measures are specified in detail in the EMPs for the project.

D. Environmental Impact and Mitigation Measures during Construction

22. Ground works.

159. **Source of impacts**: Ground works are the preparatory activities needed to prepare a construction site, primarily clearing the sites of vegetation, grubbing stumps and roots and removing any waste materials. For the WWTP area there are accumulations of domestic waste which will need to be removed in order to prepare the land for construction. Materials resulting from clearing or grubbing maybe reused, but more likely will require disposal.

160. **Receptors impacted**: Soil (compaction and erosion), flora, fauna, surface water, waste.

161. **Potential impacts**: Erosion and deterioration of soils may occur where vegetation is disturbed or removed; though for the most part the vegetation cover is scrub and the soil will be covered by the WWTP site, therefore, the likelihood of the impact to occur is relatively low and highly localized. The flora in the area is scrub and there is no evidence of significant fauna using the scrub as a habitat. The WWTP site is adjacent to a water body, on land which is currently subject to seasonal flooding. Therefore, there is potential for land clearance to add to existing sediment loading or other contaminants in the Boeung Tum drainage network. The land clearance will contribute to the waste disposal requirements for the Subproject but the waste from this activity should not be hazardous.

162. **Impact significance**: The impact significance is assessed as low on soil, flora and fauna receptors. The impacts are of relatively low magnitudes and the soil and flora receptors are highly modified and of low sensitivity. The water quality impact is assessed as moderate due to lateral linkage of the cleared area to Boeung Tum at the time of clearance; this will be dependent on the season and flood levels. The water in the lake is used by local residents, although not primarily for drinking[23] and high sediment loading over a short period of time could impact on use of the water.

163. **Mitigation measures and residual impact**. The mitigation measures are covered by those defined below for solid waste management, earthworks and use of machinery and equipment. Therefore, no further specific mitigation is needed for land clearance and grubbing. Following mitigation measures, the residual impact significance is assessed as low.

23. Production, storage, transport and use of construction materials

164. **Source of impacts**: Significant quantities of materials will be used for the construction of the WWTP and the installation of the drainage and sewage network. Asphalt and concrete batching plants will be required for WWTP construction and finishing road surfaces. The final Bill of Quantities is not available at this early phase for a detailed assessment but initial estimates for material requirements include WWTP in-fill and embankment of 970,000 m^3 and sewer network back fill with sand of 104,000 m^3.

165. At this early project preparation stage, the source of the material for in-fill is not known, however for other Subprojects within the Project for Kampong Chhnang, the borrow sites are newly established in agricultural type land south of the city i.e. the materials will not come from established currently licensed sites. It is anticipated that borrow sites or quarries will be required for this Subproject.

166. Transport of materials for the drainage and sewage network will take place in a dense urban area. For these volumes, broadly assuming a construction Heavy Goods Vehicle (HGV) carrying capacity of 8-10 m^3, as larger capacity vehicles would not be practical in the urban area, the estimated HGV movements are in the order of 10-13,000 for the sewer network back fill and 97-121,000 for the WWTP in-fill. An example HGV used for construction and earth works in Kampong Chhnang is shown in Figure 19. Note HGV movements will be lowered for a larger capacity vehicle which would be more practical for the WWTP in-fill and embankment given their more rural locations.

[23] One resident during consultation said he used the lake for drinking.

Figure 19 Material/spoil transport in Kampong Chhnang

Source: PMIS

167. **Receptors impacted**: Air quality, water quality, noise and vibration, flora and fauna, socio-economics.

168. **Potential impacts**: The use of heavy construction vehicles to move construction materials including aggregates and any pre-fabricated structures, can impact on the local community by increasing the risk of traffic incidents, noise, vibration and air pollution (dust and fumes) associated with vehicle use and the movement of loose materials. Significant numbers of vehicle movements will be required, which will be a cumulative impact in the urban core which particularly around economic hubs such as the market, can already be crowded with motorbikes and cars. Tracking dust from HGVs onto the local road network also potentially spreads the impacts from the construction site to a wider area. Noise and dust will also arise during the loading and unloading of construction materials such as loose sand or in-fill materials.

169. The choice of borrow site location and stockpile / storage areas, could impact on flora and fauna or surface water, depending on where they are be located.

170. **Potential Impact Significance:** The impact significance is assessed as high given the increase in vehicle movements and the density of highly sensitive human receptors in the urban core.

171. **Mitigation Measures and Residual Impact**. The mitigation measures in the EMP include avoiding vehicle movements where possible by careful construction planning; sensitive location of any batching facilities; water sprays to dampen fugitive dust; covering loose materials during transport; locating stockpiles away from water sources; low speed limits on unmade roads and in the urban core; signage on national roads where heavy vehicles are turning; a separate Traffic Management Plan which manages construction traffic movements, scheduled to avoid congested and/or sensitive periods; widespread communication on traffic issues; criteria for borrow site selection. Following mitigation measures, the residual impact significance is assessed as medium; many of the impacts from vehicle movements can be lowered through good e.g. disturbance (dust, noise and traffic) can be controlled, but not avoided.

24. Use of Machinery & Equipment

172. **Source of impacts**: The construction will require static and mobile machinery and equipment. This will include equipment used to break out and excavate trenches for the sewage network such as a roadsaw, handheld disc cutter, jackhammer or digger. Machinery for cleaning and improving the drainage network will also be required as well as standard heavy earth moving equipment used in the WWTP site preparation and construction such as excavators, bulldozers and backhoe loaders. The machinery will require regular maintence and refueling which requires the use and disposal of hazardous fluids.

173. **Receptors impacted**: Air quality, noise and vibration, water quality, soil, socio-economics.

174. **Potential impacts**: The mobile machinery and equipment will cause noise and air quality impacts on local residents and business owners, particularly in densely populated urban areas. This will contribute to the cumulative impacts of existing traffic noise and local air pollution from vehicles particularly in the urban core. Also the type of informal housing around parts of the Subproject area means residents will be particularly affected by noise and dust, as their housing affords little protection.

175. The use of equipment may impact on water or soil quality if the machinery is not kept in good order, or is repaired without adequate preventative measures to protect against spillages and in the wrong location e.g. near a sensitive water receptor. Also, there are inherent occupational health and safety risks to when using construction equipment and risks to the community when large machinery is used in a confined urban context.

176. **Potential Impact Significance**: The impact significance is assessed as high for impacts on residents, as highly sensitive receptors and low for impact on water quality and soil. Also, the impacts will contribute to the cumulative noise and dust in the urban core from baseline traffic levels. Occupational H&S is considered separately.

177. **Mitigation Measures and Residual Impact**: The mitigation measures in the EMP will focus on good vehicle maintenance and spill prevention protocols; restriction of working hours from 8am-6pm; clear and advanced communication with the community including GRM information; use of mobile noise barriers around machinery; preventing vehicle maintenance/washing close to water courses. The residual impact is assessed as medium; noise and vibration impacts are short term and can be lowered through good practice but cannot be avoided; pollution and health and safety impacts can be avoided.

25. Trench excavations

178. **Source of impacts**: The Subproject requires approximately 38 km of pipes to be laid in excavated trenches. The exact methodology of trench excavation is not known at this stage of the project; the excavation methods can have a significant influence on the impacts that such excavations may cause. The excavations are in a dense urban core, which in many places is crowded with traffic, market stalls, businesses and pedestrians. The streets are poorly lit, if at all and application of traffic regulations is not always effective. A recent ADB project in Battambang resulted in a tuk-tuk falling into an unguarded excavation[24]. The impacts caused by the machinery to excavate the trenches are discussed above.

