Executive Summary

1. Project Overview

Cambodia Urban Infrastructure Development Project (C-UIDP), implemented by the Ministry of Public Works and Transport (MPWT) with proposed financing from the Asian Infrastructure Investment Bank (AIIB). The subproject is located in Doun Kaev Municipality, Takeo Province, and is intended to improve municipal wastewater collection, conveyance and treatment. Stormwater drainage and flood-control road works are outside the scope of this ESIA.

The subproject will establish a separate wastewater collection and treatment system comprising a new wastewater treatment plant (WWTP), primary, secondary and tertiary sewer networks, household/property connections, manholes and associated wastewater conveyance facilities. The current feasibility-stage design provides for a 4,000 m³/day WWTP, with provision for an additional 2,000 m³/day future treatment capacity, giving an ultimate planned capacity of approximately 6,000 m³/day. The current feasibility study indicates that average wastewater generation is projected to increase from approximately 2,600 m³/day in 2024 to 5,400 m³/day by 2058. The final configuration and quantities will be confirmed during detailed engineering design.

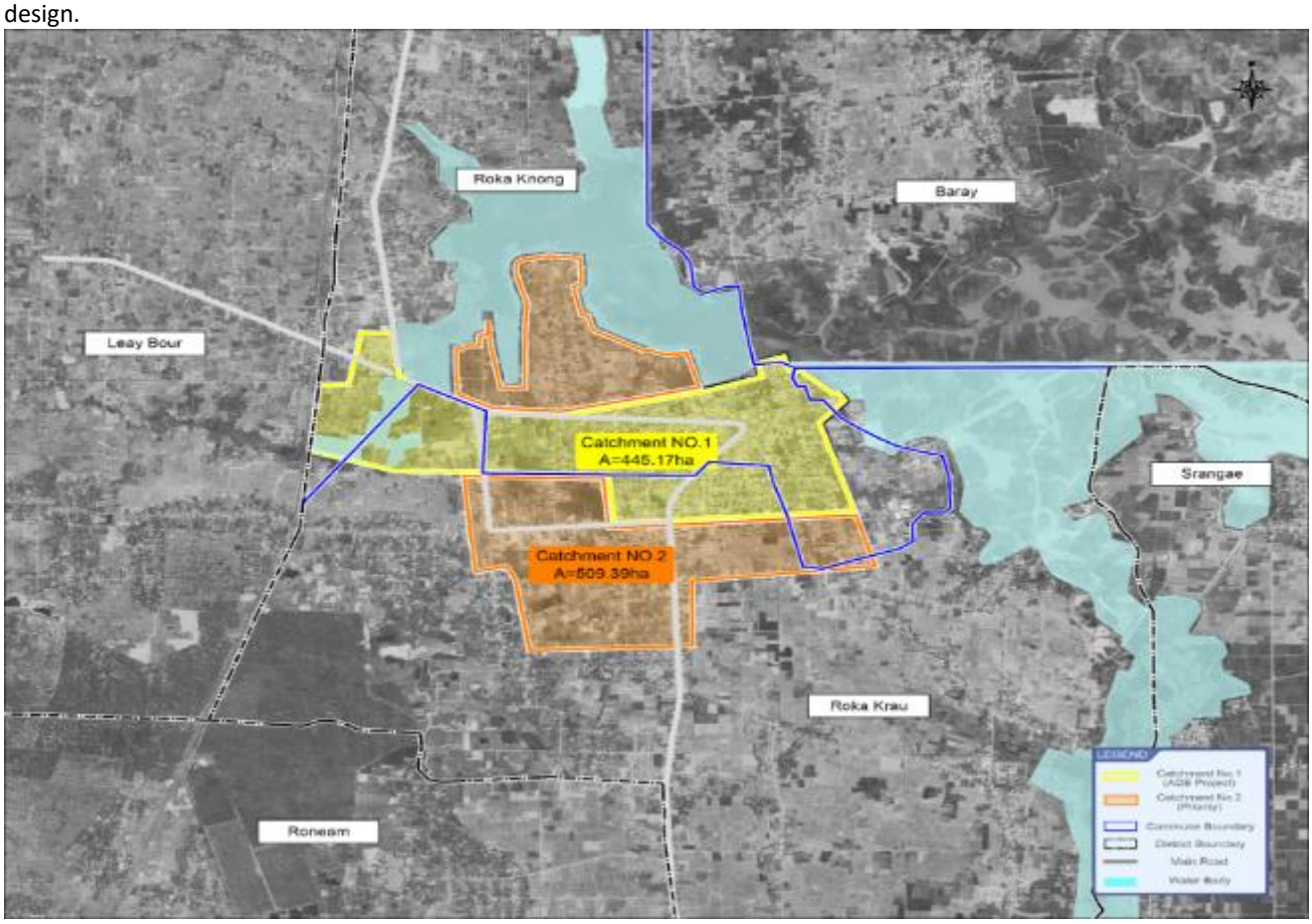

Figure 1: Location Map of Investment Project
Source: Feasibility Study Report

The proposed WWTP is located at Boeung O Tum and will use Waste Stabilization Pond (WSP) technology. The treatment process comprises anaerobic ponds, facultative ponds and maturation ponds, providing progressive biological treatment prior to discharge of treated effluent. The treatment system will be required to meet applicable Cambodian wastewater discharge requirements under Sub-Decree No. 27 ANRK.BK on Water Pollution Control (1999), as amended by Sub-Decree No. 103 ANRK.BK (2021), together with applicable Good International Industry Practice (GIIP). The final effluent discharge arrangement, compliance point and operational monitoring requirements will be confirmed through detailed design and applicable environmental permitting.

