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Draft of Environmental and Social Impact Assessment Report. Volume II. Book 2.5

Technical Assistance for Kambarata 1 Hydropower Plant Project

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Volume No.	Designation	Content	Title
1	Volume I	Executive Summary	<p>Book 1</p> <p><i>Executive Summary</i></p>
2	Volume II	Main Report	<p>Book 2.1</p> <p><i>Chapter 1. Introduction</i></p> <p><i>Chapter 2. Regulatory Framework</i></p> <p><i>Chapter 3. International Standards and Guidelines</i></p> <p><i>Chapter 4. Description of the Proposed Project</i></p> <p><i>Chapter 5. Analysis of Alternatives</i></p> <p>Book 2.2</p> <p><i>Chapter 6. ESIA Methods</i></p> <p><i>Chapter 7. Social Baseline Conditions</i></p> <p><i>Chapter 8. Biophysical Baseline Condition</i></p> <p><i>Chapter 9. Stakeholder Engagement</i></p> <p>Book 2.3</p> <p><i>Chapter 10. Description of Impacts</i></p> <p>Book 2.4</p> <p><i>Chapter 11. Mitigation and Management</i></p> <p><i>Chapter 12. Risk Assessment</i></p> <p><i>Chapter 13. Cumulative Impact Assessment</i></p> <p><i>Chapter 14. Environmental and Social Management Plan (ESMP)</i></p> <p>Book 2.5</p> <p><i>Chapter 15. Findings</i></p> <p><i>Chapter 16. Budget, Implementation Arrangements and Training Needs</i></p> <p><i>Chapter 17. Conclusion</i></p> <p><i>Chapter 18. References</i></p>
3	Volume III	Appendices	<p>Book 3.1</p> <p><i>Appendix 1-A: Terms of Reference of World Bank for "Updating and Completing Environmental, Social Assessment and Planning the preparation of tender documents of the Kambarata-1 HPP"</i></p> <p><i>Appendix 8-A: Flora and Fauna Species recorded or potentially occurring in the Study Area</i></p> <p><i>Appendix 8-B: Details of the Critical Habitat Screening</i></p> <p><i>Appendix 10-A: Significance Scoring of Impacts to VECs</i></p> <p>Book 3.2</p> <p><i>Appendix 10-B: Calculation of Greenhouse Gas Emissions</i></p> <p><i>Appendix 10-C: Environmental Flow Impact Assessment</i></p> <p><i>Appendix 14-A: ESMP Sub-Plans</i></p> <p><i>Appendix 14-B: Supporting Kambarata 1 HPP PMO for the Livelihood Restoration and Pastureland aspects preparing the</i></p>

Volume No.	Designation	Content	Title
			<i>Kambarata 1 HPP: Sustainable and Transformational Energy Program (P504168)</i>
4	Volume IV	ESMP Sub-Plans	<p style="text-align: center;">Book 4.1</p> <p><i>Sub-Plan 1. Air Quality Management Plan</i></p> <p><i>Sub-Plan 2. Noise and Vibration Management Plan</i></p> <p><i>Sub-Plan 3. Water Quality and Resource Management Plan</i></p> <p><i>Sub-Plan 4. Material and Waste Management Plan</i></p> <p><i>Sub-Plan 5. Muck and Spoil Management Plan</i></p> <p><i>Sub-Plan 6. Site Restoration Management Plan</i></p> <p><i>Sub-Plan 7. Occupational Health & Safety Plan</i></p> <p><i>Sub-Plan 8. Catchment Area Treatment Plan</i></p> <p><i>Sub-Plan 9. Environmental Flow Management Plan</i></p> <p><i>Sub-Plan 10. Biodiversity Management Plan</i></p> <p><i>Sub-Plan 11. Community Health, Safety and Security Management Plan</i></p> <p><i>Sub-Plan 12. Labor Influx Management Plan</i></p> <p><i>Sub-Plan 12.1. Labor Management Procedure</i></p> <p style="text-align: center;">Book 4.2</p> <p><i>Sub-Plan 13. Traffic and Road Safety Management Plan</i></p> <p><i>Sub-Plan 14. Cultural Heritage Assessment and Management Plan</i></p> <p><i>Sub-Plan 15. Gender, Vulnerability and Inclusion Action Plan</i></p> <p><i>Sub-Plan 16. Project Commissioning and Construction Closeout Management Plan</i></p> <p><i>Sub-Plan 17. Dam Break Analysis and Emergency Preparedness Response Plan</i></p> <p><i>Sub-Plan 18. Material Supply Management Plan</i></p> <p><i>Sub-Plan 19. Blasting and Explosives Management Plan</i></p> <p><i>Sub-Plan 20. Borrow Pit Management Plan</i></p> <p style="text-align: center;">Book 4.3</p> <p><i>Sub-Plan 21. Stakeholder Engagement Plan & Grievance Redress Mechanism</i></p> <p><i>Sub-Plan 22. Resettlement and Livelihood Restoration Framework</i></p> <p><i>Sub-Plan 22.1. Terms of Reference for Resettlement Plan Preparation</i></p>

Abbreviations

AA	Ayil Aymaks (Rural Community)
AAQ	Ambient Air Quality
ABSS	Aquatic Biodiversity Sampling Sites
ACM	Asbestos containing Materials
ACRD	Asphalt Core Rockfill Dam
ADB	Asian Development Bank
AH	Affected Households
AIIB	Asian Infrastructure Investment Bank
APA	Approximate Permissible Amounts
ARM	Adaptive Resource Management
AVC	Animal Vehicle Collision
AWS	Automatic Weather Station
BFD	Bird Flight Diverters
BOD ₅	Biochemical oxygen demand
BSP	Benefit Sharing Program
BVO	Basin Water Organization
CAP	Corrective Action Plan
CASA 1000	Central Asia South Asia Electricity Transmission and Trade Project
CATP	Catchment Area Treatment Plan
CBD	Convention on Biological Diversity
CBSP	Community Benefits Sharing Pilot
CCKP	Climate Change Knowledge Portal
CE	Contractor's Engineer
CEDAW	Convention on the Elimination of All Forms of Discrimination Against Women
CERAs	Climate and Environmental Risk Assessments
CESMPs	Contractor-specific Environmental and Social Management Plans
CFP	Chance Find Procedures
CFRD	Concrete Face Rockfill Dam
CH	Critical Habitat
CHMP	Cultural Heritage Management Plan
CHQ	Critical Habitat Qualifying
CHS	Critical Habitat Screening
CHSS	Community Health, Safety, and Security
CIA	Cumulative Impact Assessment
CJSC	Closed Joint-Stock Company
CKU	China–Kyrgyzstan–Uzbekistan
CLO	Community Liaison Officers
CMS	Conservation of Migratory Species of Wild Animals
CMS	Construction and Maintenance Spillway
CO _{2e}	Carbon Dioxide Equivalent
COD	Chemical Oxygen Demand
COP	Conference of the Parties

CRVA	Climate Risk and Vulnerability Assessment
CSOs	Civil Society Organizations
DEM	Digital Elevation Models
DN	Raw Digital Number
DO	Dissolved Oxygen
DSPOE	Dam Safety Panel of Experts
EAAA	Ecologically Appropriate Area of Analysis
EAP	Emergency Action Plan
EBRD	European Bank for Reconstruction and Development
ECRD	earth core rockfill dam
ECS	Environmental, Climate, and Social
EFIA	Environmental Flow Impact Assessment
EFTA	European Free Trade Area
EHS	Environmental, Health, and Safety
EIA	Environmental Impact Assessment
EIB	European Investment Bank
EIS	Environmental Impact Statement
EMCA	Earthquake Model of Central Asia
EOO	extent of occurrence
EPC	Engineering, Procurement and Construction
EPP	Electric Power Plants
EPR	Extended Producer Responsibility
EPRP	Emergency Preparedness and Response Plan
ERP	Emergency Response Plan
ESCP	Environment and Social Commitment Plan
ESF	Environmental and Social Framework
ESG	environmental, social, and governance
ESIA	Environmental and Social Impact Assessment
ESMIS	Environmental and Social Management Information System
ESMP	Environmental and Social Management Plan
ESMS	Environmental and Social Management System
ESRA	Environmental and Social Risk Assessment
ESS	Environmental and Social Standards
ESSF	Environmental and Social Sustainability Framework
ESSP	Environmental and Social Safeguards Policy
ETP	Effluent Treatment Plant
EU	European Union
FCDO	Foreign, Commonwealth & Development Office
FGDs	Focused Group Discussions
FIDIC	International Federation of Consulting Engineers
FPIC	Free, Prior, and Informed Consent
FRL/FSL	Full reservoir Level/ Full Supply Level
FS	Feasibility Study
GBV	Gender-based Violence
GDEs	groundwater-dependent ecosystems

GDP	Gross Domestic Product
GEE	Google Earth Engine
GHG	Greenhouse Gas
GIIP	Good International Industry Practice
GIS	Geographic Information System
GIVP	Gender Inclusion and Vulnerability Plan
GLOFs	Glacial Lake Outburst Floods
GMP	on g
GPS	Global Positioning System
GRC	Gender Consultant
GRM	Grievance Redress Mechanism
HBSS	Hydrobiology Sampling Sites
HCM	Highway Capacity Manual
HGIIP	Hydropower Sustainability Guidelines on Good International Industry Practice
HHs	Households
HMT	Heavy Metals Total
HPP	Hydropower Plant
HSAP	Hydropower Sustainability Assessment Protocol
IBA	Important Bird Area
IBAT	Integrated Biodiversity Assessment Tool
ICESCR	International Covenant on Economic, Social, and Cultural Rights
ICWC	Interstate Commission for Water Coordination
IDB	Islamic Development Bank
IFAD	International Fund for Agricultural Development
IFC	International Finance Center
IHA	International Hydropower Association
ILO	International Labour Organization
IP/SSAHUTLC	Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities
IPCC	Intergovernmental Panel on Climate Change
IPV	Intimate Partner Violence
IRA	Internationally Recognized Areas
IUCN	International Union for Conservation of Nature
KBA	Key Biodiversity Areas
KII	Key Informant Interview
KPI	Key Performance Indicator
LDOF	Landslide dam outburst flood
LFPs	Local focal points
LIMP	Labour Influx Management Plan
LLP	Limited Liability Company
LMP	Labour Management Plan
LRRP	Livelihood Restoration and Resettlement Plan
LRRF	Livelihood Restoration and Resettlement Framework
LOS	Level of Service
LPA	Legally Protected Areas
LRP	Livelihood Restoration Plan

LULC	Land use and land cover
MCE	Maximum Credible Earthquake
MDB	Multilateral Development Bank
MEs	Municipal Enterprises
MNRETS	Ministry of Natural Resources, Ecology and Technical Supervision
MOL	Minimum Operating Level
MPC	Maximum Permissible Concentrations
MPLs	Maximum Permissible Levels
NDP	National Development Program
NG	Net Gain
NGO	Non-governmental organizations
NHRDC	National HR Development Contractor
NNL	No Net Loss
NSC	National Statistical Committee (of the Kyrgyz Republic)
OCC	Organic carbon content
OHC	Occupational Health Centre
OHS	Occupational Health and Safety
OJSC	Open Joint-Stock Company
OSHA	Occupational Safety and Health Administration
OVOS	Russian acronym for “Environmental Impact Assessment”
PA	Protected Area
PAP	Project Affected Persons
PCU	Passenger Car Unit
PGA	peak ground acceleration
PM	Particulate Matter
PMC	Project Management Consultant
PMF	Probable Maximum Flood
PMO	Project Management Office
PMP	Probable Maximum Precipitation
PNH	Protected Natural Habitat
POPs	Persistent Organic Pollutants
PPE	Personal Protective Equipment
PR	Performance Requirement
PSHA	Probabilistic Seismic Hazard Assessment
PUAs	Pasture User Associations
RCC	Roller-compacted Concrete
REA	Regional Environmental Assessment
ROR	Run of River
RTS	Reservoir-triggered seismicity
SDGs	Sustainable Development Goals
SDR	Sediment Delivery Ratios
SDS	Sustainable Development Strategy
SEA	Sexual Exploitation and Abuse
SEE	Safety Evaluation Earthquake
SEFR	Singapore Emission Factors Registry
SEP	Stakeholder Engagement Plan