179. **Receptors impacted**: Air quality, noise and vibration, traffic, cultural heritage, socio-economics (Community and occupational health and safety).

180. **Potential impacts**: Impacts from trench excavation in urban areas and along public roads include increased noise and traffic generated by construction vehicles as well as road closures or restrictions. The excavation itself (dust) and traffic (emissions) will impact on localized air quality. The excavation will also generate spoil which will require disposal if it cannot be reused on site or elsewhere within the Subproject. The most significant impact will be on poorly managed open trenches in terms of community health and safety, for example if trenches are poorly lit, signed and guarded and also in terms of access to businesses, houses and places of worship. In addition, the Project's Resettlement Plan identified issues for businesses (market traders) conducting their business during sewer excavations around the market area in particular. Also the busier areas are a potential health and safety risk for construction workers.

[24] Discussion with ADB CARM, 2019

181. **Potential Impact Significance**: The impact significance is assessed as high as community health and safety can directly be impacted on by poorly managed trenches with serious consequences.

182. **Mitigation Measures and Residual Impact**: The measures required are covered by those specified for Earthworks, Use of Machinery and Equipment, Materials Production Transport and Use (Traffic Management Plan), and Occupational and Community Health and Safety. In addition, through agreement during consultation, a night time construction schedule (8pm to 4pm) will be required for market areas to minimize impact on livelihoods. Noise protection measures and early awareness in the community will be needed as for Use of Machinery and Equipment. Mobile vendors operating from evening to late at night will be with provided two optional temporary market locations within the locality, in order to remove them from the construction areas and ensure their livelihoods can continue. The residual impact is assessed as medium as health and safety impacts can be lowered through good practice, but traffic / road network disturbance and dust/noise cannot be fully avoided.

26. Earthworks

183. **Source of impacts**: Earthworks comprise a major part of civil engineering projects and include excavation / cutting and placement and compaction of fill materials to create earth structures such as slopes and embankments[25]. The Subproject will require significant earthworks. This includes cut and fill operations, formation of the raised roads with embankments and the large area of in-fill for the WWTP site. The majority of the major earthworks i.e. WWTP site and embankment are in a semi-rural area which is not heavily populated.

184. **Receptors impacted**: Air quality, noise and vibration, soil (compaction and loss), surface water (quality and flooding), socio-economics, cultural heritage.

185. **Potential impacts**: Earthworks activities can impact on air quality from fugitive dust generation, and emissions from vehicles, including noise and traffic disturbance from an increase in large vehicles on the roads. Earthworks can also affect water quality if drainage on not controlled sites is poorly managed. Poor site drainage during rainstorms can cause erosion of soil and subsequent increases in sediment loading in receiving waters and ponding or flooding, particularly if natural run off routes become blocked by construction activities. The construction sites in which these major earthworks take place also have inherent occupational and community health and safety risks from, for example, the use of large-scale machinery or the potential unauthorized access to the sites by community members.

186. Although no specific heritage sites are known in the area, given the cultural history of Cambodia, there is also a potential impact on cultural heritage through a chance find during earthworks.

187. **Potential Impact Significance**: The impact significance is assessed as high for H&S and moderate for dust and noise given the magnitude of impact is likely to be low although the receptors (residents and businesses) are highly sensitive; the majority of earthworks are in low density semi-rural areas. The impacts on water quality and flooding are assessed as moderate and low for cultural heritage.

188. **Mitigation Measures and Residual Impact**: The mitigation measures in the EMP include the provision of short term drainage on construction sites; work primarily during the dry season; the use of water sprays on earthworks to control dust; and the cessation of works if a chance find occurs until the find is investigated. Community and Occupation H&S measures are considered

[25] ICE (2015) Earthworks: A guide, Second Addition. Institute of Civil Engineers.

separately. The overall residual impact is assessed as moderate because environmental impacts can be lowered through good practice but traffic disturbance, noise and vibration from earthworks cannot be fully avoided and will impact on people.

27. Storage and Use of chemicals and fuels

189. **Source of impacts**: Chemicals are required for the operation and maintenance of vehicles and equipment, e.g. degreasers, oils and fuels. Many of these substances can be harmful if allowed to enter the environment or come into contact with humans either through skin, ingestion or respiratory pathways. Volatile substances such as solvents emit Volatile Organic Compounds which contribute to low level ozone levels.

190. **Receptors impacted**: Air quality, water quality, soil (quality), socio-economics.

191. **Potential impacts**: Depending on the location of the chemical storage and use, there is potential for localized soil and water pollution to occur through contamination by poorly managed chemicals. Poor storage can also contribute to Volatile Organic Compound (VOC) emissions and its associated impacts on air quality, in the wider environment. Occupational H&S impacts may occur at any time particularly when using flammable chemicals and those which can impact on human health such as acids, cleaning chemicals and solvents.

192. **Potential Impact Significance**: The impact significance is assessed as moderate for impacts on air, water and soil as impacts will be in the main small scale unless a major rupture of a fuel tank occurs. The impact significance is assessed as high for H&S as significant harm could occur with long term consequences.

193. **Mitigation Measures and Residual Impact**: The mitigation measures in the EMP include a designated appropriate refueling area >200m from watercourses and water bodies; use of drip trays; storage in bunded areas with impermeable surfaces; clear labeling of containers; and spill control planning. Occupation H&S measures are considered separately.

28. Spoil, Solid Waste and Liquid Waste Management

194. **Source of impacts**: Spoil will be generated during excavation for sewerage works and solid waste will be generated during all construction activities including the cleaning of the drainage network. Much of the spoil will be uncontaminated inert waste which can be reused where possible on the project. Non-inert wastes are those which undergo biological degradation such as organic wastes from septage, or food wastes. Some waste will be considered hazardous, as defined in national legislation (Sub decree No. 36) and international waste legislation (e.g. EU Directive 2008/98 on Waste and Decision on List of Wastes). This is waste which has significant potential to impact on the environment and human health.

195. **Receptors impacted:** Soil quality, water quality, materials/resource use, socio-economics.

196. **Potential impacts**: Inappropriate spoil and waste disposal can impact on receptors including soil quality and surface waters, as well as residents if biodegradable waste is indiscriminately dumped causing a nuisance. Receptors maybe sensitive, such as water bodies if spoil or waste is allowed to creep into water and the impacts can potentially be long term if wastes are hazardous such as used oils and chemical drums. Also inherent to the production of waste is the waste of resources.

197. **Potential Impact Significance**: The impact significance is assessed as high as sensitive water receptors could have long term impacts from hazardous waste disposal impacts.

198. **Mitigation Measures and Residual Impact**: The mitigation measures in the EMP include the application of the waste hierarchy with priority given to prevention of waste from being generated at source, then recycling and reuse of spoil and other recyclable materials. Waste

collection will be included in the EMP to prevent escape of waste and littering. Contaminated and uncontaminated spoil will require disposal criteria and disposal locations approved if it is not reused. The overall residual impact is assessed as low as effective and safe waste management can be implemented.