Construction activities will principally comprise sewer trench excavation, pipe laying, construction of manholes and service connections, WWTP earthworks and pond construction, transportation of excavated material and construction materials, equipment mobilisation and establishment of temporary construction/work areas. Sewer works will largely occur within or alongside existing road corridors and will therefore interface directly with traffic, residences, businesses, public facilities, utilities and pedestrian access. Locations of temporary contractor facilities, material storage areas, spoil disposal sites and other temporary or associated facilities will be confirmed during detailed design and construction planning and managed through the Contractor's Environmental and Social Management Plan (CESMP).

The principal environmental and social receptors and impact pathways identified for assessment include Boeung O Tum and associated wetland/aquatic habitats, surface-water quality, biodiversity and fisheries, land requirements, construction traffic and road safety, dust and air emissions, noise and vibration, excavation and waste management, occupational and community health and safety, utility interference, temporary access restrictions, livelihood/business disruption and worker-community interactions. Climate-related risks and cumulative impacts have also been considered where relevant to the wastewater infrastructure.

Project Activity / Source	Key Receptor	Potential E&S Risk / Impact Pathway	Applicable AIIB ESF / ESS
WWTP footprint and site development	Boeung O Tum wetland/aquatic habitat	Habitat modification/loss, disturbance of aquatic ecology, alteration of wetland functions and local habitat connectivity	**ESS1 – Biodiversity, Natural and Modified Habitats**
WWTP construction and operation	Surface water and aquatic environment	Sediment runoff, accidental contamination, treated-effluent discharge and changes in receiving-water quality	**ESS1 – Pollution Prevention; Water Resources**
Construction within/adjacent to aquatic habitat	Fish, aquatic fauna and fisheries	Disturbance or loss of aquatic habitat, interruption of local movement pathways and effects on fisheries/ecosystem services	**ESS1 – Biodiversity and Ecosystem Services**
Excavation, earthworks and material handling	Residents, businesses, schools and other sensitive receptors	Dust, particulate matter and construction equipment/vehicle emissions	**ESS1 – Pollution Prevention; Community Health and Safety**
Construction plant, vehicles and trenching	Residential and other sensitive receptors	Temporary noise and vibration disturbance	**ESS1 – Pollution Prevention; Community Health and Safety**
Sewer construction within road corridors	Road users, pedestrians, schools and communities	Traffic congestion, temporary lane restriction, collision risk and pedestrian/motorcycle safety	**ESS1 – Community Health and Safety**
Sewer trenching	Residences, businesses and public facilities	Temporary restriction of property, pedestrian and commercial access	**ESS1 – Social Impacts; ESS2 where economic displacement occurs**
Land requirements for permanent/temporary facilities	Landowners, land users and livelihood activities	Land acquisition, restriction of land use, loss of assets and physical/economic displacement where applicable	**ESS2 – Involuntary Resettlement**
Construction adjacent to commercial activities	Businesses, vendors and livelihood activities	Temporary loss/reduction of access, customers or income	**ESS2 – Economic Displacement**, where attributable to Project restrictions
Excavation and earthworks	Soil, land and receiving environment	Surplus excavated material, contaminated material if encountered, erosion and improper spoil disposal	**ESS1 – Pollution Prevention and Resource Efficiency**
Construction camps/worksites	Land, water and communities	Domestic waste, wastewater, hazardous waste, fuel/oil spills and sanitation impacts	**ESS1 – Pollution Prevention; Community Health and Safety**
Existing utilities along sewer corridors	Communities and service users	Accidental damage or temporary interruption of water, electricity, telecommunications or other services	**ESS1 – Community Health and Safety / Social Impacts**
Construction activities	Project workers	Excavation collapse, confined spaces, moving equipment, electrical hazards, traffic, noise, dust and other occupational hazards	**ESS1 – Labor and Working Conditions; Occupational Health and Safety**
Construction traffic and open excavations	Local communities	Accidents, injuries, unsafe access, interaction with heavy equipment and emergency-access restrictions	**ESS1 – Community Health and Safety**
Contractor workforce and labor influx	Workers and surrounding communities	Worker-community conflict, communicable disease, SEA/SH and GBV risks and pressure on local services	**ESS1 – Labor and Working Conditions; Community Health and Safety; Gender and Vulnerability**

Project activities affecting vulnerable persons	Poor/vulnerable households, women, elderly persons, persons with disabilities and other vulnerable groups	Disproportionate exposure to construction disturbance, access restrictions and livelihood impacts	**ESS1 – Vulnerable Groups and Non-discrimination**
WWTP operation	Workers and nearby receptors	Odour, aerosols, biological exposure, confined-space hazards, chemicals and operational safety risks	**ESS1 – Pollution Prevention; OHS; Community Health and Safety**
Sludge generation and management	Soil, water, workers and communities	Sludge handling, transport, accidental release and inappropriate disposal/reuse	**ESS1 – Pollution Prevention, Waste Management and OHS**
Climate hazards	WWTP, sewerage system and surrounding environment	Extreme rainfall, flooding, heat and other climate hazards affecting infrastructure performance and environmental risk	**ESS1 – Climate Change Risk and Adaptation**
Project combined with existing/planned development	Communities, water environment and biodiversity	Incremental/cumulative pressure on environmental and social receptors	**ESS1 – Cumulative Impact Assessment**

Table 1 Key Environmental and Social Receptors and Risk Pathways

The ESIA has been prepared alongside the ongoing feasibility and engineering studies using available Project design information, environmental and social baseline surveys, laboratory monitoring, biodiversity and aquatic ecology surveys, traffic surveys, socioeconomic investigations and stakeholder consultations. The assessment applies the mitigation hierarchy of **avoidance, minimization, mitigation/restoration and compensation where required**, and establishes the environmental and social management, monitoring, institutional, reporting and grievance-management requirements for construction and operation.