SER	State Environmental Review
SFARR	Strengthening Financial Resilience and Accelerating Risk Reduction
SH	Sexual Harassment
SLO	Stakeholder Liaison Officer
SMEs	Subject Matter Experts
SN	Sanitary Norms
SPCC	Spill Prevention, Control, and Countermeasure
SPS	Safeguard Policy Statement
SPZ	Sanitary Protection Zones
SR	Surface Reflectance
STP	Sewage Treatment Plant
TB	Terrestrial Biodiversity
TBSS	Terrestrial Biodiversity Sampling Sites
TCB	Total Coliform Bacteria
TDS	Total Dissolved Solids
TF	Traffic Volume
TKN	Total Kjeldahl Nitrogen
TL	Transmission Line
TLV	threshold limit value
TOA	Top of Atmosphere
TOR	Terms of Reference
TSS	Total suspended solids
TT	Transportation Tunnel
TWL	Total Water Level
UAS	Unrelated anthropogenic sources
UN	United Nations
UNECE	United Nations Economic Commission for Europe
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
USAIs	Unavoidable Significant Adverse Impacts
USD	United States Dollars
USSR	Union of Soviet Socialist Republics
VECs	Valued Ecosystem Components
VMS	variable message signs
VNIR	Visible and Near Infrared
WB	World Bank
WGMS	World Glacier Monitoring Service
WHO	World Health Organization
WPZ	Water Protection Zone
WQRMP	Water Quality and Resource Management Plan



Ministry of Energy, Kyrgyz Republic

KAMBARATA-1

HYDROPOWER PLANT

Address: Bishkek, Zhibek Zholy Street, 326
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Draft of Environmental and Social Impact Assessment Report “Technical Assistance for Kambarata 1 Hydropower Plant Project”

Volume II Book 2.5 Chapters 15-18

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15. Findings

The Project Management Office (PMO) under the Ministry of Energy (MoE) in the Kyrgyz Republic has hired SMEC to conduct the Environmental and Social Impact Assessment (ESIA) (hereinafter referred to as “the Study” or “ESIA”) for the proposed 1,880 MW Kambarata 1 Hydropower Plant on the Naryn River (hereinafter referred to as “the Project or K1 HPP”) following the Terms of Reference provided by the PMO, Ministry of Energy, Government of the Kyrgyz Republic.

Before starting the ESIA study, an Inception Report and a Screening and Scoping Report were prepared to clarify and narrow the focus and scope of the ESIA study on both temporal and spatial bases. The ESIA is designed to ensure alignment with the environmental and social requirements set by international lenders, specifically the World Bank Group (WBG), alongside the regulatory standards of the Kyrgyz Republic and other development finance institutions (DFIs) such as the EU, EIB, ADB, IDB, and OPIC.

15.1 Potential Significant Impacts and Mitigation Measures

The ESIA for the K1 HPP has identified a number of potentially significant environmental and social risks and impacts across multiple domains. To minimise these adverse impacts, the ESIA has proposed a series of mitigation and compensation measures to be implemented as part of the Project’s Environmental and Social Management Plan (ESMP).

The key environmental and social impacts identified, along with the corresponding mitigation and management measures, are summarised in **Table 15–1**.

Table 15–1: Key environmental and social impacts with the corresponding mitigation and management measures

No.	Theme	Impact Description	Mitigation and Management
1.	Biodiversity	<p>Terrestrial Species, Habitats & Ecosystem Services:</p> <ul style="list-style-type: none"> The Project is expected to result in loss of natural terrestrial habitats, comprising approximately 0.05 sq km of riparian forest, 0.1 sq km of shrubland, 1 sq km of cold desert & 3 sq km of rocky area, all situated below Full Reservoir Level (FRL). The Project is expected to result in loss of slightly to moderately modified habitat, comprising approximately 55 sq km of grassland partially utilized as pasture, situated below FRL. The said natural & modified habitats collectively represent potential habitat of 3 precautionarily assumed critical habitat qualifying (CHQ) flora species, namely the cold desert species CR <i>Ammopiptanthus nanus</i> (Dwarf Sandlip), the riparian forest species CR <i>Crataegus knorringiana</i> (Knorring’s Hawthorn) and the shrubland/pastureland species EN <i>Tulipa toktogulica</i> (Toktogul Tulip). The grassland habitat utilized for grazing livestock is reportedly highly valued by the local community for the provisioning ecosystem service accrued from it, in terms of fodder resources. The Project is expected to result in loss of significant populations of 13 flora species highly valued nationally for the cultural ecosystem services accrued from them by the Kyrgyz people. <p>Aquatic Species, Habitats & Ecosystem Services:</p> <ul style="list-style-type: none"> The Project is expected to lead to degradation of natural aquatic habitat, consisting of approximately 8 sq km of inland wetland (permanent river), through conversion of lotic habitat into lentic habitat. The said habitat represents potential habitat of 1 precautionarily assumed critical habitat qualifying 	<p>Terrestrial Species, Habitats & Ecosystem Services:</p> <ul style="list-style-type: none"> Protection & conservation/restoration of comparable areas of riparian forest, shrubland, cold desert & rocky areas to reasonably achieve No Net Loss (NNL) of natural habitat. Transplantation, as also, conservation breeding & rewilding of the 3 CHQ flora species through a Conservation Nursery to reasonably achieve precautionary Net Gain (NG) with respect to critical habitat values . Conservation breeding & rewilding of the 13 nationally valued flora species through the said Conservation Nursery to maintain the associated cultural ecosystem servicesImplementation of the Livelihood Restoration & Pasture Management Plan being separately developed for the Project is expected to maintain the provisioning ecosystem services associated with grassland habitats. <p>Aquatic CHQ Species:</p> <ul style="list-style-type: none"> Confirmatory eDNA studies focused on Pike Asp in the Study Area followed by support to an ongoing Pike Asp conservation project or conservation breeding & rewilding of Pike Asp through a Conservation Hatchery to achieve precautionary Net Gain for the species. (Details of nature & duration of support to be discussed with the program implementing organization.) Conservation breeding & rewilding of Turkestan Catfish to maintain the cultural ecosystem services associated with it.

No.	Theme	Impact Description	Mitigation and Management
		<p>(CHQ) fish species, namely EN <i>Aspiolucius esocinus</i> (Pike Asp).</p> <ul style="list-style-type: none"> The said habitat also represents confirmed habitat of LC <i>Glyptosternon oschanini</i> (Turkestan Catfish) which is legally protected & culturally valued by the Kyrgyz people as native to Kyrgyzstan. 	
2.	Environmental Flows and Operational Considerations	<p>The river reach between the proposed Kambarata-1 HPP and the existing Kambarata-2 reservoir is fully impounded and no longer functions as a natural river channel. Under normal operations, the Kambarata-1 tailrace discharges directly into the lentic backwater of Kambarata-2, eliminating the need for routine environmental flow releases.</p> <p>Non-routine events, such as river diversion, initial impoundment, or emergency drawdown — may result in rapid changes to flow or water level, which could disrupt operational stability in the Kambarata-2 reservoir. The objective of environmental flow management in these scenarios is to maintain stable water levels in the impounded reach and at the Kambarata-2 interface.</p> <p>Peaking operations are expected to be adopted during future operation. These will cause short-term discharge fluctuations in the upper Kambarata-2 reservoir, requiring ramping protocols to minimise shoreline instability, turbidity, and operational stress.</p> <p>Sediment trapping at Kambarata-1 is expected to reduce sediment inflows to Kambarata-2 and extend the operational interval between sediment flushing events, effectively eliminating the need for sediment flushing, as confirmed by AFRY (2025).</p>	<p>Although routine environmental flow releases are not needed, the ESMP outlines management measures for non-routine events. During river diversion and initial impoundment phases, coordinated discharge planning and monitoring will be undertaken to maintain stable water levels in the impounded reach and protect the functional integrity of the K-2 reservoir.</p> <p>During emergencies or planned drawdowns, pre-disclosed protocols for gradual release and stakeholder communication will be activated.</p> <p>No mitigation measures are triggered under normal baseload operations. Under peaking operations, environmental flow requirements are managed through ramping measures and monitoring protocols set out in the EFMP.</p>
3.	Greenhouse Gas Emissions and Materials Use	<p>Construction Phase: The total Scope 1 Emissions is estimated to be ~2,465,000 ton CO₂e during the total construction period of 7 to 8 years..</p> <p>Operation Phase: During operations, the reservoir is</p>	<p>Construction Phase Mitigation:</p> <ul style="list-style-type: none"> Use low-carbon materials, optimize fuel use, switch to electric equipment where possible, ensure sewage

No.	Theme	Impact Description	Mitigation and Management
		estimated to emit ~ 10,252 ton CO ₂ e/year—less than 0.06% of Kyrgyzstan’s annual GHG emissions.	<p>treatment, source materials locally, and monitor carbon footprint.</p> <ul style="list-style-type: none"> Enhance waste minimization and recycling practices. Clear vegetation before initial impoundment to reduce long-term emissions. <p>Operation Phase Mitigation:</p> <ul style="list-style-type: none"> Consider operational adjustments (Adjustment of water storage level, timing and magnitude of flow) to reduce methane generation in littoral zones. Monitor water quality, particularly nutrient levels, e.g. Phosphate, Nitrate, etc. Engage with local authorities to sensitize and prevent indiscriminate discharge of untreated sewage from the community. Similarly engage with the industries like Min-kush mining Authorities upstream of the K1 Reservoir within the catchment area of Naryn River, to prevent any untreated effluent discharge which may impact the water quality and add nutrients resulting in enhanced methanogenesis and GHG emissions.. Periodic GHG emission and energy audits to guide efficiency improvements.
4.	Geological Instability and Landslide Risk	<p>Pre-Construction Phase: Slope instability during early site works—such as vegetation clearance and road excavation—may trigger shallow landslides or rockfalls, particularly in fault-affected or steep terrain. These failures may be triggered by heavy rainfall, snowmelt, freeze–thaw cycles, or surcharging from equipment. Impacts include mobilisation delays, safety risks, and potential loss of access.</p> <p>AFRY (2025) identified unstable loose material and tectonic fault zones near the dam site that require further detailed study before final design. Extended field investigations are recommended to refine hazard mapping and mitigation requirements.</p>	<p>Pre- Construction Phase Mitigation:</p> <ul style="list-style-type: none"> Conduct detailed geotechnical and seismic assessments, including fault mapping and slope stability analysis during the pre-construction phase to avoid costly design rework. <p>Construction Phase Mitigation:</p> <ul style="list-style-type: none"> Integrate hazard maps into site layout and infrastructure placement. Apply engineered slope protection (e.g. bolting, shotcrete, surface drainage) in high-risk zones. Implement phased excavation and tunnelling with full-time geotechnical oversight and vibration monitoring.