29. Community Health and Safety (H&S) and Urban Access

199. **Source of impacts:** The Subproject will include extensive street works in an urban core, which can be crowded with people and traffic. A National Road also runs through the centre of the sewer service area, which is a trunk road connecting Phnom Penh to the Thai border. The construction work will generate many HGV movements, adding to the baseline traffic in the area.

200. **Receptors impacted**: Cultural heritage, Socio-economics

201. **Potential impacts**: Street works in an urban area needs specific attention paid to health and safety considerations. Construction machinery and excavations in an urban area will pose potential health and safety risks to the residents, visitors and business owners if management of the construction sites is not adequate. Impacts can include physical accidents involving machinery, trench excavations and the WWTP and embankment construction sites. Access to houses and businesses can be impaired which can pose risks when insecure access routes are used by pedestrians and motorbike riders to enter properties across excavations. The urban core also includes several places of worship which are central to specific festivals and celebrations.

202. **Potential Impact Significance**: The impact significance is assessed as moderate, due to a low magnitude of impact on highly sensitive human receptors.

203. **Mitigation Measures and Residual Impact**: The mitigation measures in the EMP include adequate signing, lighting and guarding of all street works; lighting and buffer zones around construction sites where needed on access roads and populated locations. For urban excavations, safe access will be maintained for pedestrians and vehicles to schools, markets, houses, pagodas and commercial establishments a Traffic Management Plan, as specified in Materials Production, Transport and Use' above. The work will be carried out in sections such that there is minimum disturbance to access for residents and businesses with backfilling completed at the end of each working day. Residual impact significance is assessed as low, impacts can be avoided through good practice.

30. Occupational H&S and Emergency Response

204. **Source of impacts**: Typical of large construction projects, workers from overseas or from outside the locality are likely to be engaged, such workers are increasingly vulnerable to health care shocks, driven by lack of access to basic healthcare facilities and the absence of social support and financial protection.[26] The International Labor Organization (ILO) estimates that globally, there are 2.7 million occupational fatalities annually.[27] Of these deaths, the ILO notes that the construction sector 'has a disproportionately high rate of recorded accidents'[28]. Accidents and incidents in the construction sector are not uncommon and can include small scale minor spillages to large scale releases to the environment, such a through a rupture to a fuel store, polluting soil and water, and accidents with machinery and vehicles leading to physical disability and death.

205. The 2020 COVID-19 virus has caused a global pandemic. It is a highly contagious virus which as of July 1st 2021, has lead to over 180 million confirmed cases and nearly 4 million deaths

[26] ADB (2020) Outline Terms of Reference REG:TA Health Borders Special Economic Zones.
[27] https://www.ilo.org/global/topics/safety-and-health-at-work/lang--en/index.htm
[28] https://www.ilo.org/moscow/areas-of-work/occupational-safety-and-health/WCMS_249278/lang--en/index.htm

worldwide.[29] This virus is not anticipated to be eliminated within the short term, therefore is of relevance to the construction workers for this Subproject; everyone who is in close contact with colleagues, such as those who live in construction work camps, could be at risk of contracting and spreading the virus.

206. **Receptors impacted**: Socio-economics (Occupational Health and Safety), Water, Soil.

207. **Potential impacts**: The impacts from construction accidents on workers can be temporary or permanent or fatal. These impacts are of particular concern when in the context of poor public health services. Occupational H&S risks are particularly a concern in construction sites where excavations, heavy machinery and equipment is used. The depth of sewer excavations may require the need for additional trench supports to stop trench collapse, but this will be decided on by a case by case basis depending on the material being excavated.[30]

208. Spillages can lead to release of chemicals or fuels harmful to the environment if an accident occurs. This can have localized impacts such as a small spillage on soil, or widespread environmental consequences for a major release which enters a water body. The impact will depend on the toxicity of the release.

209. **Potential Impact Significance:** The impact significance is assessed as high; the receptors (construction workers) are sensitive and the magnitude of an impact will be high, should life changing injury or a fatality occur.

210. **Mitigation Measures and Residual Impact:** The mitigation measures in the EMP include a combination of thorough training including induction and tool box talks by a trained H&S officer, and include training on COVID-19 related practices; warning signs for construction workers; clear Emergency Response Procedures for a minimum of injury, spillage and fire. Use of Personal Protection Equipment (PPE) is required but it considered a last resort as the first step is to remove the hazard. The residual impact significance is assessed as low; accident risks can be eliminated through good practice.

211. COVID-19 specific requirements include implementing ILO's Practical Guidance – Safe Return to Work where appropriate. ILO has developed 10 preventive measures for a safe return to work in the context of COVID-19 which are summarized below as related to construction work and in particular work camps. The table also incorporates additional COVID-19 management guidance specific to construction sites.

212. The contractor must implement the COVID-19 Mitigation Measures in the EMP and present a risk assessment relating to COVID-19 prior to any construction works or site preparation. PMU will review and approve the Risk Assessment, seeking advice and guidance from the Ministry of Health as required. This Risk Assessment is now a requirement of the Construction Environmental Management Plan (CEMP).

31. Construction Workers and Camp Management.

213. **Source of impacts:** Construction camps are often required to accommodate workers from outside the local area on large construction projects, and in line with similar projects in Cambodia, it is anticipated that a worker camp will be required for this Subproject. Camps can cause impacts both socially and environmentally. Socially an influx of workers from outside the area may cause

[29] World Health Organisation (WHO) COVID-19 Dashboard: https://covid19.who.int/?gclid=EAIaIQobChMIn_LCvufY6QIVEud3Ch2YCgYuEAAYASAAEgJxlPD_BwE

[30] International Finance Corporation /World Bank EHS Guidance for Occupational H&S does not give guidance on shoring excavations. Other jurisdictions such as UK Health and Safety Executive recommend shoring at 1.2m but it is dependent on the likelihood of material slippage.

social problems, particularly if the workers are from overseas and unfamiliar with local customs and laws. Environmentally a poorly sited and managed camp can pollute local soil and water courses, cause compaction of the soil and will generate biodegradable and plastic household-type wastes.

214. **Receptors impacted**: Socio-economics, water, soil.

215. **Potential impacts**: Social impacts include local social conflicts between workers and residents, over issues such as wildlife hunting, fishing and not conforming to local social norms and expectations in terms of behavior. Also, there can be local resentment if the workers are not nationals or from the local area. Environmentally, poorly managed sewage, chemicals and grey water can impact on local water courses and create long term contaminated land issues.

216. Impact associated with COVID-19 transmission in work camps are considered in Occupational H&S.

217. **Potential Impact Significance**: The impact significance is assessed as moderate.

218. **Mitigation Measures and Residual Impact:** The mitigation measures in the EMP include a preference for use of local workers, then workers renting houses within the area, instead of a camp. If this is not possible suitable accommodation will be provided in order to meet ILO Minimum Work Camp Standards, see supplementary table in EMP. In addition to ILO Requirements[31], International Finance Corporation requirements are included in the EMP to the extent practicable. Good camp housekeeping will be maintained includes sounds waste management; relevant training on local laws and health protection measures provided including on COVID-19; first aid kits are required; communal areas will be provided; strict food hygiene standards will be maintained. The residual impact significance is assessed as low, with appropriate training, camp siting and management.