2. AIIB Environmental and Social Categorization

Under the AIIB Environmental and Social Policy (ESP), categorization is based on the **Project component presenting the highest environmental or social risk and potential impacts**, including direct, indirect, cumulative and induced impacts. AIIB may revise the category as its understanding of Project risks develops.

Category	AIIB Categorization Basis	Typical Assessment Instrument
A	Significant adverse E&S impacts that may be **irreversible, cumulative, diverse or unprecedented**, potentially extending beyond the physical works area.	ESIA + ESMP
B	Limited adverse impacts; **not unprecedented**; few, if any, irreversible or cumulative; generally localized and **manageable through good practice**.	Instrument determined case-by-case; **ESIA may be required**
C	Minimal or no adverse E&S risks or impacts.	No further E&S assessment normally required beyond review
FI	AIIB financing is provided through a **Financial Intermediary** that selects and finances subprojects.	ESMS and applicable subproject assessment

Environmental & Social Risk / Project Condition	Cat. A	Cat. B	Cat. C	Project Basis – ESIA Findings	Categorization Reasoning
Scale of wastewater infrastructure	No	Yes	No	WSP WWTP of 4,000 m³/day initial capacity, expandable by 2,000 m³/day, giving 6,000 m³/day ultimate capacity. Wastewater generation projected at approximately 2,600 m³/day (2024) to 5,400 m³/day (2058).	Material municipal infrastructure requiring detailed E&S management, but the scale and treatment process do not, by themselves, indicate significant, diverse or unprecedented impacts characteristic of Category A.
Permanent habitat / land modification	No	Yes	No	WWTP proposed at Boeung O Tum, within an approximately 23 ha project site/envelope. The biodiversity AoI is predominantly modified habitat.	Permanent modification requires detailed assessment and mitigation; however, available survey evidence does not indicate conversion of Critical Habitat or an impact of regional ecological significance.
Critical Habitat / threatened biodiversity	No	Yes	No	IBAT screening identified 30 globally threatened species potentially occurring within 1 km. Field surveys did not confirm CR, EN or VU species during point observations, and the CH assessment found none of the five criteria triggered. Targeted verification remains recommended for priority taxa.	Biodiversity risk is sufficiently material to require ESIA-level assessment, but current evidence does not demonstrate significant impacts on Critical Habitat that would support Category A.
Wetland and aquatic ecology	No	Yes	No	Transects comprised approximately 65% rice fields, 15% wetlands/drainage canals, 8% scrub, 7% scattered trees and 5% built-up area. Aquatic habitat was assessed as a modified floodplain wetland of Moderate ecological value.	Wetland functions and aquatic connectivity require mitigation and monitoring; however, surveys did not identify intact critical wetland habitat or unique ecosystem features indicating Category A.
Aquatic fauna / fisheries	No	Yes	No	78 specimens representing 16 fish species were directly sampled. No threatened fish species or critical spawning/nursery habitat was confirmed during the survey.	Fisheries and aquatic ecosystem services are relevant receptors, but the observed biodiversity does not presently indicate an irreversible or Critical Habitat-level impact or an impact on critical Habitat.
Terrestrial biodiversity	No	Yes	No	Survey inventory reported 75 bird, 6 mammal, 47 reptile and 16 amphibian species. Direct bird observations recorded 20 species and 310 individuals at 10 fixed points.	Biodiversity requires management, but no significant breeding colony, conservation-significant roost or confirmed concentration of threatened species was identified.
Physical displacement	No	Yes	No	Current social assessment does not identify large-scale physical displacement associated with the WWTP or sewer infrastructure.	Land-related impacts require ESS2 management where applicable, but current evidence does not indicate displacement of a magnitude normally associated with Category A risk.
Economic displacement / livelihood effects	No	Yes	No	Temporary access and livelihood effects may occur along sewer construction corridors; wetland-related resource use and fisheries are also considered in the social assessment.	Potential livelihood impacts require mitigation and compensation where applicable, but current assessment does not indicate significant or large-scale economic displacement.
Surface-water quality / effluent	No	Yes	No	Existing monitoring recorded BOD 255–282 mg/L, COD 470–497 mg/L and TSS 165–192 mg/L at monitored wastewater locations. Treated effluent will require compliance and receiving-water monitoring.	Wastewater discharge is a material operational risk, but it is predictable and controllable through treatment performance, discharge compliance and monitoring rather than an unprecedented pollution pathway.
L,Construction traffic / road safety	No	Yes	No	Traffic assessment included TC-01–TC-07 at six physical locations. TC-05 recorded the highest baseline V/C ratio at approximately 0.399.	Trenching, road occupation and heavy vehicles create locally significant community-safety risks, but these are temporary and manageable through traffic management and construction controls.
Air quality / dust	No	Yes	No	Baseline SO_2 was 0.197 mg/m³ at ANV-01 and 0.135 mg/m³ at ANV-02, demonstrating an existing air-quality sensitivity	Construction may temporarily worsen local air quality, requiring controls and monitoring, but the impact is