No.	Theme	Impact Description	Mitigation and Management
		<p>Construction Phase:</p> <ul style="list-style-type: none"> • Temporary infrastructure (e.g. camps, roads) located on or below unstable slopes may be impacted by landslides or slope movement, leading to asset damage or injury. • Excavation and blasting in fractured terrain may trigger slope collapses, particularly near tunnel portals or cut slopes. • During initial impoundment, undetected slope instability may be activated by rising reservoir levels, resulting in localised slope failure and associated wave generation or sediment surge. • AFRY recommends more detailed assessment of larger unstable slope areas near the future reservoir and dam body to improve risk estimation. At the rear end of the future reservoir (Kökömeren–Naryn confluence), critically large debris flows could be generated, representing an additional hazard during construction and early impoundment. <p>Operation Phase:</p> <ul style="list-style-type: none"> • Reservoir rim slopes may progressively fail due to seismic activity or drawdown cycles, potentially generating displacement waves, sediment-laden inflows, or slope debris entering the reservoir. Risks are elevated in zones of weak or weathered lithology. • Residual risk of large-scale rockslides and avalanches entering the reservoir cannot be fully excluded. Ancient landslide-dammed lake deposits identified upstream may also reactivate under reservoir impoundment. Such mass movement waves could threaten dam safety or critical infrastructure, necessitating long-term slope surveillance and integration into emergency preparedness planning. 	<ul style="list-style-type: none"> • Stabilise and drain spoil disposal sites to avoid induced landslide risks. <p>Operation Phase Mitigation:</p> <ul style="list-style-type: none"> • Monitor high-risk slopes using deformation and seismic sensors, with monitoring frequency adapted to slope sensitivity and intensified following drawdown or seismic events. • Conduct periodic slope stability analyses under both routine and post-event scenarios. • Establish and maintain a long-term slope surveillance programme integrated with reservoir operation protocols. • Coordinate geotechnical reviews through the Dam Safety Panel of Experts (DSPOE) as part of 5-year dam safety reviews, and following significant operational changes or major hazard events.
5.	Local Economy	Construction phase	Implement Labor Influx Management Plan (LIMP) for the K-1 HPP and Associated Facilities that effectively manages the

No.	Theme	Impact Description	Mitigation and Management
		<p>The Influx of 7,000 workers at peak construction and setting up of workers' camps may cause significant economic strain on local communities due to increased prices of essential goods and services, especially if resource demand is not effectively managed.</p> <p>Operation phase</p> <p>The sharp decline in employment following the construction phase of the HPP poses a critical risk to local livelihoods and the broader economy. Without timely training and transition support, job losses could exceed 10% of the local labor force, leading to long-term economic strain across the region.</p>	<p>influx of workers associated with the Project while mitigating potential social, economic, environmental, and health-related impacts on the host communities.</p> <p>The LIMP will ensure Project benefits for local communities by creating local jobs and providing training opportunities. A National HR Development Contractor (NHRDC) will be engaged to work with communities to fill job vacancies for the Project, and work with training partners to deliver capacity building programs including on-the-job training models to increase benefits for directly affected communities.</p> <p>In addition to pre-employment training, the NHRDC will also develop other customized programs, especially for women and vulnerable groups to address specific skills gaps. The NHRDC will play a key role in facilitating the survey and registration of eligible locals from the project affected communities.</p> <p>Contractors will be encouraged to employ local workers in accordance with Local Employment Hierarchy Policy and by providing preference to suitably qualified and experienced applicants from local communities.</p> <p>The LIMP will introduce and promote a centralized procurement system that is transparent and streamlines all purchases from local vendors—ensuring consistency, transparency, and fair pricing for all. Partnering with trusted local suppliers and agreeing on prefixed prices, eliminate cost fluctuations and improve/reinforce commitment to the local economy.</p> <p>To support transition at completion of construction, an Exit Plan will be prepared which will include the HR Development Contractor working with PMO will support maintaining a skilled local workforce, by proactively identifying future projects planned in the area and related opportunities</p> <p>A BSP (not part of ESIA) is recommended to be established, in parallel to Livelihood Restoration and Resettlement Planning. A BSP could be linked to key social management plans to provide additionality to key areas that can be prioritized by</p>

No.	Theme	Impact Description	Mitigation and Management
6.	Community Infrastructure and Access to Services	<p>Construction phase</p> <p>Up to 83.42 km of horse and foot trails will be inundated by the reservoir. In addition, eleven bridges including two bridges used to cross the Toluk River and Temirken River will be submerged by the Project.</p>	<p>government and other development partners to enhance project benefits. The BSP will strengthen social cohesion by promoting inclusivity, dialogue, and participation.</p> <p>The loss of access will be included and addressed in the LRRP for reservoir area and associated facilities in accordance with the LRRF.</p> <p><i>Infrastructure Proposals for Pasture Access</i> have been identified and will be subject to more detailed verification of costs and practicality assessments in close consultation with affected communities and pasture users.</p>
7.	Community Health Safety and Security	<p>Construction phase & Operation Phase</p> <p>Community health may be affected by air and noise pollution, wastewater, hazardous materials, and labor influx. Social tensions could arise from cultural differences between locals and migrant workers. There will also be an increased risk of gender-based violence, sexual exploitation and abuse, sexual harassment, crime, and substance abuse due to influx of workers, vehicle drivers and a floating population coming in search of livelihood. Security personnel may use excessive force during conflicts leading to social tension. In addition, nearby settlements may face a higher risk of road accidents.</p>	<p>Implement a Community Health, Safety and Security Plan (CHSSP), LIMP and LMP. A separate Security Plan will also be prepared for the Project</p> <p>The CHSSP will include measures to ensure all reasonable precautions to protect the health and safety of nearby communities and villages, to protect against and mitigate security risks that could threaten communities, employees, facilities, and ability to operate, and to ensure that the Project complies with the safeguard requirements</p> <p>LIMP includes measures to ensure:</p> <ul style="list-style-type: none"> Workers' accommodation areas shall be adequately provided by the Contractor so that there are no requirements of staying with local communities. The accommodation should be in line with WB norms. The provision of good quality accommodation, services and facilities is likely to reduce the need for mixing with the local population. All persons residing in the local community shall be transported to and from the site daily by the contractor's transport in accordance with the worker

No.	Theme	Impact Description	Mitigation and Management
			<p>transit plan. Transportation of migrant workers should also be arranged, to avoid use of public transport</p> <p>The LMP will include specific provisions relating to SEA/SH not being tolerated. The Contractor shall work with management, local women's committees and district authorities to ensure that any complaints are dealt with in accordance with the law.</p> <p>The LMP includes appropriate clauses relating to GBV/SEA/SH in a 'Code of Conduct' and this will be applicable to all security personnel and requiring . All security personnel to fully comply with the Code of Conduct.</p> <p>Additionally, a Worker Code of Conduct will be implemented for all workers during the induction process (and refresher training annually), with a specific focus on preventing and addressing GBV and SEA/SH throughout the Project in accordance with "Measures to Address SEA & GBV".</p> <p>The SEP will be used to provide information to communities on gender-sensitive grievance mechanism.</p>
8.	Land Acquisition, Resettlement, Livelihood, and Restriction of Access	<p>Pre-Construction phase & Construction Phase</p> <p>Approximately 173.67 km² of land will be affected by the Project, primarily from the Elmirebek Imanaliev, Sary-Kamysh, and Toluk Ayil Aimaks in Toktogul District, with smaller areas from Atai and Kargalyk Ayil Aimaks (Toguz-Toro District) and Minkush Ayil Aimak (Jumgal District). The affected areas include 1.27 km² for the dam site and auxiliary works, 0.31 km² for associated facilities; 61.7 km² of land to be inundated due to reservoir formation; 13.94 km² of land that will become inaccessible due to loss of access; 95.99 km² within the Water Protection Zone and 0.46 km² of land located within the Right-of-Way of the 110kV transmission line.</p> <p>Approximately 61.7 km² of land will be submerged due to the reservoir formation. Of this, around 35.38 km² of</p>	<p>Implement two Livelihood Restoration and Resettlement Plans (LRRPs) that will be developed for both the reservoir and construction-associated areas, in line with national laws, ESS5, and the Kambarata-1 Livelihood Restoration and Restoration Framework (LRRF).</p> <p>These plans will include a full census and inventory of affected households and assets. Compensation and livelihood restoration measures will be provided to eligible persons—including seasonal and informal users—based on asset ownership, land access, and economic reliance.</p> <p>As presented in the LRRF, eligibility and entitlements for compensation will cover</p> <p>(i) Individuals/families</p> <ul style="list-style-type: none"> • Users of agricultural or pasture land affected permanently or temporarily by the Project, including loss of access;

No.	Theme	Impact Description	Mitigation and Management
		<p>pastureland will be permanently affected, impacting an estimated 1,024 households (or ~6,211 individuals), primarily due to land acquisition for the reservoir and as a result of submerged horse and foot trails, and bridges.</p> <p>Most of the inundated area (58.51 km², 94.84%) is located in Toktogul district, covering lands from the following AAs: E. Imanaliev AA (27.07 km²), Toluk AA (15.64 km²) and Sary-Kamysh AA (15.80 km²). The remaining 5.16% of the affected land lies within Toguz-Toro and Jumgal districts.</p> <p>Beyond the direct loss of pastureland due to reservoir submergence, villagers in Toluk AA may also struggle to access their remaining grazing areas once the reservoir is filled. In addition to the pasture that will be submerged, approximately 13.94 km² of remaining winter pastures may become inaccessible due to the loss of key bridge and horse paths in Toluk AA.</p> <p>Additionally, 70 pasture-related structures (e.g., shelters, storage units) will be affected, of which 57 lie in the inundation area. Three potentially affected households will be physically displaced from their housing as a result of reservoir formation.</p> <p>Two institutional land users—the Toktogul State Forestry Enterprise and Zhoon-Terek Hunting Enterprise—will also be affected. Given the interlinked land uses in the area, many households may experience overlapping impacts on land, access, and livelihood.</p>	<ul style="list-style-type: none"> Persons whose livelihoods are impacted (e.g., herders, shepherds, beekeepers, forest product collectors); Individuals whose non-land assets (including graves) or access to them are partially or fully affected. <p>(ii) Community/State assets and facilities:</p> <ul style="list-style-type: none"> Community infrastructure (e.g., access roads, horse paths, small bridges) affected by the Project; State-owned land, houses, and structures affected temporarily or permanently by the Project. <p>To mitigate the loss of access to winter pastures in Toluk caused by the submergence of existing paths and bridges, a key mitigation measure proposed is the construction and upgrade of a 17-km road and bridge to the Achyk-Tegirmenti winter pastures on the right bank of the Toluk River. This infrastructure is technically feasible and, if implemented, would restore full access for currently affected pasture users</p> <p>Compensation for affected land and other assets will be provided to the affected people and livelihood restoration measures will be also initiated prior to the expected commencement of works or the impoundment of the respective Project areas.</p>
9.	Labour Influx and Working Conditions	<p>Construction Phase & Operation Phase</p> <p>Labour influx during peak construction (over 7,000 workers) is expected to bring both economic benefits and risks.</p>	<p>A Labour Influx Management Plan (LIMP) and Labour Management Plan (LMP) have been prepared and will be implemented.</p>