32. Temporary land take

219. **Source of impacts:** A staging area will be required for storing machinery, equipment, fuels, chemicals, stockpiles, and materials required for construction. Any pre-cast concrete will be made off site in a staging area. For the sewer network, land will be required that it outside the urban area therefore is likely to be in an agricultural or semi-rural area, given the surrounding land use. The construction camp, discussed above, is also considered to require temporary land take.

220. **Receptors impacted**: Soil, water, flora, fauna.

221. **Potential impacts**: There is potential for temporary land take to cause deterioration, specifically soil compaction which could impact on its use as agricultural land in the future. It may also cause localized soil pollution from any spillages. Water pollution may also occur from liquid storage should the site be poorly located. Both accidental releases and the physical presence of the construction activities may impact on flora and fauna in the immediate vicinity.

222. **Potential Impact Significance**: The impact significance is assessed as low as the impact should be a moderate magnitude, assessed as such due to the potential size of the land take given the construction camp and staging area and the sensitivity of the soil receptor is assessed as low, given the highly modified environment.

223. **Mitigation Measures and Residual Impact**: The mitigation measures in the EMP include the provision of a map to identify any areas of temporary land take, and a report on the condition of the land prior to its use by the construction company. The staging area will not be within 200m of a

[31] ILO (2009) Workers' housing. ILO Helpdesk Factsheet No. 6

water course and the other mitigation measures in the EMP such as fuel storage and vehicle maintenance requirements will be followed. A plan for restoration following construction will be required in accordance with the Restoration and rehabilitation mitigation measures and any other contractual requirements related to normal construction practices. The residual impact is assessed as low following sound site selection, management and rehabilitation.

33. Restoration and rehabilitation.

224. **Source of impacts**: At the end of the construction phase, areas such as construction workers camps, staging areas, borrow sites and access roads may contain waste, spoil and other debris. The sites will not be in the condition they were before the construction started; damage may be accidental or predicted prior to construction. The sites will have been used for heavy vehicles and storage and use of potentially contaminating materials. Within the urban area, the excavation and reinstatement of trenches can cause vibration which is often a concern to property owners who. Although not identified in the consultation conducted to date, street works can cause anxiety amongst the local population if their structures (houses and businesses) are close to the right of way. Concerns about damage to buildings from vibration or accidental vehicle strikes are not uncommon.

225. **Receptors impacted**: Soil, socio-economics, flora and fauna.

226. **Potential impacts**: The use of construction sites outside the urban core, including unmade access roads e.g. from borrow sites, can result in loss of flora, fauna and soil degradation. Heavy construction traffic within a town, given the number of vehicle movements required, can impact on poor quality roads or minor roads which were not designed for HGVs. Accidental damage to property may also occur from vibration from construction equipment and HGVs as well as accidental building strikes during maneuvering. Typically, the project construction contract includes repairs caused by such damage and is also included in the EMP for consistency

227. **Potential Impact Significance**: The impact significance is assessed as moderate as the environmental receptors are of low value but the consequences for damage to buildings and public infrastructure is of more importance.

228. **Mitigation Measures and Residual Impact**: The mitigation measures in the EMP include a plan to be implemented on rehabilitation of borrow site such as contouring slopes; retention of topsoil on landfill construction areas to support vegetation screening; clear up of debris, waste, spoil and removal of any contaminated land e.g. oils spills; repair road damage and other accidental damage to the quality specified in the bill of quantities.

34. Utilities movement

229. **Source of impacts:** Any street works has potential impact on existing utilities infrastructure, including communications cables, water, and electricity. Also, overhead cables can also be damaged by tall vehicles or carrying large loads.

230. **Receptors impacted**: Socio-economics.

231. **Potential Impact.** The engineering team has established that the sewer along the road has no impact on the existing utilities of telephone and electricity supply but can have impact on the existing water supply connections. In case of the rider mains in the footpath, there might be many conflicts with underground fiber optic and telephone cables.

232. **Potential Impact Significance**: The impact significance is assessed as moderate; interruptions should be short term but will be very inconvenient to residents and businesses

233. **Mitigation Measures and Residual Impact**: The contractor will ensure planning and co-ordination with the utilities suppliers and provide early information for residents affected by any

interruptions. Interruptions to significant receptors including healthcare facilities, should this be required, will require careful co-ordination actions and consultation. The Residual impact significance is assessed as low, after impacts are mitigated with good planning.

E. Impacts and Mitigation Measures during Operation

35. Operation and Maintenance.

234. **Source of impacts:** Operation of the WWTP and drainage and sewage network involves the cleaning and transport of potentially odorous materials and the operation involves open ponds or lagoons. A pumping station is required near a residential area which will require long term operation.

235. For all of the Subproject's components, inadequate maintenance and repair will lead to ineffective operations and services. Without a budget for O&M being ring-fenced and clear procedures on how O&M will be performed, the WWTP may begin to operate ineffectively and effluent standards not maintained. If the drainage network is not cleared of silt it will render the network ineffective and will contribute to flooding within the town.

236. **Receptors impacted**: Air quality, water quality, noise, socio-economics

237. **Potential impacts**: The release of poorly treated waste water will potentially be an environmental consequence because it is concentrated in one discharge point, rather than without a WWTP where there are many dilute discharge points. Poor WWTP maintenance can therefore impact on water quality, soil quality and local residents will be subject to odor issues. It is critical that the designed effluent standards are met and maintained. As a result of maintenance of the WWTP and the sewerage and drainage network, sludge require disposal. This can include sludge contaminated with pollutants from roads such as hydrocarbons and rubber particles, or sludge from WWTP maintenance which may contain pathogens if operation is not effective and sludge is not fully mineralised. Sludge disposal is largely unregulated in Cambodia, which increases the risk throughout operation. In addition, operation of WWTPs inevitably lead to odor nuisance if they are pond based, regardless of how well operated the site is. The pumping station may lead to noise impacts, but this is to be determined by the final design.

238. **Potential Impact Significance:** The impact significance is assessed as high, given the sensitivity of the operatives and community and the potential magnitude of environmental impact if the WWTP operates below the design standard, particularly in dry season where dilution will be limited.

239. **Mitigation Measures and Residual Impact**: The mitigation measures in the EMP include: The WWTP operator should be contactable and provide a signboard outside the site indicating key contacts; public complaints and their resolution will be recorded. Measures to support sound O&M are based on the development of an O&M manual by the Operator in collaboration with MPWT and MoE. It will provide clear methods and procedures for all aspects of the WWTP operation. A network maintenance schedule will be developed for sewerage and drainage. Ensure relevant staff attend available training during Subproject implementation and capacity development, and disseminate knowledge to colleagues. Ensure fully digested sludge is put to beneficial use without harm to human health or water courses where possible, and dispose e.g. landfill, sludge waste which would otherwise cause harm or contamination if applied to land. The operators will conduct a regular environmental analysis program. Develop and test procedures for emergency situations including COVID-19 outbreaks to ensure operational continuity. If well maintained, the residual impact of operation is moderate, but this will require budget and commitment.

36. Occupational Health and Safety.

240. **Source of impacts:** The maintenance of the drainage and sewerage network will include cleaning and entering manholes and the use of cleaning equipment such as high pressure water

jets and working in and around ponds/lagoons. The current practice of hand desludging the sewer/drainage network should stop with the use of jet washing machines which is a positive health and safety impact. Particularly for the WWTP, there are risks around the use and handling of chemicals and the health risks associated with raw sewage and sewage sludge.