					localized, reversible and based on established construction risk pathways.
Noise and vibration	No	Yes	No	Baseline noise levels were approximately 50–53 dBA across monitored periods.	Construction noise/vibration may affect nearby receptors but is temporary, localized and controllable through working-hour, equipment and receptor-specific mitigation.
Major accident / hazardous process	No	Yes	No	WWTP uses anaerobic, facultative and maturation ponds. No industrial-scale hazardous process or major hazardous-material inventory is identified in the current design.	Absence of a major industrial hazard pathway reduces the likelihood of severe off-site or catastrophic consequences characteristic of Category A projects.
Community health and safety	No	Yes	No	Open trenches, road occupation, heavy vehicles, construction equipment and temporary access restrictions create community-safety risks along sewer corridors.	Risks may be locally significant but are identifiable and manageable through CTMP, safe-access provisions, barriers, traffic control and emergency procedures.
Occupational health and safety	No	Yes	No	Key hazards include excavation, trench collapse, confined spaces, machinery, electrical work, traffic and wastewater exposure.	Material OHS risk warrants comprehensive contractor controls, but hazards are conventional for sewerage construction and can be managed through GIIP.
Climate vulnerability	No	Yes	No	Climate Risk Assessment identifies high flood vulnerability for the WWTP.	Climate exposure requires resilient engineering design and emergency measures but does not, by itself, constitute a Category A E&S impact.
Cumulative / off-site impacts	No	Yes	No	Potential pathways include receiving-water effects, wetland interaction and construction transport routes. Current assessment has not identified significant regional-scale cumulative impacts.	Effects extend beyond individual work fronts in some cases, but available evidence does not indicate significant irreversible, cumulative or unprecedented impacts at the scale required for Category A.
Minimal or negligible E&S impacts	No	No	No	Permanent WWTP development, wastewater discharge, wetland interface, sewer construction, biodiversity, traffic, OHS and community risks are all identified.	The presence of multiple material E&S risks clearly excludes Category C.
Overall Categorization	Not Triggered	✓ Triggered	Not Triggered	The ESIA identifies material but predominantly localized, predictable and manageable environmental and social risks.	Category B is indicated. A full ESIA and ESMP are warranted due to the nature and combined scale of the risks, while current evidence does not demonstrate the significant irreversible, cumulative, diverse or unprecedented impacts required for Category B.

Table 2 Project Scope Screening Matrix

Based on the above screening, the Doun Kaev Subproject is assessed as a **higher-risk Category B** requiring **ESIA and ESMP**. Category C is excluded because material environmental and social risks are present, while the current ESIA has not identified impacts meeting the AIIB Category A threshold, including **Critical Habitat impacts, large-scale displacement, significant irreversible or cumulative impacts, unprecedented impacts, or industrial-scale accident risks**.

2.1 AIIB Independent Accountability Mechanism

In addition to the Project-level Grievance Redress Mechanism (GRM), Project-affected people have access to AIIB's independent accountability mechanism, the **Project-affected People's Mechanism (PPM)**. The PPM provides an independent and impartial avenue for people who believe they have been, or are likely to be, adversely affected by AIIB's failure to implement its Environmental and Social Policy (ESP), where concerns cannot be satisfactorily addressed through the Project-level GRM or AIIB Management processes. The PPM is independent of AIIB Management and reports directly to AIIB's Board of Directors.

Information on access to the PPM, together with Project GRM, will be disclosed to affected communities through stakeholder consultations and Project information materials. Information on access to the PPM, together with Project GRM, will be disclosed to affected communities through stakeholder consultations and Project information materials. The **revised PPM Policy effective from 1 January 2026** applies to submissions made from that date.[1]

3. Implementation Arrangements

The Doun Kaev Sanitation and Drainage Infrastructure Sub-Project will be implemented by the Ministry of Public Works and Transport (MPWT).

The Project is being delivered through an integrated implementation arrangement comprising the Project Management Unit (PMU) of MPWT, the Project Implementation Unit (PIU) in Takeo Province, the Detailed Design and Construction Supervision Consultant (Kunhwa Engineering & Consulting Co., Ltd.), and the Environmental and Social Consultant, who is responsible for the preparation of the Environmental and Social Impact Assessment (ESIA), Environmental and Social Management Plan (ESMP), and associated safeguard studies. Construction works will be undertaken by competitively procured civil works contractors under the supervision of the Engineer. Environmental and social safeguards will be implemented in accordance with the AIIB Environmental and Social Framework (ESF), applicable Cambodian legislation, and the approved Environmental and Social Management Plan (ESMP). Regulatory oversight will be provided by the Ministry of Environment (MoE), while institutional coordination among the Executing Agency, consultants, contractors, and relevant government authorities will ensure effective implementation, environmental compliance, and sustainable operation throughout the Project lifecycle.

4. Sanitation and Drainage Infrastructure Feasibility Summary

The proposed sanitation and drainage infrastructure is based on the findings and recommendations of the Project Feasibility Study, which confirmed the technical, operational, financial, environmental, and institutional viability of the Project. The study identified the preferred engineering solution through the evaluation of alternative design options, service requirements, future development needs, and long-term operational sustainability.

The recommended infrastructure has been designed to provide an integrated wastewater collection, treatment, and stormwater drainage system capable of meeting the projected demands of Doun Kaev Municipality while improving environmental quality, reducing flood risks, protecting public health, and enhancing climate resilience. The selected design reflects internationally accepted engineering practices and has been developed to ensure operational reliability, resource efficiency, and compatibility with future urban growth.

The outcomes of the feasibility study have formed the engineering basis for the detailed design and this Environmental and Social Impact Assessment (ESIA), providing confidence that the proposed Project is technically feasible and can be implemented in an environmentally and socially sustainable manner, subject to the mitigation and management measures presented in this ESIA.