No.	Theme	Impact Description	Mitigation and Management
		Benefits include local job creation, increased demand for goods and services, and potential upskilling of local labour.	Contractors will be required to develop their own LMPs aligned with these frameworks within one month of contract award.
		Risks include inflationary pressures on local markets, social tensions from cultural differences, increased potential for gender-based violence (GBV), sexual exploitation and abuse (SEA), and pressure on public services.	Key measures include: local hiring preferences, human resources (HR) development support, community training programs, and transparent procurement from local vendors.
		The post-construction drop in employment may also result in economic shock.	A Construction Workers' Accommodation Plan and Code of Conduct (CoC) will be developed, covering GBV/SEA/SH, substance use, and harassment.
		Additional concerns include unsafe working conditions, inadequate housing, wage-related disputes, and freedom of association challenges.	Worker accommodations will meet international standards, with gender-sensitive designs. An internal Grievance Redressal Mechanism (GRM) for workers, including a channel for sensitive and confidential complaints, will be established, and all contractors will undergo routine audits. The Gender Inclusion and Vulnerability Plan (GIVP) will support long-term community development. Health monitoring, site security measures, and traffic safety will also be implemented as part of the Community Health, Safety and Security Management Plan (CHSSMP).
10.	Cultural Heritage	<p>Construction Phase</p> <p>The assessment confirms that a total of 14 cultural heritage sites, including burial mounds, rock art complexes, traditional structures, and sacred landscapes are located in the planned reservoir area, therefore directly impacted. These sites vary in their cultural significance, physical integrity, and sensitivity to project activities. Sites such as the Kokomeren-Naryn Burial Ground and Chiyin-Tash Rock Art Complex are of exceptional significance, requiring</p>	A comprehensive Cultural Heritage Management Plan (CHMP) has been developed. It includes avoidance planning through constraints mapping and the establishment of exclusion zones, as well as protocols for relocation of movable cultural sites in consultation with local communities. Where avoidance is not possible, measures include documenting and transferring artefacts to local museums, in line with Good International Industry Practice (GIIP). Archaeological investigations will be undertaken prior to construction, including surveys, excavation, analysis (e.g., radiocarbon, archaeobotanical), and the

No.	Theme	Impact Description	Mitigation and Management
		<p>immediate protection and detailed documentation prior to any project activity.</p>	<p>conservation and storage of excavated materials in temperature-controlled facilities.</p> <p>To support broader heritage preservation, the CHMP also includes publication of findings through books and documentary film, promoting cultural awareness and transparency. Health and safety measures are planned for field teams, including personal protective equipment and emergency medical support. A Chance Find Procedure (CFP) will be integrated into the ESMP to ensure proper management of unexpected cultural discoveries during construction.</p> <p>Training of all personnel—including on cultural protocols and site sensitivities—will be provided, and ongoing stakeholder engagement, including with ICOMOS and UNESCO, is mandated throughout the construction phase to ensure international standards are upheld.</p>
11.	<p>Inclusion, Vulnerabilities and Gender</p>	<p>Construction Phase & Operation Phase</p> <p>Potential adverse impacts on women and vulnerable groups include increased GBV risks from labor influx, unsafe accommodation, health and safety risks in employment, lack of reporting mechanisms, discrimination, disadvantages in resettlement and compensation, food insecurity, conflict over resources, and limited decision-making participation due to social norms.</p>	<p>A Gender, Inclusion and Vulnerability Plan (GIVP) have been prepared and will be implemented. The GIVP outlines specific actions to address risks of gender-based violence (GBV), sexual exploitation and abuse (SEA), and sexual harassment (SH) during both the construction and operation phases of the project. It also aims to improve access for women and vulnerable groups to project benefits and opportunities.</p> <p>Key measures outlined in the GIVP include:</p> <ul style="list-style-type: none"> • Establish a gender working group and appoint a senior Gender and Inclusion Program Manager. Infrastructure improvements will be designed with the needs of women and vulnerable groups in mind. • Targeted measures at the project site, contractor level, and resettlement areas to prevent and respond to risks. • Promote employment and participation of women and vulnerable groups in project implementation. • Ensure women and vulnerable groups are actively involved in project-related decision making and oversight. <p>The GIVP also require Project Contractors to:</p>

No.	Theme	Impact Description	Mitigation and Management
			<ul style="list-style-type: none">• Develop gender management plans within 1 month of contract award.• Implement a gender-sensitive Code of Conduct (CoC) for all workers.• Establish a confidential, gender-sensitive channel within the Grievance Redress Mechanism (GRM).• Employ trained personnel and third-party experts to handle gender issues and sensitive grievances.• Ensure women's rights and compensation are protected during resettlement, regardless of marital status.

15.2 Cumulative Impacts

The Project will contribute to cumulative impacts in the Naryn River Basin, especially in conjunction with other hydropower developments. These include altered sediment transport, ecosystem fragmentation, and socio-economic changes at the basin scale. The potential cumulative impacts and associated mitigation and management measures are summarised in **Table 15–2** below.

Table 15–2: Summary of Cumulative Impact Themes and Corresponding Mitigation Measures

No.	VEC	Impact	Management, Mitigation and Monitoring
1.	Water Availability	<p>The Kambarata-1 Hydropower Project (HPP), located upstream of Toktogul, will add a significant regulating structure to the upper Naryn cascade. While Kambarata-1 is designed to operate under seasonal storage conditions, the initial reservoir filling period presents a cumulative risk: if not coordinated with downstream operations and seasonal water allocation plans, it could reduce flows to Toktogul and the broader Syr Darya system during dry years. This may affect irrigation supply, reservoir operations, and wetland ecosystems, particularly in Uzbekistan and Kazakhstan during the spring–summer growing season.</p> <p>AFRY’s modelling indicates that under coordinated operations, Kambarata-1 can help preserve storage in Toktogul during winter, thereby improving irrigation water availability in summer. However, any deviation from planned impoundment schedules or asynchronous operation across the cascade could undermine these benefits.</p> <p>Although peaking operations are not currently assumed in the base case for Kambarata-1, future adoption of peaking would alter daily release patterns. These sub-daily fluctuations are unlikely to propagate significantly beyond Toktogul due to buffering, but under low-flow conditions or in combination with operational changes elsewhere in the cascade, they could affect irrigation intake timing and ecological stability in downstream regulated reaches. This scenario would require reassessment of flow variability impacts if considered in future operational revisions.</p>	<p>To mitigate water availability risks:</p> <ul style="list-style-type: none"> • A basin-wide Impoundment Plan should be developed in collaboration with riparian states, coordinated through the Interstate Commission for Water Coordination (ICWC). This plan should define timing of initial filling to coincide with peak snowmelt inflows and align with seasonal irrigation demands • Initial reservoir filling must be planned and coordinated through the Interstate Commission for Water Coordination (ICWC), particularly during dry or low-inflow years. • If future operational shifts include peaking, ramping protocols and impact assessments should be developed to address downstream flow variability. • Ongoing monitoring of cascade-wide storage, releases, and allocations should be maintained and reported through ICWC mechanisms to support equitable transboundary water sharing and adaptive management under multi-year hydrological variability.
2.	Water Quality	<p>The water quality in the K-1 reservoir is not expected to be strongly impacted, with only minor temperature changes. However, upstream mining activities could cause contamination, affecting water quality in the Naryn River and downstream areas.</p>	<p>Effluents from open-pit mines must be controlled, and tailings dams should be built to safely store contaminated sediments. The water quality issue is mainly national, with no significant transboundary impact if managed properly.</p>
3.	Flood Risks	<p>The Kambarata-1 HPP is expected to contribute positively to downstream flood management by adding upstream storage capacity to the Naryn River cascade. When operated in coordination with Toktogul and downstream structures, Kambarata-1 can help attenuate high flows, particularly during spring snowmelt or extreme rainfall events.</p>	<p>To manage cumulative flood risks:</p> <ul style="list-style-type: none"> • Coordinated operation of Kambarata-1 within the full cascade is required to maximise flood attenuation benefits, particularly under high-snowmelt or extreme rainfall scenarios.

No.	VEC	Impact	Management, Mitigation and Monitoring
		<p>However, the cumulative flood risk profile of the basin remains complex. Glacial lake outburst floods (GLOFs), landslide dam failures (LDOFs), and extreme precipitation events pose upstream hazards that could affect the dam site and adjacent infrastructure. While AFRY has conducted preliminary flood modelling, including PMF estimation, the detailed residual risk associated with a dam breach or cascading failure scenario has not been assessed to date.</p> <p>Moreover, although Kambarata-1 may reduce flood peaks downstream, any asynchronous cascade operation or inadequate early warning dissemination could increase transboundary flood risks in downstream reaches — especially in the floodplains of Uzbekistan and southern Kazakhstan.</p>	<ul style="list-style-type: none"> • A full dam break and cascading failure risk assessment should be conducted prior to commissioning, including downstream flood wave propagation to transboundary areas. • The Emergency Preparedness and Response Plan (EPRP) must integrate GLOF/LDOF scenarios, cascade failure risks, and stakeholder alert protocols — including cross-border communication mechanisms.
4.	Sediments	<p>The Kambarata-1 Hydropower Project will serve as a major sediment trap on the Naryn River, intercepting upstream sediment before it reaches Kambarata-2 and Toktogul reservoirs. This is expected to significantly reduce sedimentation in Kambarata-2, eliminating the need for sediment flushing and improving downstream turbine efficiency and maintenance intervals.</p> <p>Although AFRY’s modelling confirms that upstream catchment activities—including mining, road building, and the China–Kyrgyzstan–Uzbekistan Railway—are likely to increase sediment yields, these materials will be effectively trapped in the Kambarata-1 reservoir. Toktogul already traps essentially all remaining sediment from the Naryn River, and therefore, Kambarata-1’s contribution to cumulative transboundary sediment changes is negligible.</p>	<p>To manage sediment-related risks within the national context:</p> <ul style="list-style-type: none"> • Regular monitoring of sediment inflows to Kambarata-1 should be conducted to confirm the performance of its sediment trapping function and support future reservoir management. • Catchment-level sediment yield projections should be updated periodically to account for land use change, infrastructure expansion, and mining activity. • Future developments in the upper catchment should be required to implement erosion control and sediment retention measures to minimise reservoir sedimentation. • No further sediment monitoring is required downstream of Toktogul in relation to Kambarata-1, but cascade-wide sediment budgets should continue to be tracked for adaptive reservoir management.
5.	Biodiversity	<p>Habitat loss will affect threatened flora species like Toktogul Tulip and Dwarf Sandlip. The Project will contribute to cumulative biodiversity impacts, particularly from future HPP developments, climate change, and grazing pressures. Common fauna and threatened species like Snow</p>	<p>Mitigation for flora and fauna impacts should be handled at the Project level. Conservation measures, such as the protection of vegetation and habitat, will help minimize impacts. Additional studies are needed to assess regional cumulative impacts. No cumulative transboundary impacts are expected.</p>

No.	VEC	Impact	Management, Mitigation and Monitoring
		Leopard will also be impacted by habitat loss and fragmentation, but no cumulative impact on Snow Leopard is expected.	
6.	Protected Areas	Ramsar sites like Kayrakum Reservoir (Tajikistan) and Aydar-Arnasay Lake System (Uzbekistan) could be affected by changes in water flow, leading to reduced habitat for migratory birds and aquatic life. The Lesser Aral Sea and associated wetlands may also face negative cumulative impacts due to reduced water inflows.	Operational patterns in Naryn should be maintained to avoid drastic changes in water distribution that would affect Ramsar sites. Water releases in summer can be optimized to support wetland habitats downstream.
7.	Socioeconomic	The Project will result in the loss of winter pasture and job creation during construction, benefiting the local economy, although temporary. Increased competition for skilled labor, especially if other large projects (e.g., CKU Railway) coincide, could lead to wage inflation and social tensions. Increased electricity generation will improve supply locally, nationally, and internationally, benefiting neighboring countries like Pakistan through the CASA 1000 project.	Cumulative impacts related to employment and the local economy should be managed at the national level. The impact on electricity supply will be positive at local, national, and international levels, contributing to economic benefits.