241. **Receptors impacted**: Socio-economics (health and safety)

242. **Potential impacts:** Impacts from operation and maintenance include the health risks associated with working in an environment with raw sewage and sewage sludge. Accidental contact can have serious health consequences, both short or long term. Also, occupation H&S impacts may arise around the use of equipment, machinery, cleaning chemicals, if used and working around deep water. Another WWTP subproject under the Project[32] will use dry calcium hypochlorite. This comes with additional specific health and environmental risks[33]. Harm to health can be caused by inhalation, eye contact, skin contact and ingestion. Harm to the environment may be caused as the concentrated substance is highly toxic to aquatic life. It should be stored in a cool well-ventilated area in a closed and labeled container. Specific training should be provided on its handling. Note similar chemicals are used in waste water treatment sites elsewhere in Cambodia.

243. **Potential Impact Significance**: The impact significance is assessed as high given the potential health risks to workers.

244. **Mitigation Measures and Residual Impact**: The mitigation measures in the EMP include the development of rigorous site specific health and safety procedures which sets out how the operators will complete a comprehensive H&S training programme; Undertake risk assessments; Use of appropriate PPE; Retain Material Safety Data Sheets on all chemicals used; Undertake health assessments; develop emergency procedures and provide access to first aid. The residual impact is low with adequate H&S mitigation measures.

37. Unanticipated Impacts during Construction and Operation

245. In the event, unanticipated impacts become apparent during project implementation, the borrower will: (i) inform and seek ADB's advice; (ii) assess the significance of such unanticipated impacts; (iii) evaluate the options available to address them; and (iv) update the IEE including EMP. ADB will help the borrower mobilize the resources required to mitigate any adverse unanticipated impacts or damage.

[32] Pursat WWTP
[33] Material Safety Data Sheet, Cacium Hypochlorite, Breckland Scientific revision date 23/10/18

VI. INFORMATION DISCLOSURE AND PUBLIC CONSULTATIONS

A. Information Disclosure

246. This IEE will be disclosed by ADB as required including a copy on the Project section of ADB's website. Environmental information on the project, including the IEE and other safeguards information will be disclosed in accordance with ADB's Public Communications Policy (2011) and SPS (2009). This includes:

(i) The EMP will be translated into Khmer and be available for review PDPWT offices;
(ii) The IEE will be disclosed on ADB's project website (www.adb.org);
(iii) Copies of the IEE are available upon request; and
(iv) Semi-annual environmental monitoring reports on project's compliance with the Environmental Management Plan (EMP) and other necessary information will be available at www.adb.org.

B. Public Consultations during Project Preparation

247. ADB's Safeguard Policy Statement requires meaningful consultation with stakeholders early on in the project cycle. As a result, Subproject specific public consultation took place on 12th March 2020 in Kampong Chhnang, in the Municipality office. This is separate to the consultation that has taken place for the Project as a whole. Consultation took place prior to Ministry of Health restrictions on mass gatherings (issued 3rd April) and restrictions on internal movement (issued 9th April)[34].

248. The Subproject consultation included participants from all of the four Sangkats that comprise the project area; in Kampong Chhnang Municipality (district) there are four Sangkats (communes), B'er, Phsar Chhnang, Khsam and Kampong Chhnang. Participants included 19 village chiefs from all four Sangkats.

Figure 20 Subproject public consultation meeting

Source: PMIS

249. The public consultation meeting showed the participants in the consultation to actively support and agree with the project, understanding that it will serve to improve the local environment. A number of questions were raised by participants and answers given in response to the PMIS team asking questions, as shown in Table 22.

250. In May and August 2020, during further consultations, related to resettlement, the PIU/PMIS

[34] http://www.cdcmoh.gov.kh/images/Document/Coronaviruses/COVID-19/WHO-MOH_SITREP/COVID_19_JointWHO-MOH_SITREP__6July2020_FINAL.pdf Wearing facemasks, hand hygiene and respiratory etiquette have not formally been required.

team explained the Subproject scope from house to house and distributed the updated public information brochures (PIBs). The PIU/PMIS team assisted the illiterate affected people by reading out loud and explaining all the information in the updated PIBs to them. The PIB was distributed containing a description of the project and contact details for the PIU and PMU.

Table 22 Consultation response 12th March 2020

Participants	Comments / Requests / Questions / Issues	Project Response
Municipality Sangkat B'er Sangkat Phsar Chhnang Sangkat Khsam Sangkat Kampong Chhnang	1. All agree with, and support the sub-project (Sewerage collecting system and WWTP). 2. Does the project affect to small shops and houses along the road in Sangkat B'er? 3. Does the project affect to local resident's land in WWTP site? 4. Does the sewerage system collect from every Sangkat and treat at WWTP site? 5. Does the water from toilet can discharge to this system? 6. Does the discharge from WWTP affect to water quality? Due to water in the big lake (WWTP site) use bath, washing, cooking and drinking as well.	1. No response required 2. Social Specialist response 3. Social Specialist response 4. Yes, a map showing the collection area is part of the public information booklet 5. Yes water from toilets should discharge to this collection system. 6. The water discharged from the WWTP will meet national standards for effluent and therefore should not negatively impact on the lake or its uses [The team noted only one person who said water is used for consumption] 7. The Municipality requested: a) that Sangkats and villages representative extend the information to local people b) Local people to join future consultation on the project and prohibit on new construction on the right of way.

Source: PMIS

C. Public Consultations during Project Implementation

251. The PIU undertook consultations during the finalization of the detailed design, and the PIU ESC will conduct further consultation interviews within four to six weeks of construction starting and then again, every three months until the end of construction, if COVID-19 permits this to be undertaken safely. This is set out in the Environmental Monitoring Plan.

252. It is suggested that the consultations take the form of meetings and site-based discussions and include the following:

(i) Environmental impacts of civil works (e.g., solid & liquid waste, erosion, local flooding, pollution);
(ii) Any unforeseen impacts caused accidentally e.g. through spillages;
(iii) Civil nuisance (e.g., noise, dust, disrupted business & agricultural activity, social issues, community health and safety);
(iv) Impaired use of access road to WWTP site and roads within urban core (e.g. traffic issues and access); and
(v) GRM and its procedures including details of persons to contact and contact details.

253. The COVID-19 pandemic is anticipated to continue at least during the early stages of implementation, if not beyond. This may impact on the ability of the project to undertake consultation in larger groups and national travel may be stopped at any time if a lockdown is put in place by the Government. The project will therefore endeavor to consult people meaningfully and disseminate information through small groups, outside, with appropriate protective measures or via electronic means, as long as the national laws permit.

254. In summary, informal monitoring interviews with affected people will focus on complaints

about community disturbance from construction activities, as well as public concerns about ecological protection, soil / land concerns and access issues. This will form part of the PIU's role in Environmental Monitoring and will contribute to overall Project monitoring.

D. Consultation during Operation

255. The mitigation measures for this IEE specify that the WWTP operator, in collaboration with PDPWT undertake consultations with local residents to discuss any operational impacts or concerns.

VII. Grievance Redress Mechanism

A. GRM Objective

256. The GRM for this Subproject will be consistent with the requirements of the ADB Safeguard Policy Statement (2009) and will be established to prevent and address community concerns, reduce risks, and assist the project to maximize environmental and social benefits. The GRM will be accessible to all members of the community and free of charge. In addition to serving as a platform to resolve grievances, the GRM will help achieve the following objectives:

- Open channels for effective communication, including the identification of new environmental issues of concern arising from the project;
- Demonstrate concerns about community members and their environmental well-being; and
- Prevent and mitigate any adverse environmental impacts on communities caused by project implementation and operations.