[1] https://www.aiib.org/en/about-aiib/who-we-are/project-affected-peoples-mechanism/how-we-assist-you/index.html?utm_source=chatgpt.com

5. Project Alternatives Assessment Summary

Project alternatives were assessed based on the feasibility-stage engineering studies and ESIA findings, considering WWTP site alternatives, wastewater treatment technology, sewerage system configuration, land requirements, environmental and social impacts, capital and O&M requirements, constructability, operational reliability, and future expansion. The preferred alternatives were selected based on their overall technical feasibility and ability to avoid or minimize environmental and social impacts while meeting the required wastewater collection and treatment objectives.

Alternative One **(Option 1)** was selected as the preferred option based on its overall technical feasibility, environmental and social suitability, and operational efficiency. This selected option is presented in the Project Overview and forms the basis of the ESIA assessment.

Evaluation Criteria	No Project Option	Alternative Engineering Options	Preferred Option-1
Service Improvement	No improvement in sanitation or drainage	Evaluated	**Provides integrated wastewater collection and treatment**
Environmental Performance	Continued discharge of untreated wastewater	Evaluated	**Reduces pollution loading and improves receiving water quality**
Social Benefits	No improvement in public health or urban services	Evaluated	**Improves sanitation, flood management and public health**
Technical Feasibility	Not applicable	Alternative sewerage layouts and treatment technologies assessed	**Technically feasible and reliable**
Operational Sustainability	Existing deficiencies remain	Evaluated	**Efficient operation and long-term sustainability**
Economic Considerations	No capital investment but continued environmental costs	Evaluated	**Most cost-effective lifecycle solution**
Selection Outcome	Not Recommended	Considered during feasibility assessment	**Selected for Detailed Design and ESIA**

Table 3 Alternatives Summary

6. Environmental and Social Policies, Regulations and Laws

The Project has been planned, designed, and assessed in accordance with the applicable environmental and social requirements of the Royal Government of Cambodia and the **Asian Infrastructure Investment Bank (AIIB) Environmental and Social Framework (ESF)**. This Environmental and Social Impact Assessment (ESIA) has been prepared to satisfy both national environmental approval requirements and AIIB safeguard requirements by integrating applicable environmental legislation, environmental quality standards, land acquisition and resettlement requirements, labour and occupational health and safety provisions, biodiversity conservation measures, stakeholder engagement, and climate resilience considerations into the Project design and implementation. The ESIA confirms that, with the implementation of the proposed mitigation and management measures, the Project can be developed in compliance with the applicable regulatory and policy framework

7. Environmental and Social Risks Summary

The ESIA baseline investigations and assessment approach covered the physical, biological, and socioeconomic environments, including environmental quality monitoring, biodiversity surveys, land use assessment, stakeholder consultations, and climate risk screening. Table 5 summarizes the key environmental and social assessment areas, baseline survey components, and corresponding assessment methodologies used to establish existing conditions and inform the subsequent impact and risk assessment across the Project phases.

Assessment Area	Key Survey Items	Assessment Approach
Air Quality	Ambient air quality	Baseline monitoring at representative locations and comparison with applicable environmental standards.
Noise & Vibration	Ambient noise and vibration	Field measurements at sensitive receptors and assessment against applicable standards.
Surface Water	Water quality	Baseline sampling and laboratory analysis of representative surface water bodies.
Groundwater	Groundwater quality	Review of existing information and sampling where required.
Soil & Geology	Soil characteristics	Site investigation and review of geological conditions relevant to construction.
Biodiversity	Flora, fauna and habitats	Ecological field surveys, Critical habitat assessment and review of conservation status.
Land Use	Existing land use and sensitive receptors	Site reconnaissance and GIS-based mapping of surrounding land uses.

Social Environment	Population, livelihoods and public facilities	Household surveys, key informant interviews, focus group discussions and stakeholder consultations.
Land Acquisition & Resettlement	Affected land and assets	Inventory of affected assets and preliminary assessment of land acquisition and resettlement requirements.
Occupational & Community Health and Safety	Worker and public safety	Assessment of construction and operational risks and identification of control measures.
Cultural Heritage	Physical and cultural resources	Site inspections, consultation with local authorities and implementation of Chance Find Procedures.
Climate Change	Climate risks and resilience	Assessment of climate hazards, vulnerability and incorporation of climate adaptation measures into project design.

Table 4 Summary of Environmental and Social Baseline Surveys and Assessment Approaches

8. Public and Stakeholder Consultations Summary

Stakeholder engagement included institutional consultations, public consultations, household surveys, FGDs and KIIs with affected communities, local authorities and relevant agencies. Key issues raised—including wastewater impacts, land/access, livelihoods, construction disturbance, community safety and environmental protection were incorporated into the ESIA impact assessment, mitigation measures and Project GRM.

Consultation Level	Relevant Stakeholders Consulted	Key Outcome / Issues Raised
National	**MPWT/PMU**, Ministry of Environment (MoE) and relevant national-level agencies involved in environmental, land and infrastructure administration	Confirmed E&S assessment requirements, regulatory procedures, institutional responsibilities and coordination requirements for Project implementation.
Provincial	**Takeo Provincial Administration**, Provincial Department of Environment (PDoE), Provincial Department of Public Works and Transport (PDPWT), and other concerned provincial departments	Discussed local environmental conditions, infrastructure interfaces, land and community issues, construction coordination and provincial implementation requirements.
Municipal	**Doun Kaev Municipal Administration**, municipal technical authorities and relevant public-service/utility representatives	Reviewed WWTP and sewerage works, construction access, existing utilities, traffic/community safety and coordination with municipal services.
Commune	**Concerned Commune Councils**, Commune Chiefs and local administrative representatives within the Project AoI	Identified affected communities, existing wastewater/sanitation conditions, local access, land and livelihood concerns, sensitive receptors and consultation requirements.
Village / Community	**Concerned Village Chiefs, potentially affected households, residents, business operators, farmers/resource users, women and vulnerable households/groups**	Documented community concerns regarding construction disturbance, access, traffic safety, land/livelihood effects, wastewater impacts, odour, environmental protection and proposed mitigation measures.