15.3 Residual Risks and Unavoidable Significant Adverse Impacts

The Environmental Risk Assessment (Chapter 12) identified several significant residual risks to the Valued Ecosystem Components (VECs) of the receiving environment from activities associated with the construction and operation of the K-1 HPP. These impacts are considered Unavoidable Significant Adverse Impacts (USAIs)—that is, impacts for which no practicable management and/or mitigation measures currently exist that would reduce the residual risk to an environmentally, socially, or politically acceptable level.

These USAIs span a range of environmental and social receptors, including:

the permanent loss of critical and natural terrestrial and aquatic habitats,
permanent alteration of the downstream river geomorphology and sediment flow regime,
long-term greenhouse gas emissions associated with reservoir creation,
land acquisition and livelihood impacts related to pasture and structure loss, and
the permanent inundation of culturally significant heritage sites.

Alteration in local climatic conditions/microclimatic conditions in areas adjoining the reservoir

The USAIs identified are summarised in **Table 15–3**.

Table 15–3: Unavoidable significant adverse impacts

No.	Impact Theme	Description of Unavoidable Significant Adverse Impact	VECs Affected	Justification for Unavoidability	Compensation and Enhancement (Opportunities for the Proponent to Contribute)
1.	Loss or Degradation of Natural and Modified Habitats, including precautionarily assumed critical habitat.	The Project will result in the permanent loss of approximately 52 sq km of natural and modified terrestrial habitats situated within the submergence zone. These include ~0.06 sq km of riparian forest, ~0.07 sq km of shrubland, ~0.5 sq km of cold desert and 2.5 sq km of rocky area habitat-types. These habitats are near-natural and potential habitat for 3 precautionarily assumed critical habitat qualifying (CHQ) plant species: <i>Ammopiptanthus nanus</i> (CR), <i>Crataegus knorringiana</i> (CR), and <i>Tulipa toktogulica</i> (EN), as well as 10 legally protected and/or culturally valued species. In addition, around 49 sq km of grassland habitat-type, partially utilised as pasture and highly valued by the local community for its fodder provisioning services, will be permanently submerged. The reservoir will also convert ~9 sq km of lotic (riverine) habitat into lentic habitat, degrading the said inland wetland habitat, which is potential habitat of 1 precautionarily assumed CHQ fish species: <i>Aspiolucius esocinus</i> (EN, Pike Asp).	Terrestrial Biodiversity, Aquatic Biodiversity, Provisioning Ecosystem Services, Cultural Ecosystem Services	Despite GIIP-aligned mitigation measures, such as transplantation, compensatory plantation, habitat conservation and restoration, the original diversity and quality of habitats, species assemblages, and ecosystem services associated with these inundated areas can neither be preserved nor fully recreated elsewhere.	Fund long-term ecological monitoring and community-based biodiversity conservation initiatives; support local institutions (e.g., ranger posts, nurseries); contribute to protected area management.

No.	Impact Theme	Description of Unavoidable Significant Adverse Impact	VECs Affected	Justification for Unavoidability	Compensation and Enhancement (Opportunities for the Proponent to Contribute)
2.	Land Acquisition, Resettlement, Livelihood Restoration and Restriction of Access	The K1 HPP reservoir will permanently inundate land (61.7 km ²) currently used by over 1,024 households (approx. 6,200 people) for seasonal grazing and small-scale subsistence activities. Some users may also lose access due to infrastructure removal or water protection zone restrictions. While Livelihood Restoration and Resettlement Plans (LRRPs) will be developed, the permanent loss of access to traditional lands and grazing patterns will lead to long-term social and economic disruption.	Livelihoods, pasture use, community stability	Despite planned compensation, restoration programs, and benefit-sharing mechanisms, the permanent nature of land loss and cultural attachment to specific grazing lands will present new challenges for the local rural economy. These changes may jeopardise the resilience of traditional livelihoods and undermine food and economic security in the affected areas, if social mitigations implementation is not closely monitored.	Provide transitional livelihood support, prioritize affected persons for project jobs, and implement skills development and enterprise support (e.g., for agriculture, livestock, or microbusinesses) beyond what is legally required.
3.	Local Economy and Employment	The influx of workers during construction is expected to inflate local prices of goods and services, straining household economies. Post-construction, the sudden drop in employment opportunities may result in significant job losses—potentially affecting over 10% of the local labor force—without adequate economic transition support.	Local households, workforce, informal economy, small businesses	These impacts are linked to structural shifts in the local economy resulting from project cycles. While local hiring, training, and livelihood restoration programs can reduce adverse outcomes, residual risks remain due to market inflation, limited absorptive capacity of local economies, and uncertainty about long-term economic diversification options.	Fund post-construction transition programs (vocational training, business incubation); support local supply chains for project O&M; promote local procurement even after the construction period ends.
4.	Community Health, Safety and Security	Despite mitigation measures, there remains residual risk of negative impacts from labor influx and increased population mobility during construction, including heightened risks of gender-based violence (GBV), sexual exploitation and abuse (SEA), social tension, substance abuse, and	Local communities, vulnerable groups (especially women and children), social fabric, public health infrastructure	These risks stem from large-scale labor influx and proximity of worksites to settlements, and while mitigated through codes of conduct, worker training, community engagement, and GBV action plans, full elimination is rarely feasible. Residual risks persist due to	Establish ongoing community health outreach programs (e.g., mobile clinics, awareness campaigns), improve local emergency response systems, and co-develop community-policing frameworks with authorities.

No.	Impact Theme	Description of Unavoidable Significant Adverse Impact	VECs Affected	Justification for Unavoidability	Compensation and Enhancement (Opportunities for the Proponent to Contribute)
		road accidents. The presence of security personnel may also create tension if not properly trained and managed.		enforcement challenges, cultural sensitivities, and unpredictability of human behavior in high-pressure environments.	
5.	Cultural Heritage	Several cultural and sacred sites—including burial grounds, petroglyphs, pilgrimage locations, and historic landmarks—fall within the area to be inundated by the K1 HPP reservoir. Some sites may be relocated or documented; others, due to their physical nature or community preference, may be submerged permanently.	Sacred sites, heritage values	Many cultural sites are geographically tied to their original locations or hold spiritual value that cannot be transferred. Despite best efforts at relocation, intangible and place-based heritage will be permanently impacted for some communities.	Develop cultural preservation initiatives in consultation with local communities (e.g., site documentation, signage, storytelling exhibits); support local museums and education programs on heritage.
6.	Landscape and Visual Character	The transformation of the Naryn River valley into a large reservoir (~61 km ²), combined with the construction of the dam and supporting infrastructure, will permanently alter the landscape. These changes include submergence of the existing riverbed, reshaping of valley slopes, and visibility of dam structures from inhabited and high-use areas. Despite restoration efforts in adjacent zones, the overall landscape character and visual amenity of the area will be irreversibly changed.	River valley, scenic viewpoints, local aesthetic values	The scale and permanence of the reservoir and associated structures make landscape alteration unavoidable. Mitigation can soften secondary impacts but cannot restore the pre-Project visual or geomorphic character. For impacted residents and visitors, the altered viewshed will represent a permanent change in any attached visual and emotional amenity.	Support community-driven landscaping initiatives (e.g., viewpoint beautification, local tree planting); develop interpretive signage or visitor infrastructure showcasing natural and cultural values of the area; fund visual screening measures near key sensitive receptors.
7.	Reservoir-Triggered Seismicity and Landslide Risk	Reservoir impoundment may cause slope instability along steep reservoir banks, potentially triggering landslides or small-scale seismic	Reservoir rim, downstream infrastructure, dam safety	Even with geotechnical design and monitoring systems, reservoir-triggered geohazards are inherently uncertain and cannot be completely	Establish an early warning and slope monitoring system; partner with national geological institutes to build regional landslide/seismic risk

No.	Impact Theme	Description of Unavoidable Significant Adverse Impact	VECs Affected	Justification for Unavoidability	Compensation and Enhancement (Opportunities for the Proponent to Contribute)
		activity. These processes may impact water quality, intake structures, and long-term slope stability. In extreme cases, mass movements may generate waves that threaten dam safety or downstream infrastructure. While monitoring and early warning systems can reduce risk, full prevention is not technically feasible.		ruled out due to complex geology, hydrological loading, and seismic fault activity. Hence, the residual risk remains unavoidable under current engineering and environmental constraints.	knowledge; support training for local emergency responders and contribute to resilient infrastructure in vulnerable settlements.
8.	Sediment Trapping and Downstream River Morphology Alteration	The Kambarata-1 dam will trap a significant portion of upstream sediment, reducing sediment loads delivered downstream. This will disrupt sediment continuity, leading to channel incision, bank destabilization, and degradation of floodplain ecosystems downstream of Kambarata-2HPP over the long term (over time, outflows from Kambarata-2 to downstream areas will become increasingly sediment deficient).	Downstream riverine morphology, floodplains, aquatic habitat	Sediment trapping is an inherent consequence of large dams, particularly those without sediment bypass or sluicing systems. While some mitigation (e.g. sediment flushing, adaptive reservoir operation) may reduce severity, long-term changes to geomorphology and habitat are effectively unavoidable in large storage reservoirs like Kambarata-1.	Support sustainable watershed management (afforestation, erosion control); contribute to downstream channel restoration works or sediment augmentation if feasible; fund academic or institutional research on sediment dynamics to support basin-wide river health.
9.	Local Climatic Effects / Microclimate	Potential alterations in local microclimate patterns during the operation phase, including rapid temperature and humidity fluctuations, localized wind turbulence, and enhanced convective activity leading to changes in precipitation. These effects are associated with the presence of the large reservoir and altered land-atmosphere interactions.	Ambient climate conditions; human receptors; ecosystems potentially influenced by altered microclimate		No direct mitigation or compensation measures currently exist to manage microclimatic shifts. Such changes are emergent properties of large reservoirs and cannot be engineered out. Given the site-specific nature of such effects and global variability in evidence, long-term baseline and post-impoundment monitoring are recommended to better understand and manage these impacts over time.

15.4 Unresolved Project Aspects

While this ESIA has endeavoured to assess the full range of potential environmental and social risks and impacts of the K1 HPP, certain aspects could not be comprehensively assessed due to the unavailability of finalized information at the time of reporting. These include:

Worker Camp Location and Design: The exact location and layout of the proposed workers' camp, intended to host up to 7,000 workers during peak construction, had not been finalized. While potential sites—such as Ketmen Tobo Village, Nickhe-Sai (an affected village), or a site adjacent to the dam—have been preliminarily discussed and profiled in the social impact assessment sections, detailed assessment of site-specific impacts will only be possible once the final location is selected. Corresponding site-specific environmental and social management plans will also be required.

Supply Chain Arrangements for Cement and Fly Ash: Given the RCC (Roller Compacted Concrete) design of the dam, large quantities of cement and fly ash will be required. While the Material Supply Management Plan outlines indicative sources and associated risks based on AFRY's Feasibility Study, a definitive and verified supply chain has yet to be secured. This limits assessment of environmental impacts such as emissions from transport, quality and sustainability of source operations, and cumulative impacts along the supply corridor.