38. Grievance Redress System

257. The Subproject will be incorporated into the existing Grievance Redress Mechanism (GRM) for the Project. The Project GRM was established prior to construction works starting in Kampong Chhnang for the landfill subproject. The same GRM approach will be used, however the local GRM entry points will be geographically specific to this Subproject.

258. The following roles and responsibilities for the GRM are set out in Table 23.

Table 23: 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-Environment Safeguard Counterpart (PIU-ESC) PMU-Environment Safeguard Officer (PMU-ESO) Municipality representatives Provincial representatives Function: GRM Access Point and Decision Making Monitor and record complaints
PMU-Environmental Safeguard Officer (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- Environmental Safeguard Counterpart (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

39. Access to the mechanism.

259. 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 and camps.
- Access points will participate in the GRM 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.

40. Communication on the GRM: Project Hotline

260. 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 which must include three locations around the town in for the drainage and sewage network construction and construction camps and staging areas.

261. The project hotline notice board will include the following information in Annex 3 and will require a designated telephone number which is for the project and not personal to individual members of staff.

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

262. Complaints will be managed centrally by the PMU-ESO. Records will 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 will be compiled centrally by PMU-ESO to ensure none are missed and trends are identified. This will include all formal and informal complaints and their resolution.

263. For comments, suggestions or minor issues that can be managed within the construction area, the Hotline Access Point will record the following information (Table 24), and will inform the PMU:

Table 24: 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]	*Waste water 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 (AP) [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*

264. For issues that cannot be resolved on site, by discussion with the contractor, the PMU will use the following table (Table 25) to record and resolve the issue.

Table 25: Project Hotline Formal 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 22-02-19*
	Name of Person & Contact Details [If Given]	*D. Than, 092 90129901*
	Construction Site / Project Activity [relevant to person]	*Drain excavation*
	Suggestion / Comment / Complaint: [give detail]	*Complaint: Contractor has cut off water supply to house*
	Date PMU (Phnom Penh) Informed:	*22-02-19*
	Name of Person in PMU Informed:	*T. Pheap, PMU-ESO*
Day 2	Action Taken: [for suggestions / comments, for questions, for complaints]	*Site Supervisor informed. Contractor disagrees.*
	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 D. Than.* *Confirmed water supply not restored*
	Further action or resolved? [describe if the problem is solved or action needed]	*Not resolved* *Contractor disagrees. Water supply was never connected.*
	For PMU if Complaint Not Resolved:	
Day 5	Complaint Screening: [explain why it is valid/not valid]	*Valid complaint. All houses in the road have a water supply.*
	Date Person informed of Screening [tell affected person if PMU considers the complaint valid]	*26-02-19*
Day 6-7	Investigation & Agreement [discuss on site with PMU, PIU, Contractor and others as required. Identify a solution]	*Meeting on site. Contractor will replace the PVC water pipe. Agreed on 28-02-19*
	Date for implementing resolution [to be completed within 15 days of initial complaint]	*30-02-19*
Day 16	Implementation Follow Up [Contact PIU/Contractor/Site Supervisor and get evidence from site e.g. photographs of completed works]	*PIU photos via Telegram of completed pipe work. Discussed with contractor by phone*
Day 20	Solution Satisfaction Follow Up [Contact Affected Person, obtain signed letter of satisfaction that complaint resolved]	*Call to D. Than. Water supply restored. Letter is signed. PIU sent copy via Telegram*

265. **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.

266. 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.

267. 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.

268. 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.

269. **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 25 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 25 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.

42. Managing Unresolved Complaints

270. **District Level.** For actions not taken within the agreed timeframe and when an 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.

271. **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.

272. **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.

273. **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

274. 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.

275. 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.

276. 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 environmental monitoring reports during construction and annual monitoring reports during operation, submitted to ADB.

277. 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.

VIII. ENVIRONMENTAL MANAGEMENT PLAN

278. A detailed environmental management plan (EMP) is provided in a separate document for the subproject, which is updated with the detailed engineering design and IESIA requirements. This stand-alone EMP will be included into the bidding documents and updated versions post-bidding are provided to the successful contractor. The EMP aims to avoid impacts where possible and mitigate those impacts which cannot be eliminated to an acceptable and minimum level. The EMP includes requirements for:

- Institutional arrangements and project responsibilities;
- Mitigation measures;
- Monitoring and reporting requirements;
- EMP budget for implementation; and
- Capacity building and training requirements.

279. 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 the 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.

280. A summary of the key functions for project implementation and environmental safeguards is presented in below.

Table 26: 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 including Construction Supervision Consultant (PMIS-CSC)
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

IX. CONCLUSIONS

A. Conclusions

281. 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.

282. The main project risks related to environment include: (i) low institutional capacity for environmental management and the possibility that the PMU and Implementing Agency or operator inadequately monitor the environmental impact and implement the EMP during the construction and operation of the project; (ii) the PMU and Implementing Agency inadequately implement corrective actions as issues arise during project implementation (iii) inadequate budget is allocated for maintenance of the WWTP.

283. The most significant long-term impacts from the project will arise from WWTP operations. Short term impacts will arise from street works in a dense urban core. 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.

284. 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. Consultations will be conducted throughout implementation in addition to the GRM. Public consultations will be at high risk of disruption from COVID-19 therefore the PMU and PIU will endeavor to consult people meaningfully and disseminate information through small groups, outside, with appropriate protective measures or via electronic means, as long as the national laws permit.

285. Overall, the project is anticipated to bring environmental benefits to the subproject towns and its residents. It will serve to improve the current situation and will provide long term environmental improvements.

B. Recommendations

286. The project will require agreements and commitments from the Government that the key risks from the subprojects will be mitigated as set out in the EMP. In particular the provision of adequate operation and maintenance budgets for effective long-term service delivery, in accordance with the designs, for the operation of the landfills and the waste water treatment plant.

ANNEXES

Annex 1 Domestic IESIA Approval

ព្រះរាជាណាចក្រកម្ពុជា
ជាតិ សាសនា ព្រះមហាក្សត្រ

ក្រសួងបរិស្ថាន
លេខ: ១៦៣០ ... ប.ស្ត

សូមគោរពជូន
ឯកឧត្តមទេសរដ្ឋមន្ត្រី រដ្ឋមន្ត្រីក្រសួងសាធារណការ និងដឹកជញ្ជូន

កម្មវត្ថុ៖ ករណីពិនិត្យ និងផ្តល់យោបល់លើរបាយការណ៍វាយតម្លៃហេតុប៉ះពាល់បរិស្ថាន និងសង្គមដំបូង(IESIA) សម្រាប់អនុគម្រោងសាងសង់ប្រព័ន្ធលូ និងស្ថានីយប្រព្រឹត្តកម្មទឹកកខ្វក់ក្រុងកំពង់ឆ្នាំង នៃគម្រោងកែលម្អការគ្រប់គ្រងបរិស្ថានក្រុងជុំវិញបឹងទន្លេសាបរបស់ក្រសួងសាធារណការ និងដឹកជញ្ជូន នៅខេត្តកំពង់ឆ្នាំង