Table 5 Summary of Consultations

9. Ecology & Biodiversity Summary:

The Project Area of Influence (AoI) is predominantly modified agricultural and peri-urban habitat, comprising approximately 65% rice fields and 15% wetlands and drainage habitats. Boeung O Tum and associated seasonal wetlands represent the principal biodiversity-sensitive receptors.

The completed Critical Habitat Assessment (CHA), incorporating field surveys, IBAT screening, expert review and conservation-authority consultations, identified five CR/EN species triggering Critical Habitat Criterion 1(a): Giant Asian Pond Turtle (CR), Black Marsh Turtle (EN), Giant Carp (CR), Striped Catfish (EN) and Yellow-breasted Bunting (CR). White-winged Duck was screened out following final specialist review. No independent triggers were established under the remaining Critical Habitat criteria.

The CHA findings are subject to the species-specific qualifications documented in Appendix 2A. Accordingly, the Project shall implement a Biodiversity Management Plan (BMP) and Biodiversity Action Plan (BAP), including targeted pre-construction monitoring, habitat protection, aquatic connectivity measures and measurable net-gain commitments, consistent with AIIB biodiversity safeguard requirements.

10. Climate Change Consideration Summary

UIDP Climate Risk Assessment (CRA, July 2026). The CRA identifies Doun Kaev as one of the more climate-vulnerable project locations due to its low-relief terrain, slow flood recession and very high flood susceptibility. The assessment reports a mean Height Above Nearest Drainage (HAND) of approximately 1.20 m, with 95.1% of the assessed area classified as High–Very High flood susceptibility. Observed rainfall records indicate a statistically significant increasing trend of approximately +9.3 mm/year (p=0.014).

For the Project's 2058 design horizon, the CRA projects continued warming and intensification of extreme rainfall. Climate-adjusted design parameters include a +13% IDF rainfall uplift under SSP2-4.5 and a +22% sensitivity test under SSP5-8.5, together with climate-adjusted flood levels. The residual climate vulnerability of the WWTP/platform is assessed as Moderate, subject to site-specific hydrodynamic modelling during Detailed Engineering Design (DED).

Based on the CRA findings, additional flood-resilience measures have been incorporated into the Project design, including flood-proofing and elevation of critical mechanical and electrical equipment, flood-resilient pumping facilities, standby power systems and backflow protection. Flood-season operational preparedness has also been extended through 30 November. These measures strengthen the Project's resilience to future climate-related flooding, with final design elevations and technical specifications to be confirmed during DED.

CRA Consideration	Doun Kaev-Specific Finding / Design Requirement
Flood Susceptibility	Doun Kaev has a mean HAND of approximately 1.20 m, with approximately 95.1% of the assessed area classified as High–Very High flood susceptibility.
Observed Rainfall Trend	Long-term rainfall records show a statistically significant increasing trend of approximately +9.3 mm/year (p=0.014).
Future Climate – Design Horizon	Project infrastructure is assessed against a 2058 design horizon, considering CMIP6 SSP2-4.5 and SSP5-8.5 climate scenarios.
Climate-Adjusted Rainfall	Apply +13% IDF rainfall uplift as the central design adjustment and undertake a mandatory +22% SSP5-8.5 sensitivity analysis for relevant WWTP hydraulic design.
WWTP Climate Vulnerability	Doun Kaev WWTP/platform is assessed as having Moderate residual climate vulnerability, reflecting the low terrain, very high flood susceptibility, slow drainage and absence of existing structural flood protection.
Flood-Level Design	CRA-derived climate-adjusted flood levels shall inform infrastructure elevations, with the final design to be verified through site-specific hydrodynamic modelling during DED.
Critical Equipment Protection	Critical mechanical/electrical equipment and pumping facilities shall be raised and flood-proofed, including protected cable entries, sealed conduits and flood-resilient electrical/control systems.
Power Resilience	Provide a minimum 72-hour standby power capability for critical WWTP and pumping functions.
Backflow Protection	The CRA specifically identifies backflow prevention at Doun Kaev outfalls as a priority climate-adaptation requirement.
Operational Preparedness	Flood-risk operational preparedness shall extend through 30 November, with major maintenance, inspection or commissioning treated accordingly.
DED Requirement	Climate-resilience parameters remain subject to confirmation and refinement through DED-level hydraulic/hydrodynamic modelling and site-specific verification.

Table 6 Climate Change Summary

11. Mitigation Measures Summary

Mitigation measures have been developed based on the ESIA impact assessment and incorporated into the Project design, construction controls, Contractor's Environmental and Social Management Plan (CESMP), and operational ESMP, following the mitigation hierarchy. The table distinguishes construction-phase and operation-phase impacts, including those associated with the WWTP, pumping stations, sewerage network and associated maintenance activities.