Operational Flow Regimes: K1 HPP's operating regime had not been finalised at the time of finalising this ESIA. While regular operations of K1 HPP are not expected to result in significant transboundary flow impacts, due to the buffering capacity of the downstream Toktogul Reservoir—residual risks remain under extreme scenarios. These include Toktogul operating at historically low levels combined with emergency releases or impoundment at K1 HPP. Under such conditions, the flow regime of the Naryn River could be significantly altered, with potential implications for irrigation, ecosystems, and international water-sharing obligations involving Uzbekistan and Kazakhstan.

It is noted that this is a joint-stock project with financial and political involvement from all three riparian countries. Continued dialogue and disclosure of this ESIA and future operating protocols will play a critical role in mitigating the risk of transboundary tension or disruption.

Impoundment Planning: While AFRY's feasibility modelling demonstrates that Kambarata-1 can support coordinated cascade regulation, the precise timing and management of initial reservoir filling requires basin-wide agreement. A Joint Impoundment Plan, to be developed in collaboration with the riparian states and coordinated through the ICWC, must be prepared and endorsed prior to commencement of reservoir filling. This is consistent with the recommendation in the Cumulative Impact Assessment (Chapter 13).

These limitations are acknowledged and will need to be addressed during detailed design, contractor mobilization, and operational planning phases through dedicated assessments, stakeholder consultations, and targeted management plans.

16. Budget, Implementation Arrangements and Training Needs

16.1 Overview

This chapter outlines the overall arrangements necessary to implement the Environmental and Social Management Plan (ESMP) developed for the Kambarata-1 Hydropower Project (K1 HPP or the “Project”). It provides a comprehensive framework for ensuring that all environmental and social measures are adequately planned, resourced, and executed throughout the Project lifecycle.

The chapter is structured as follows:

Institutional Implementation Structures: Defining the roles and responsibilities of key stakeholders, including the Ministry of Energy’s Project Management Office (PMO), contractors, consultants, and regulatory bodies.

Capacity Development Needs: Assessing the existing capacity of the PMO to manage the technical, social, and environmental functions of the Project, and identifying areas for development through recruitment, training, and external support. This assessment will be augmented with the findings of a detailed Borrower’s Capacity exercise which is scheduled to be carried out after completion of this ESIA study and firming up of some aspects of the management plans in consultation with PMO.

Training Strategy: Establishing a detailed training plan to build the necessary skills across all Project levels, from PMO staff to site workers, to ensure effective implementation of the ESMP.

Budget Breakdown: Providing an overview of the financial requirements for ESMP implementation, detailing the costs for staffing, training, monitoring, stakeholder engagement, and third-party verification. A detailed breakdown of costs is provided in **Chapter 14, Section 14.13 (Indicative ESMP Budget)**.

This chapter consolidates all resources, oversight, and financial planning into a unified implementation framework that complements the detailed arrangements already embedded in individual ESMP subplans. Its purpose is to ensure that the Project is fully equipped, both in terms of capacity and financial resources, to meet its environmental and social commitments.

16.2 Institutional Arrangements and Capacity Assessment

The implementation of the ESMP for the K1 HPP will be led by the PMO, with active support from contractors, subcontractors, consultants, and regulatory bodies. The PMO will play a central role in ensuring that all mitigation and monitoring measures are effectively executed throughout the Project phases. However, as of the ESIA stage, it is assumed that the PMO may lack the full in-house capacity to manage the technical, social, and environmental functions required for a Project of this scale and complexity.

16.2.1 Organizational Structure for Implementation

The organizational structure for the implementation of the ESMP is illustrated in **Figure 16–1**, which shows the roles and responsibilities of key stakeholders, including the PMO, contractors and subcontractors. This structure ensures clear lines of authority and accountability, facilitating smooth coordination and effective execution of mitigation and monitoring measures.

The PMO will be the central body overseeing the implementation of the ESMP, with clearly defined roles and responsibilities for all Project personnel. Key components of the organizational structure include:

PMO’s Environmental and Social Unit (E&S Unit): This multi-disciplinary team will be led by the Environmental, Health, and Safety Manager (EHSM), supported by specialists in resettlement, stakeholder engagement, biodiversity, safety, and community health.

Contractors and Subcontractors: The contractors, under the supervision of the PMC Engineer, will be responsible for implementing the ESMP’s mitigation measures on-site. The Contractor will recruit experienced EHS staff (Environmental Specialist, Social Specialist, ISO 45001 certified or equivalent Health and Safety Specialist, Human Resources Specialist responsible for Labor aspects, Terrestrial and an aquatic biodiversity specialist) who will be present at the construction site during working hours. They will ensure adherence to environmental and social obligations and maintain regular communication with the PMO and other stakeholders.

Regulatory Bodies: National and local government agencies, along with third-party auditors, will provide oversight to ensure that the Project complies with national laws, regulations, and international standards.

The roles and responsibilities within the Project team will be integrated into the broader Project governance structure, ensuring clear lines of authority and accountability. This structure will also facilitate regular coordination between different stakeholders and enable efficient decision-making.

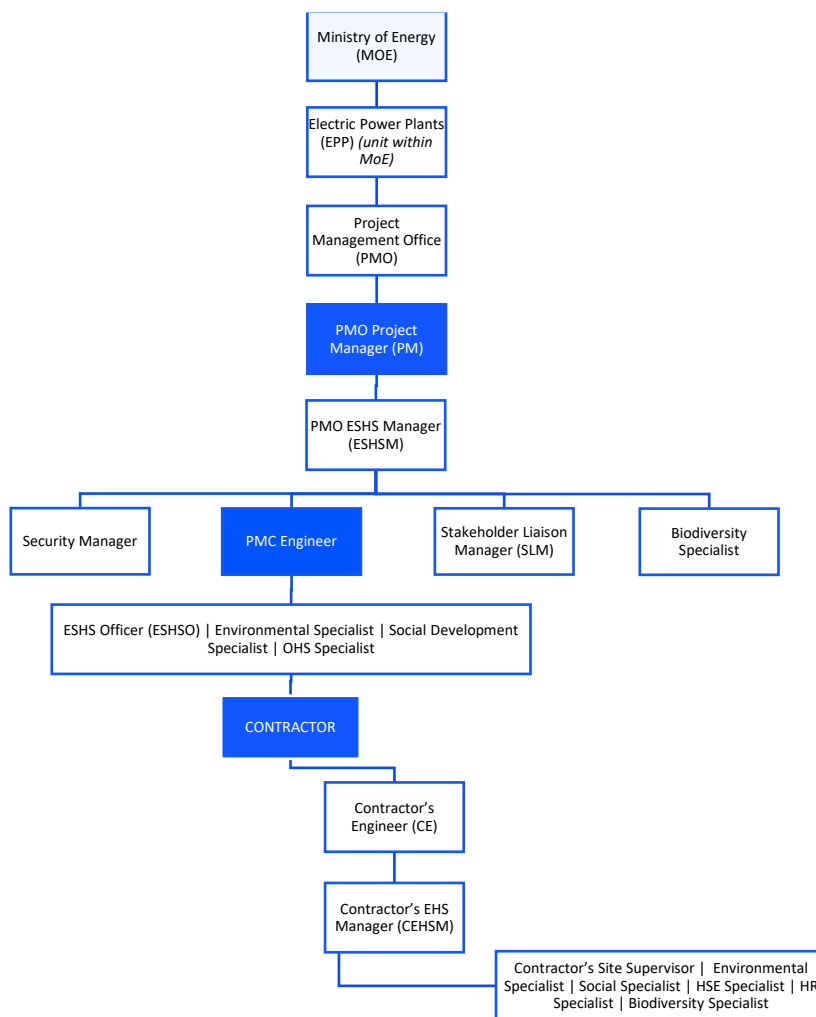


Figure 16-1: Organizational Structure for ESMP Implementation

16.2.2 Project Governance and Oversight Mechanisms

The Project governance structure will include:

PMO Oversight: The PMO will oversee the day-to-day implementation of the ESMP, ensuring that all mitigation measures and monitoring actions are carried out in accordance with the Project’s environmental and social commitments.

Project Management Consultant (PMC): Under a FIDIC-based contract structure, the PMC will act as the Engineer to the Contract, providing independent oversight and ensuring that the contractor’s activities are compliant with the ESMP and contractual obligations.

External Audits: Regular external audits will be conducted to assess the Project's compliance with the ESMP and international standards, particularly the World Bank's Environmental and Social Framework (ESF).

World Bank and Other Financiers: These stakeholders will provide oversight through regular reporting and monitoring of ESMP implementation.

In addition to the PMO and contractors, several **regulatory bodies** play a crucial role in overseeing the Project's adherence to national and international environmental and social standards. These bodies are responsible for ensuring that the Project complies with relevant laws and regulations and that all environmental and social mitigation measures outlined in the ESMP are being properly implemented.

Key regulatory bodies include:

Ministry of Natural Resources, Ecology, and Technical Supervision: This ministry is responsible for overseeing environmental protection, natural resource management, and technical supervision of projects. It will be involved in ensuring that the Project complies with environmental regulations, conducts proper environmental impact assessments, and adheres to sustainable practices throughout the construction and operational phases.

Ministry of Agriculture, Water Resources, and Regional Development: This ministry has oversight over the water resources. It will ensure that the Project follows proper water management protocols, mitigates adverse impacts on local water resources, and complies with laws governing water usage, irrigation, and regional development.

Other Local Government Agencies: Depending on the Project's location, additional local regulatory bodies may be involved. These agencies will monitor the Project's impact on local communities, biodiversity, and other social aspects to ensure that the Project aligns with regional environmental and social goals.

These regulatory bodies will work in close collaboration with the PMO and Project Management Consultant (PMC) to ensure that the Project complies with the World Bank ESF and national legislation. Regular consultations, site inspections, and compliance checks will be carried out by these bodies, and they will provide guidance on any necessary corrective actions.

The regulatory bodies' role in overseeing compliance will help ensure that the Project's implementation does not negatively impact the environment or the surrounding communities, and that the Project contributes to sustainable development goals.

16.2.3 Coordination and Communication

Effective coordination and communication between all stakeholders is essential for the successful implementation of the ESMP. Key mechanisms for coordination include:

Regular Meetings: The PMO will coordinate regular meetings with the contractor, PMC, and other stakeholders to review progress on ESMP implementation, discuss challenges, and identify solutions.

Integrated Project Management Systems: The use of Project management tools and systems will facilitate the sharing of information and ensure that all stakeholders are kept informed of progress and any emerging issues.

16.2.4 Communication Plan (Internal and External)

The communication plan will outline how information is shared internally within the Project team and externally with stakeholders, including the public and local communities. Key components of the communication plan include:

Internal Communication: Clear communication channels will be established within the PMO and between the PMO, contractors, and subcontractors to ensure smooth implementation of the ESMP.

External Communication: The PMO will ensure that stakeholders, including regulatory bodies, local communities, and the general public, are regularly updated on Project progress, potential environmental and social impacts, and mitigation measures.

Stakeholder Engagement: The PMO will ensure that local communities and relevant authorities are involved in decision-making processes and are informed of any significant changes to the Project that may affect them.

16.2.5 Collaboration with Local Communities and Relevant Authorities

Engaging with local communities and collaborating with relevant authorities is a critical component of the Project's success. The PMO will implement the following strategies:

Community Liaison Officers (CLOs): CLOs will be responsible for maintaining regular contact with local communities, ensuring their concerns are addressed, and facilitating effective communication between the project team and stakeholders.

Grievance Mechanism: A robust grievance redressal mechanism will be established to ensure that any concerns raised by local communities are promptly addressed.

Government Engagement: Regular meetings and consultations will be held with local and national authorities to ensure that the Project complies with all legal requirements and that any issues are identified and addressed in a timely manner.