យោង ៖
- ព្រះរាជក្រមលេខ នស/រកម/១២៩៦/៣៦ ចុះថ្ងៃទី២៤ ខែធ្នូ ឆ្នាំ១៩៩៦ ដែលប្រកាសឱ្យប្រើច្បាប់ស្តីពីកិច្ចការពារបរិស្ថាន និងការគ្រប់គ្រងធនធានធម្មជាតិ
- អនុក្រឹត្យលេខ៧២ អនក្រ.បក ចុះថ្ងៃទី១១ ខែសីហា ឆ្នាំ១៩៩៩ ស្តីពីកិច្ចដំណើរការវាយតម្លៃហេតុប៉ះពាល់បរិស្ថាន
- ប្រកាសលេខ២៣០ ប្រក ប.ស្ត ចុះថ្ងៃទី២៩ ខែមិថុនា ឆ្នាំ២០២១ ស្តីពីនីតិវិធី និងការអនុវត្តគោលការណ៍ណែនាំសម្រាប់តារាងផ្ទៀងផ្ទាត់ក្នុងការរៀបចំរបាយការណ៍វាយតម្លៃហេតុប៉ះពាល់បរិស្ថាន និងសង្គមដំបូងលើគម្រោងរោងចក្រធុនស្រាល និងមធ្យម
- លិខិតលេខ៦២៣ សក.កបទ១ ចុះថ្ងៃទី២៥ ខែកុម្ភៈ ឆ្នាំ២០២១ របស់ក្រសួងសាធារណការ និងដឹកជញ្ជូន
- លិខិតលេខ១៨១០ សក.កបទ១ ចុះថ្ងៃទី៤ ខែមិថុនា ឆ្នាំ២០២១ របស់ក្រសួងសាធារណការ និងដឹកជញ្ជូន
- លិខិលេខ៦២៥ វ.ហ.ប.ស្ត ចុះថ្ងៃទី១៨ ខែឧសភា ឆ្នាំ២០២១ របស់នាយកដ្ឋានវាយតម្លៃហេតុប៉ះពាល់បរិស្ថាន

សេចក្តីដូចមានចែងក្នុងកម្មវត្ថុ និងយោងខាងលើ ខ្ញុំសូមគោរពជម្រាបជូន **ឯកឧត្តមទេសរដ្ឋមន្ត្រី** មេត្តាជ្រាបថា ក្រសួងបរិស្ថានឯកភាពលើរបាយការណ៍វាយតម្លៃហេតុប៉ះពាល់បរិស្ថាន និងសង្គមដំបូង សម្រាប់អនុគម្រោងសាងសង់ប្រព័ន្ធលូ និងស្ថានីយប្រព្រឹត្តកម្មទឹកកខ្វក់ក្រុងកំពង់ឆ្នាំង នៃគម្រោងកែលម្អការគ្រប់គ្រងបរិស្ថានក្រុងជុំវិញបឹងទន្លេសាប នៅលើផ្ទៃដីទំហំ ៥០ហិកតា (ហាសិបហិកតា) ដែលមានទីតាំងភូមិសាស្ត្រស្ថិតនៅក្នុងសង្កាត់កំពង់ឆ្នាំង សង្កាត់ប្អេរ សង្កាត់ផ្សារឆ្នាំង និងសង្កាត់ខ្សាម ក្រុងកំពង់ឆ្នាំង ខេត្តកំពង់ឆ្នាំង របស់ក្រសួងសាធារណការ និងដឹកជញ្ជូន (ម្ចាស់គម្រោង) ដោយម្ចាស់គម្រោងត្រូវគោរពតាមកិច្ចសន្យាការពារបរិស្ថានលេខ៣១០១ សក.កបទ១ ចុះថ្ងៃទី១៤ ខែកញ្ញា ឆ្នាំ២០២១ របស់ក្រសួងសាធារណការ និងដឹកជញ្ជូន។

អាស្រ័យដូចបានគោរពជម្រាបជូនខាងលើ សូម **ឯកឧត្តមទេសរដ្ឋមន្ត្រី** មេត្តាទទួលអនុវត្ត និងចាត់ចែងដោយក្តីអនុគ្រោះ។

សូម **ឯកឧត្តមទេសរដ្ឋមន្ត្រី** មេត្តាទទួលនូវសេចក្តីគោរពពីខ្ញុំ។

ថ្ងៃ ខែ ឆ្នាំឆ្លូវ ត្រីស័ក ព.ស.២៥៦៥
រាជធានីភ្នំពេញ ថ្ងៃទី ខែ ឆ្នាំ២០២១

ជ.រដ្ឋមន្ត្រី
រដ្ឋលេខាធិការ

សាបូ-អូហ្សាណា

ចម្លងជូន៖
- ទីស្តីការគណៈរដ្ឋមន្ត្រី
- ក្រសួងសេដ្ឋកិច្ច និងហិរញ្ញវត្ថុ
- ក្រសួងរៀបចំដែនដី នគរូបនីយកម្ម និងសំណង់
- ក្រសួងកសិកម្ម រុក្ខាប្រមាញ់ និងនេសាទ
- រដ្ឋបាលខេត្តកំពង់ឆ្នាំង
- មន្ទីរបរិស្ថានខេត្តកំពង់ឆ្នាំង
- ឯកសារ កាលប្បវត្តិ

KINGDOM OF CAMBODIA
Nation Religion King

(Logo)
MINISTRY OF ENVIRONMENT
No. 1307 S.Chh.N.MoE

Respectfully to
His Excellency Senior Minister and Minister of Public Works and Transport

Subject: Regarding the review and comment on the Initial Environmental and Social Impact Assessment - IESIA Report for the Sewerage, Flood Protection and Wastewater Treatment sub-project in Kampong Chhnang Town, Kampong Chhnang Province of the Integrated Urban Environmental Management in the Tonle Sap Basin project.

Ref.:
- Royal Code No. NS/KRM/1296/36, dated December 24, 1996, promulgating the Law on Environmental Protection and Management of Natural Resources,
- Sub-Decree No. 72 Ankr.Bk, dated August 11, 1999, concerning the Environmental Impact Assessment Process,
- Prakas No. 230 BRK MoE dated June 29, 2021, Procedure and Guideline on IESIA Report Preparation Checklist for Small-Medium Factories
- Letter No. 623 SK/KBT1, dated February 25, 2021, of the Ministry of Public Works and Transport,
- Letter No. 1810 SK/KBT1, dated June 04, 2021, of the Ministry of Public Works and Transport,
- Letter No. 625 V.H.MoE, dated May 18, 2021, of the Environmental Impact Assessment Department of Ministry of Environment,

With regard to the above mentioned subject and references, I would respectfully like to inform Your Excellency Senior Minister that the Ministry of Environment has approved the Initial Environmental and Social Impact Assessment Report for the Sewerage, Flood Protection and Wastewater Treatment sub-project in Kampong Chhnang Town of the Integrated Urban Environmental Management in the Tonle Sap Basin project with area of 50ha (Fifty Hectare), located at Sangkat Kampong Chhnang, Sangkat B'er, Sangkat Phsar Chhnang Sangkat Khsam, Kampong Chhnang Town, Kampong Chhnang Province, the project of the Ministry of Public Works and Transport (Principal) subject to the Principal's compliance with the Environmental Protection Commitment No. 3101 SK/KBT1, dated September 14, 2021 of the Ministry of Public Works and Transport.