Risk / Impact Area	Project-Specific Figure / Condition	Key Mitigation Measures	Relevant AIIB / Cambodian Requirement
CONSTRUCTION PHASE			
Water & Soil	Baseline wastewater: BOD 255–282 mg/L; COD 470–497 mg/L; TSS 165–192 mg/L. Excavation, trenching and dewatering	Sediment and erosion control, controlled dewatering, spill prevention, proper disposal of excavated materials and protection of drainage channels.	AIIB ESS1; Sub-Decree No. 27, as amended by Sub-Decree No. 103 (2021).

	may affect soil and water quality.		
Biodiversity & Critical Habitat	Approximately 15% wetland/drainage habitat; 16 fish species (78 specimens) sampled. Final CHA identifies five CR/EN species triggering Criterion 1(a), subject to Appendix 2A qualifications.	Avoid sensitive wetland habitats, maintain aquatic connectivity, undertake pre-construction ecological verification, implement species-specific protection measures and prepare BMP and BAP with net-gain commitments.	AIIB ESS1 biodiversity requirements; IFC PS6 as supporting GIIP; Environmental and Natural Resources Code (2023).
Air Quality	Baseline SO_2: 0.197 mg/m³ (ANV-01) and 0.135 mg/m³ (ANV-02). Dust and equipment emissions expected during construction.	Dust suppression, covered transport, speed restrictions, equipment maintenance and monitoring at sensitive receptors.	AIIB ESS1; Sub-Decree No. 42.
Noise & Vibration	Baseline noise approximately 50–53 dBA; construction equipment and excavation activities may affect nearby receptors.	Restrict noisy activities to approved working hours, maintain equipment, install temporary barriers and monitor sensitive locations.	AIIB ESS1; Sub-Decree No. 42.
Traffic & Community Safety	TC-01–TC-07 at six physical locations; highest baseline V/C approximately 0.399 at TC-05. Sewer installation may temporarily restrict road access.	Traffic Management Plan, designated haul routes, traffic marshals, signage, barriers, speed control and maintenance of pedestrian/property access.	AIIB ESS1; Cambodian road traffic and construction-safety requirements.
Land Acquisition & Livelihoods	Approximately 23 ha WWTP site/envelope; temporary business, access and livelihood disruption possible along sewer corridors.	Implement RAP requirements, provide compensation where applicable, minimize temporary occupation and maintain access to residences and businesses.	AIIB ESS2; Land Law (2001); Expropriation Law (2010); GDR SOP.
Occupational Health & Safety	Excavation, trenching, lifting, machinery, confined spaces and electrical hazards.	CESMP/OHS Plan, trench protection, confined-space permits, PPE, safe lifting, emergency preparedness and worker training.	AIIB ESS1; Cambodian Labour Law; WBG EHS Guidelines.
Waste & Hazardous Materials	Excavated soil, construction debris, packaging, oils, fuels and hazardous materials.	Waste segregation, designated storage, authorized transportation/disposal, spill containment and waste tracking.	AIIB ESS1; Sub-Decree No. 36; Sub-Decree No. 113.
OPERATION PHASE			
WWTP Effluent & Receiving Water Quality	Waste Stabilization Pond system: 4,000 m³/day initial capacity, expandable to 6,000 m³/day. Potential receiving-water pollution from non-compliant discharge or system failure.	Routine influent/effluent monitoring, treatment-performance verification, preventive maintenance, emergency response and upstream/downstream receiving-water monitoring.	AIIB ESS1; Sub-Decree No. 27, as amended by Sub-Decree No. 103 (2021).
Biodiversity & Aquatic Habitat	Treated-effluent discharge and changes in receiving-water quality may affect Boeung O Tum, connected wetlands and habitats	Implement BMP/BAP, monitor aquatic habitat and species, maintain hydrological connectivity, prevent untreated discharges and apply adaptive management and net-gain measures.	AIIB ESS1 biodiversity and Critical Habitat requirements; IFC PS6 as GIIP.

	supporting the five retained CR/EN species.		
Pumping Stations – Noise, Odour & Pollution	Pumping equipment, emergency generators, wastewater storage and potential overflow incidents may affect nearby communities.	Noise attenuation, odour control, enclosed equipment where appropriate, regular equipment maintenance, overflow prevention, standby power and emergency response.	AIIB ESS1; Sub-Decree No. 42; Sub-Decree No. 27 and applicable amendments.
Sewerage Network Operation & Maintenance	Sewer blockages, leaks, manhole overflows and maintenance activities may cause pollution, odour, temporary access restrictions and community safety risks.	Preventive inspection, sewer cleaning, leak detection, emergency blockage response, controlled maintenance operations and community notification.	AIIB ESS1; applicable Cambodian water pollution and community safety requirements.
Occupational Health & Safety	WWTP operation, sludge handling, electrical equipment, chemical exposure, maintenance and confined-space entry into sewers and pumping facilities.	Operational OHS Plan, confined-space entry procedures, gas monitoring, PPE, safe maintenance procedures, electrical isolation and emergency rescue arrangements.	AIIB ESS1; Cambodian Labour Law; WBG EHS Guidelines.
Waste, Sludge & Hazardous Materials	WWTP sludge, screenings, grit, maintenance wastes, used oils and operational chemicals.	Controlled sludge treatment and disposal, waste segregation, secure chemical storage, spill prevention and authorized waste transportation/disposal.	AIIB ESS1; Sub-Decrees No. 36 and No. 113; applicable MoE requirements.
Community Health, Safety & Livelihoods	Temporary disturbances from sewer maintenance, pumping station operation, odour, wastewater overflow and potential restrictions on road/business access.	Advance notification, safe maintenance work zones, access management, odour and overflow controls, community liaison and operational GRM.	AIIB ESS1; AIIB ESS2 where applicable; Cambodian safety requirements.
Climate Change & Flood Resilience	CRA: approximately 95.1% High–Very High flood susceptibility; mean HAND approximately 1.20 m.	Incorporate climate-adjusted flood design levels, flood-proofed mechanical/electrical systems, resilient pumping facilities, backflow prevention, standby power and flood-season preparedness.	AIIB ESS1 climate-resilience requirements; Project CRA design parameters.
Stakeholder Engagement & GRM	Communities surrounding the WWTP, pumping stations and sewerage corridors may be affected during construction and operation.	Maintain stakeholder engagement, disclose construction/maintenance schedules, operate accessible grievance mechanisms and document resolution of complaints.	AIIB ESP/ESS1; Cambodian EIA consultation requirements.