By establishing clear coordination and communication protocols, the Project will ensure that the implementation of the ESMP is transparent, inclusive, and aligned with the interests of all stakeholders.

16.3 Integration with FIDIC PMC Engineer

The PMC Engineer for K1 HPP will be responsible for the tasks and scope of construction supervision, implementation monitoring, as well as project performance monitoring and evaluation.

The PMC Engineer shall be staffed with an Environmental Specialist, Social Development Specialist, Occupational health and safety (OHS) Specialist, and Biodiversity expert, at a minimum, to fulfil the environmental and social roles, and responsibilities including by conducting capacity building training activities/instructions/toolbox talks/ and assisting in developing work plans, monitoring progress reports, conducting E&S inspections and audits at sites.

The PMC Engineer will:

1. Support the establishment and operation of a project-wide Environmental and Social Management System (ESMS) and Occupational Health and Safety System (OHSS).
2. Support land acquisition, livelihood restoration and stakeholder plans, communication management plan and dam safety plans.
3. Undertake additional studies identified during the project preparation that include, inter alia, sediment and water quality tests.
4. Spearhead the finalizing of the drafting of required environmental and social documents such as the site-specific ESMPs, and updating of the LRRF, LMPs, SEP, etc., as needed and ensure that the Contractors will formulate their own corresponding documents as to be stipulated in the civil works contract;
5. Support the tendering process including the ensuring of proper transfer, including update of environmental, social, health and safety requirements of the ESMP and its sub-plans, into the bidding documents and evaluation of the same during selection of Contractors.
6. Confirm the final designs and approvals, including the relevant provisions of the environmental, social, health and safety management plans that the Contractors will draft, seek approval of, and implement.
7. Act as the Engineer for the FIDIC contracts and will be responsible for the Supervision and Administration of Contracts. For that purpose, Monitoring Contractors' Compliance with E&S Plans is an integral function of the PMC. In that capacity, the PMC will also be responsible for the post-construction supervision and performance monitoring
8. Work collaboratively with PMO, MoE, Ministry of Environment, and other related ministries and departments, etc., as needed.
9. Ensure effective implementation of ESMPs and other E&S documents developed for the Project and regular supervision in compliance with the Kyrgyz national legislation and ESF requirements; minimum disruption/damage to the environment and local communities by approval of contractors' work statement/methodology on implementation of the ESMPs, including monitoring the impact of construction works on the environment and local communities and assisting the PMO in preparation of regular progress reports on E&S risk management performance of the Project.

10. Incorporate into the project design the environmental protection/mitigation measures identified in the ESMP for the design/pre- construction stage.
11. Assist the PMO to ensure that all the environmental and social requirements and mitigation measures from the ESMP are incorporated in the civil works bidding documents and contracts as well as in the final detailed designs.
12. Review and approve Contractor's site-specific management plans (C-ESMP);
13. Assist PMO in establishing the Grievance Redress Mechanism as described in the SEP, RAP and summarized in this ESIA/ESMP;
14. Implement all mitigation and monitoring measures for various project phases, specified in the ESMP.
15. Undertake environmental and social management capacity building activities for the PMO and Contractors, as required;
16. Prepare E&S Checklist for ESF assurance inspections of the Contractor's environmental and social performance;
17. Supervise Contractors' compliance with site-specific ESMPs and organize frequent environmental and social site inspections/audits to each project site;
18. Prepare and regularly submit to PMO the Environmental and Social Monitoring Reports to be included into the Project Progress reports for the Project.
19. Participate in regular supervision missions and share Corrective Action Plans supported by photo/video records with PMO and mission teams in response to the mission findings and recommendations.

16.4 Civil Works Contractor

The Contractor will be selected based on procurement guidelines of the World Bank and Government of the Kyrgyz Republic. The Contractor will be expected to be responsible for implementing measures recommended in the ESMP to mitigate the identified environmental and social risks and impacts. Specifically, the Contractor will:

1. Mobilize a full-time Environmental Specialist, Social Development Specialist, Occupational Health and Safety (OHS) Engineer, and other project-specific qualifications, as needed.
2. Prior to starting civil works, prepare, consult on, and submit site-specific Contractor's Environmental and Social Management Plans (C-ESMPs) to the PMC for review and approval. The C-ESMPs shall also be reviewed and approved by the E&S staff of the PMO. The C-ESMPs and other project documents if required (LRRF, LMPs, SEP, etc.) shall be updated if there are any changes in the E&S risks and impacts associated with the changes in the design or scope of works during implementation.
3. Provide sufficient funding and human resources for implementation of the ESMP, including for instrumental measurements as part of the monitoring, provision of full set of seasonal Personal Protective Equipment (PPE) to workers and for other necessary arrangements for proper ESMP implementation. This should include protective visibility clothing, helmets, safety boots, goggles, hearing protection, respiratory protection equipment (filtering masks), gloves, and balaclava; equipment to prevent workers falling from height, etc.
4. Ensure proper and timely implementation of required pre-construction and construction mitigation measures as stipulated in the ESMP.
5. Implement additional environmental and/or social mitigation measures as necessary, consistent with the grievance redress mechanism (GRM) and complying with other measures in the SEP.

16.5 Training and Capacity Development

Effective implementation of the ESMP for the K1 HPP requires a robust training and capacity development program to ensure that all personnel involved in the Project are equipped with the knowledge and skills necessary to fulfill their roles. This training program will be designed to address the specific needs of different

stakeholder groups involved in the Project, including the PMO, contractors, subcontractors, and field workers. The training program will be integrated into the broader ESMP implementation strategy to ensure that environmental and social objectives are met at every stage of the Project.

The overall goal of the training and capacity development program is to ensure that all Project staff understand their roles and responsibilities in implementing the ESMP and are capable of executing them effectively. Training will focus on building capacity in key areas such as environmental and social compliance, health and safety, stakeholder engagement, grievance management, and emergency preparedness.

16.5.1 Training Objectives

The main objectives of the training program are as follows:

To ensure that all personnel are knowledgeable about the environmental and social requirements outlined in the ESMP.

To build technical and managerial capacity at all levels of the Project organization.

To promote a culture of safety, compliance, and accountability across all Project activities.

To ensure that the PMO, contractors, and subcontractors are capable of identifying and addressing environmental and social risks effectively.

To foster a collaborative approach between different teams, including the PMO, contractors, and local communities.

16.5.2 Training Program Design

The training program will be structured to target different layers of Project personnel, from senior management to field workers. The content will be tailored to each group's specific responsibilities and exposure to environmental and social risks.

Key training topics will include:

Environmental Awareness and Compliance: Ensuring that all Project personnel are familiar with the environmental and social impacts of the Project and the necessary mitigation measures.

Health, Safety, and Emergency Procedures: Providing all site workers with the necessary training to minimize occupational risks and respond effectively to emergencies.

Stakeholder Engagement and Grievance Mechanisms: Ensuring that all relevant personnel are equipped to engage with local communities and manage grievances in accordance with the Project's commitments.

Biodiversity Protection and Cultural Heritage: Training for environmental specialists and contractors on the management of protected species and cultural heritage resources.

This training will be delivered through a combination of in-house sessions, toolbox talks, and where necessary, by external specialists or consultants.

Table 16–1 below outlines the indicative training topics and target groups.

Table 16–1: Indicative Training Topics and Target Groups

Topic Area	Target Audience	Delivery Responsibility
Environmental awareness & compliance	PMO & Contractor staff	PMO EHSM / PMC Engineer / Environmental Specialists
Resettlement and Livelihood Restoration	Social team, (Community Liaison Officers) CLOs	Social Development Specialist
Occupational Health & Safety	All site-based workers	OHS Advisor / Safety Contractor
Emergency Preparedness	PMO, contractors, local authorities	ERP Lead
Biodiversity protection	Field ecologists, contractors	Biodiversity Coordinator

Topic Area	Target Audience	Delivery Responsibility
Gender and GBV/SEA/SH prevention	PMO, CLOs, contractors	Gender Specialist / External NGO
Labour rights and grievance mechanisms	Contractor HR teams, workers	HR Contractor / LMP Focal
Construction Workers' CoC & ethics	All workforce	Contractor HR & Safety Officers

16.5.3 Capacity Development Strategy

In addition to the training program, a broader capacity development strategy will be implemented to ensure that the Project team continuously improves its technical, managerial, and operational capabilities. This strategy will involve:

On-the-job training and mentoring: Providing hands-on learning experiences and guidance from senior experts to develop practical skills.

Train-the-trainer programs: Enabling select team members to deliver training sessions, thus ensuring sustainability and continuity of the program.

External certifications: Where necessary, Project personnel will be encouraged to obtain recognized environmental and social certifications to enhance their professional expertise.

16.5.4 Monitoring and Evaluation of Training

The effectiveness of the training program will be monitored and evaluated regularly. This will include:

Tracking training participation through attendance logs and pre/post evaluations.

Assessing training effectiveness through feedback surveys and performance reviews.

Including training progress and outcomes in the monthly compliance reports submitted to the World Bank.

Conducting refresher training on a regular basis to ensure that all personnel are up-to-date with the latest standards, procedures, and regulations.

The PMO will maintain a centralized training log to track training hours, topics, and participation rates across all Project staff. This will provide valuable insights into the program's success and areas for improvement.

16.6 Budget Summary

A consolidated budget for the implementation of the ESMP has been developed to ensure that sufficient resources are allocated for the effective execution of environmental and social mitigation measures throughout the Project lifecycle. The budget summary includes estimates for personnel, monitoring activities, training programs, stakeholder engagement, and third-party verification.

The ESMP budget is divided into three main phases: **pre-construction**, **construction**, and **operation**. These phases align with the key stages of the Project and reflect the varying levels of resource requirements at each stage. **Table 16–2** provides a summary of the key budget components for each phase.

Table 16–2: ESMP Budget Summary

Pre-Construction and Construction Phases			
Item	Average Annual (USD)	Total Over Construction Period (USD)	Assumptions
Personnel Costs	\$1,382,821	\$11,753,982	8.5 year pre-construction & construction

Environmental Monitoring Costs	\$246,934	\$2,098,941	
Additional Sub-Plan Implementation Cost	\$5,546,084	\$38,822,589	Refer to Table 14-12 for a detailed cost estimate of excluded services; additional expenses will be assessed and added after finalizing the design.
Total (Pre-Construction and Construction Phases)	\$7,175,840	\$52,675,513	
Total (Pre-Construction and Construction Phases) including 7% Contingency	\$7,678,149	\$56,362,799	
Operation Phase			
Item	Average Annual (USD)	40 Year Total (USD)	
Personnel Costs	\$872,500	\$34,900,000	
Environmental Monitoring Costs including ongoing consultation	\$61,734	\$2,469,343	The average annual cost is assumed to be 25% of the construction phase monitoring and consultation cost
Additional Sub-Plan Implementation Cost	\$1,580,444	\$63,217,760	The average annual operation cost has been factored down in recognition of the fact that some operational expenses (e.g. monitoring health of new trees planted) will be one-off costs to the Project during the first 1-2 years only. Refer to Table 14-12 for a detailed cost estimate of excluded services; additional expenses will be assessed and added after finalizing the design.
Total (Operation Phase)	\$2,514,678	\$100,587,103	
Total (Operation Phase) including 7% Contingency	\$2,690,705	\$107,628,200	

16.6.1 Pre-construction and Construction Phase

The pre-construction and construction phase will involve significant investments in staffing, training, and environmental monitoring. Key budget components for this phase include:

E&S Personnel: Approx. **USD 8.6 million** (including contingency) for the recruitment and staffing of environmental and social specialists, including environmental engineers, social development specialists, and health and safety experts.