In view of the foregoing, may Your Excellency Senior Minister follow the above instruction and take appropriate action accordingly.

Please accept Your Excellency Senior Minister, the assurances of my highest regards.

Phnom Penh, September 28, 2021
For Minister
Secretary of State
(Signature and stamp)

SABO OZANO

CC:
- Office of the Council of Ministers
- Ministry of Economy and Finance
- Ministry of Land Management, Urban Planning and Construction
- Ministry of Agriculture, Fishery and Forest
- Kampong Chhnang Provincial Administration
- Kampong Chhnang Provincial Department of Environment
- File – Archive

Annex 2 Fauna species in Subproject area

Table 27: Fish species in Kampong Chhnang and Pursat town

Order	Family	Scientific name	Local name
Osteoglossiformes	Notopteridae	*Notopterus notopterus*	Trey Slat
		Chitala blanci	Trey Krai
Clupeiformes	Clupeidae	*Clupeichthys gonignathus*	Trey Bandol Ampov
Cypriniformes	Cyprinidae	*Rasbora spp.*	Trey Changwa
		Cyclocheilichthys sp.	Trey Chhkok
		Hypsibarbus sp.	Trey Chhpin
		Puntioplites falcifer	Trey Chrokaing
		Morulius sp.	Trey Kaek
		Cirrihnus microlepis	Trey Proul
		Thynnichthys thynnoides	Trey Linh
		Henicorhynchus sp	Trey Riel
Siluriformes	Clariidae	*Clarias macrocephalus*	Trey Andaing Toun
		Clarius batrachus	Trey Andaing Roueng
	Bagridae	*Pseudambassis notatus*	Trey Kanchan Chras
	Pangasiidae	*Pangasius lamaudiei*	Trey Po
		Pangasius sp.	Trey Pra
		Pangasius sp.	Trey Chhwiet
	Siluridae	*Micronema micronema*	Trey Kes
		Belodonticchthys dinema	Trey Klang hay
		Ompok bimaculatus	Trey Kromorm
		Wallago attu	Trey Sanday
Perciformes	Channidae	*Channa macropeltes*	Trey Chhdaur
		Channa striata	Trey Phtuok/Raws
	Nandidae	*Pristolepis fasciata*	Trey Kantrawb
	Anabantidae	*Anabas testudineus*	Trey Kranh
	Belontiidae	*Trichogaster trichopterus*	Trey Kamphlienh
	Cichlidae	*Oreochromis mossambicus*	Trey Tilapha
	Eleotridae	*Oxyeleotris marmorata*	Trey Damrey
Beloniformes	Belonidae	*Xenentodom cancila*	Trey Ptoung
Synbranchiformes	Mastacembelidae	*Macrognathus siamensis*	Trey Chhlonh
Pleuronectiformes	Soleidae	*Achiroides sp.*	Trey Andat chke

Source: PMIS Team, data from TA-8556 REG: CDIA- Pre-feasibility studies for Second Tonle Sap Integrated Urban Management Project

Table 28: Locally observed bird species, Kampong Chhnang and Pursat town Residents

Khmer Name	English Name	Scientific Name	IUCN Status
Antep Khmao	Black Drongo	*Dicrurus macroercus*	LC
Antep Tongkontrai	Great Racket-tailed Drongo	*Dicrurus paradiseus*	LC

Khmer Name	English Name	Scientific Name	IUCN Status
Brocheav	Bat	*Chiroptera*	LC
Chab krouch	Yellow-vented Bulbul	*Pycnonotus blanfordi*	LC
Chab Tet	Common Tailorbird	*Orthotomus sutorius*	LC
Chreng	Flying Fox	*Pteropus*	LC
Chungkong Kras Champus Khmao	Great Thick-knee	*Esacus recurvirostris*	NT
Chab Dounta Tnoat	Brown Shrike	*Lanius cristatus*	LC
Chab Pouk Troung Loeung	Asian Golden Weaver	*Ploceus hypoxanthus*	NT
Chor Lor Cheung Pou Hout	Nordmann's Greenshank	*Tringa guttifer*	EN
Dom Dou	Black-tailed crake	*Amaurornis bicolor*	LC
Ka-ek	Large-billed Crow	*Corvus macrorhynchos*	LC
Khlom	Water cock	*Gallicrex cinerea*	LC
Khvek	Snipe	*Gallinago gallinago*	LC
Kleng Srak	Barn Owl	*Tyto alba*	LC
Kok	Great White Egret	*Egretta alba*	LC
Kok Sacmut	Pacific Reef Egret	*Egretta cinerea*	LC
Kok Kroung Thom	Great Egret	*Casmerodius albus*	LC
Kok Kroung Touch	Little Egret	*Egretta garzetta*	LC
Kor Dob Kbal Khmao	Black-capped Kingfisher	*Halcyon pileata*	LC
Kreal	Sarus Crane	*Grus antigone*	LC
Kro Sapropes	Grey Heron	*Ardea cinerea*	LC
Kro Sa Champosthom	Great-billed Heron	*Ardea sumatrana*	LC
Kroling Kroloung	Black-collared Starling	*Sturnus nigricollis*	LC
Kruoch Art	Barred Buttonquail	*Turnix suscitator*	LC
Lo Lok	Red Collared Dove	*Streptopelia chinensis*	LC
La-out Tom	Greater Coucal	*Centropus sinensis*	LC
Mann Teuk	White-breasted Water hen	*Amaurormis phoenocures*	LC
Meam touchprey	Asian Barred Owlet	*Glaucidium cucloides*	LC
Popich Thmar	Blue Rock Thrush	*Monticola solitarius*	LC
Popich Khmao	Black Bulbul	*Hypsipetes leucocephalus*	LC
Popich Tracheak Krahorm Sor	Red-whiskered Bulbul	*Pycnonotus jocosus*	LC
Popoul Teuk	Masked Finfoot	*Heliopais Personata*	EN
Preap Sor kmao	Pied Imperial Pigeon	*Ducula bicolor*	LC
Preap Prey	Green Imperial Pigeon	*Ducula aenea*	LC
Pro Vek	Lesser Whisling Duck	*Dendrocygna Javanica*	LC
Roneal	Painted Stork	*Mycterial Leucocephala*	LC
Sa Rikakeo	Common Myna	*Acridotheres Tristis*	LC
Sa Rikakeo Krobey	White-vented Myna	*Acridotheres grandis*	LC
Sek Kheav	Grey-head Parakeet	*Psittacula finschii*	LC
Sambok Trapeang	yellow bittern	*Ixobrychus sinensis*	LC
Tea Prey	Garganey	*Anas querquedula*	LC

Khmer Name	English Name	Scientific Name	IUCN Status
Tituy	Owl	*Strigiformes*	LC
Tro Cheakkam	Barn Swallow	*Hirundo rustica*	LC
Tung Propes	Spot-billed Pelican	*Pelecanus philippensis*	NT
LC = Least Concern, NT = Near Threatened, En=Endangered			

Source: PMIS Team, data from TA-8556 REG: CDIA- Pre-feasibility studies for Second Tonle Sap Integrated Urban Management Project

Annex 3 GRM Project Hotline Notice

Project Hotline

Project: Construction of [drainage and sewage network / Waste water Treatment Plant / or access road] in Kampong Chhnang

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]