Table 7 Summary of Key Environmental and Social Impacts and Mitigation Measures by Project Phase

12. Stakeholder Engagement Summary

Stakeholder engagement was conducted during the F/S, ESIA baseline studies and RAP preparation through institutional consultations, community meetings, household surveys, KIIs and FGDs. Key Project concerns were incorporated into the ESIA, RAP, ESMP and GRM.

Engagement Level	Key Stakeholders	Project-Specific Concerns / Outcomes
National	MPWT/PMU, MoE and relevant national agencies	ESIA requirements, land/resettlement procedures, regulatory compliance and implementation responsibilities.

Provincial	Takeo Provincial Administration, PDoE, PDPWT and relevant departments	WWTP development, environmental protection, land issues and coordination of construction activities.
Municipal	Doun Kaev Municipal Administration and technical/utility authorities	Sewer alignment, utility interfaces, road excavation, traffic management and WWTP operation.
Commune	Concerned Commune Councils and local authorities	Construction access, affected households/businesses, land/livelihood impacts and community safety.
Village / Community	Village Chiefs, affected households, businesses and vulnerable groups	Compensation, temporary access disruption, dust/noise, traffic safety, wastewater/odour concerns and local employment.

13. Grievance Redress Mechanism (GRM) Summary

A Project-level GRM will be maintained by the s C-UIDP PMU for affected persons, communities, workers and other stakeholders. Complaints may be submitted free of charge, including confidentially or anonymously, through the PMU and designated local grievance channels.

In addition, the Project-affected People's Mechanism (PPM) has been established by the AIIB to provide an opportunity for an independent and impartial review of submissions from Project-affected people who believe they have been or are likely to be adversely affected by AIIB's failure to implement its ESP in situations when their concerns cannot be addressed satisfactorily through Project-level GRMs or AIIB Management's processes.[2]

GRM Contact	Details
Responsible Agency	Ministry of Public Works and Transport (MPWT) – C-UIDP PMU
GRM Focal Person	**[To be confirmed by MPWT/PMU]**
Telephone / Hotline	**[To be confirmed by MPWT/PMU]**
Email	**[To be confirmed by MPWT/PMU]**
Project Office Address	**[To be confirmed by MPWT/PMU]**
Local Submission	PIU / designated provincial, municipal and community grievance focal points
Construction-Site Channel	Contractor/CSC grievance focal point and complaint register
Sensitive Complaints	Confidential channel for **GBV/SEA/SH** and other sensitive grievances
AIIB Independent Mechanism	**Project-affected People's Mechanism (PPM):** ppm@aiib.org

Agricultural Land (Rice Fields)	Not Quantified	Dominant surrounding land use	Field Survey / Satellite Interpretation
Seasonal Wetlands	Not Quantified	Localized low-lying wetlands	Field Survey
Drainage Canals & Water Bodies	Not Quantified	Existing drainage network	Field Survey
Roads and Transportation Corridors	Not Quantified	National, provincial and local roads	Field Survey
Commercial Areas	Not Quantified	Concentrated within urban centre	Field Survey
Public Facilities	Not Quantified	Schools, pagodas, government buildings	Field Survey
Vacant/Open Land	Not Quantified	Scattered around proposed WWTP	Field Survey

Table 8 Existing Land Use within the Project Area

Source: Source: Feasibility Study Report (Residential Area Assessment), ESIA Field Reconnaissance, Drone Survey and Satellite Image Interpretation.

According to the Feasibility Study, residential development within the Project Area covers approximately 943 ha, comprising 479 ha in Roka Knong Commune and 464 ha in Roka Krau Commune, representing the principal urban service area for the proposed wastewater collection system. The remaining land is predominantly utilized for rice cultivation, seasonal agriculture, public infrastructure, open space, and water bodies.

No industrial estates, protected landscapes, or environmentally sensitive land use zones were identified within the immediate Project footprint. Existing land use is therefore considered generally compatible with the proposed urban sanitation infrastructure.

Land Use Category	Existing Condition	Relevance to Project
Residential Areas	Dominant within urban service area	High
Agricultural Land (Rice Fields)	Extensive surrounding the Project	Moderate
Seasonal Wetlands	Localized low-lying areas	Moderate
Drainage Canals and Water Bodies	Existing drainage network	High
Transportation Corridors	National, provincial and local roads	High
Public Facilities	Schools, pagodas, government buildings	High
Commercial Areas	Local markets and urban businesses	Moderate
Vacant/Open Land	Scattered around the WWTP site	Low

Table 9 Existing Land Use Characteristics

Source: Feasibility Study Report – Residential Area Assessment.

[2] https://www.aiib.org/en/about-aiib/who-we-are/project-affected-peoples-mechanism/how-we-assist-you/index.html