Environmental and Social Monitoring: Costs related to regular monitoring activities, including air quality testing, water quality assessments, biodiversity surveys, and social impact monitoring.

Training and Capacity Building: Resources allocated for the development and delivery of training programs, including external specialists for specialized topics (e.g., biodiversity protection, resettlement procedures).

Stakeholder Engagement: Budget for community consultation activities, grievance management systems, and ongoing dialogue with local stakeholders and communities.

16.6.2 Operational Phase

Once the Project moves into its operational phase, a reduced budget will be required for environmental and social management, but ongoing monitoring and reporting will still be essential. Key components for the operational phase include:

E&S Staff: Approx. **USD 0.9 million (including contingency)** annually for the continued support and staffing of the ESU within the PMO, ensuring the transition to operation is managed smoothly and that monitoring continues.

Monitoring and Reporting: Resources for periodic audits, annual reviews, and continued environmental and social impact assessments.

Training and Refresher Programs: Ongoing training needs, particularly for staff handling post-construction operational risks, emergency procedures, and community relations.

Third-Party Verification: Costs associated with external audits and verification of the ESMP's effectiveness during operation.

16.6.3 Budget Refinement

The figures provided in this budget summary are based on current feasibility-stage information and will require refinement as design and contracting processes advance. The detailed cost breakdowns for each category are provided in **Chapter 14, Section 14.13** of the ESMP, and these figures will be revisited and updated in collaboration with the appointed PMC and contractors to ensure they accurately reflect the evolving needs of the Project.

16.7 Monitoring and Reporting

Effective monitoring and reporting are essential for ensuring that the ESMP is implemented successfully and that the Project remains in compliance with its environmental and social obligations throughout its lifecycle. This section outlines the monitoring and reporting framework that will be followed during the pre-construction, construction, and operational phases of the K1 HPP.

16.7.1 Monitoring Framework

The monitoring framework will be designed to assess the progress and effectiveness of the ESMP's implementation, ensuring that all mitigation and monitoring measures are being carried out as planned. Monitoring activities will focus on:

Environmental and Social Compliance: Ensuring that all activities align with the environmental and social measures outlined in the ESMP and relevant national and international standards.

Performance Tracking: Tracking key performance indicators (KPIs) to assess the effectiveness of mitigation measures in reducing environmental and social impacts.

Corrective Actions: Identifying any areas of non-compliance or insufficient mitigation and ensuring that corrective actions are taken in a timely manner.

The monitoring will be conducted by the PMO's E&S Unit in collaboration with the contractors, the PMC, and external monitoring agencies, where necessary. The monitoring activities will cover a broad range of environmental and social issues, including:

Air and water quality monitoring

Biodiversity and habitat protection

Waste management and disposal

Worker health and safety

Community health and safety

Grievance management and stakeholder engagement

16.7.2 Reporting Framework

A structured reporting framework will be implemented to ensure transparency and accountability in the monitoring process. The PMO will be responsible for preparing and submitting regular progress reports to relevant stakeholders, including the World Bank, local regulatory authorities, and the Project's financiers.

Key reports will include:

Monthly Compliance Reports: These will provide a summary of the Project's compliance with the ESMP, detailing the results of monitoring activities, corrective actions taken, and any incidents or non-compliances. These reports will be submitted to the World Bank and other relevant stakeholders.

Quarterly Internal Audits: The internal audits will assess the progress of ESMP implementation and provide recommendations for improving the management of environmental and social risks. These audits will be carried out by the PMO in collaboration with the PMC Engineer.

Annual External Audits: An independent external audit will be conducted annually to verify the overall compliance with the ESMP and assess the effectiveness of the mitigation measures. These audits will be critical in ensuring long-term compliance, particularly during the operational phase.

16.7.3 Reporting Content

Each report will include, but not be limited to, the following content:

Monitoring Results: Data collected from environmental and social monitoring activities, including laboratory testing, incident reports, and site inspections.

Mitigation Performance: Evaluation of the effectiveness of implemented mitigation measures, including any changes or adjustments made during the Project.

Compliance Status: An assessment of the Project's compliance with local regulations, the ESMP, and World Bank Environmental and Social Framework (ESF) requirements.

Corrective and Preventive Actions: A summary of any corrective actions taken in response to non-compliance or incidents, and the preventive measures implemented to avoid recurrence.

16.7.4 Responsibilities for Monitoring and Reporting

PMO: The PMO will be responsible for coordinating and overseeing all monitoring and reporting activities, ensuring that reports are timely, accurate, and meet the requirements of relevant stakeholders.

PMC Engineer: The PMC Engineer will provide independent oversight and review of the monitoring results, ensuring that the contractor's environmental and social performance is consistent with the ESMP.

Contractors: Contractors will be responsible for conducting day-to-day monitoring of their operations and providing relevant data to the PMO for inclusion in the monthly compliance reports.

16.7.5 Integration of Monitoring into Project Management Systems

The monitoring and reporting processes will be integrated into the broader Project management systems to ensure that environmental and social considerations are consistently tracked and managed. The integration will help streamline data collection, ensure alignment with overall Project goals, and provide visibility to stakeholders on the status of ESMP implementation.

16.8 Conclusion

This chapter has outlined the essential frameworks for the successful implementation of the ESMPs for the K1 HPP. It has provided a detailed breakdown of the necessary arrangements for institutional implementation, capacity development, training, budgeting, and monitoring, ensuring that all stakeholders are aligned and adequately resourced to meet the Project's environmental and social commitments.

Key takeaways from this chapter include:

Institutional Arrangements: Clear roles and responsibilities have been defined for the PMO, contractors, consultants, and regulatory bodies, with a particular focus on the capacity needs of the PMO, which will be addressed through recruitment, external consultants, and collaboration with the PMC Engineer.

Training and Capacity Development: A structured training program has been proposed to build the capacity of all Project personnel, ensuring they are equipped to manage and mitigate environmental and social risks throughout the Project lifecycle.

Budget: A consolidated budget for ESMP implementation has been established, providing the necessary financial resources for staffing, monitoring, training, stakeholder engagement, and third-party verification during all phases of the Project.

Monitoring and Reporting: A comprehensive monitoring and reporting framework has been designed to track the Project's environmental and social performance, ensuring compliance and transparency through regular internal audits, monthly compliance reports, and annual external audits.

The successful implementation of this framework will be critical to the overall success of the K1 HPP, ensuring that environmental and social impacts are effectively mitigated, compliance is maintained, and the Project benefits local communities and stakeholders. As the Project progresses, this chapter will serve as a foundational guide for ongoing efforts to meet the Project's environmental and social commitments and will be updated as necessary to reflect any changes in Project scope or implementation arrangements.

17. Conclusion

The Kambarata-1 Hydropower Project (K1 HPP) is a nationally significant infrastructure investment located on the Naryn River in the Kyrgyz Republic. It involves the construction and operation of a large roller-compacted concrete (RCC) dam, reservoir, and associated facilities designed to increase renewable energy generation, enhance regional energy security, and support sustainable economic development.

This Environmental and Social Impact Assessment (ESIA) was undertaken to evaluate the potential environmental and social risks and impacts associated with the Project in accordance with Kyrgyz national legislation and the World Bank's Environmental and Social Framework (ESF). The ESIA covers all key components of the Project, including the main dam and reservoir, access roads, transmission lines, construction camps, quarries, spoil disposal areas, and other associated facilities.

The scope of the ESIA includes baseline studies, impact assessments, risk evaluations, mitigation planning, and the development of a comprehensive Environmental and Social Management Plan (ESMP). It also incorporates thematic subplans addressing biodiversity, cultural heritage, resettlement and livelihood restoration, stakeholder engagement, labor management, and occupational and community health and safety. Cumulative impacts and climate risks have also been assessed in line with international good practice.

17.1 Key Environmental and Social Findings

The ESIA identified a range of significant environmental and social impacts associated with the construction and operation of the K1HPP. These impacts affect both the biophysical environment and local communities across the Project footprint and its area of influence. Key findings include:

Environmental Impacts:

Creation of a large reservoir will lead to permanent inundation of terrestrial and riverine habitats, with associated biodiversity losses, including impacts on some Red List species.

Sediment trapping behind the dam will reduce downstream sediment transport, potentially affecting river morphology and ecosystems.

Increased erosion and landscape disturbance during construction, particularly at quarry sites, access roads, and spoil disposal areas, will require active restoration and erosion control.

Potential changes to the local microclimate may occur as a result of the reservoir's heat storage capacity and increased humidity levels.

Social Impacts:

Physical and economic displacement due to inundation of homes, agricultural land, and community assets will affect several villages and seasonal users of pasture and forest resources.

Labor influx during construction is expected to place pressure on local services, increase the risk of social tensions, and exacerbate gender-based violence and health and safety risks.

Cultural heritage sites, including burial mounds, petroglyphs, and traditional structures, are present in the Project area and will be affected by construction and inundation.

Long-term risks to community health and safety include traffic accidents, waste generation, and pollution from construction camps and equipment.

The Project is expected to bring economic opportunities during construction, but also a sharp drop in local employment post-construction, which may lead to economic strain if not planned for.

Cumulative Impacts:

The CIA identified that while most Project-level impacts can be mitigated, residual risks remain in relation to cumulative sediment trapping, biodiversity fragmentation, and downstream flow regime changes. These risks stem not just from Kambarata-1, but from the clustering of multiple infrastructure developments in the basin.

Where impacts are unavoidable or cannot be fully mitigated, these have been identified as **Unavoidable Significant Adverse Impacts (USAIs)** and will require targeted compensation and long-term monitoring.

17.2 Overview of Mitigation and Enhancement Measures

The Environmental and Social Management Plan (ESMP) outlines a comprehensive set of mitigation, management, and enhancement measures designed to avoid, reduce, or offset the adverse impacts identified through the ESIA process. These measures are aligned with World Bank Environmental and Social Standards (ESS) and reflect international good practice.

Key mitigation and enhancement strategies include:

Environmental Mitigation:

- Implementation of a **Catchment Management Plan** to reduce erosion and sedimentation through afforestation, slope stabilization, and drainage improvements.
- Design and enforcement of a robust **Biodiversity Action Plan (BAP)** to address habitat loss, protect critical species, and implement restoration and offset measures.
- A **Site Restoration Plan** ensures proper closure and rehabilitation of quarries, camps, and spoil sites through topsoil management, replanting, and safety measures.
- Air quality, noise, and wastewater discharge will be managed through a combination of engineering controls, routine monitoring, and adherence to national and international standards, as outlined in the **Air Quality Management Plan, Noise and Vibration Management Plan, and Wastewater Management Plan** respectively.

Social Risk Management:

- A **Livelihood Restoration and Resettlement Framework (LRRF)** has been developed to guide the preparation of site-specific Livelihood Restoration and Resettlement Plans (LRRPs) and support income restoration, with special focus on vulnerable groups.
- **Labor Management Plan (LMP)**, including measures to prevent SEA/SH and promote worker welfare, are included in the ESMP and will be further detailed in CESMPs.
- A **Stakeholder Engagement Plan (SEP)** and operational-level **Grievance Redress Mechanism (GRM)** will support continuous community dialogue and conflict resolution.
- Specific subplans such as the **Community Health, Safety and Security Plan**, and **Gender Action Plan**, will address labor influx risks and ensure the safety and inclusion of affected populations.
- Cultural heritage safeguards, including a **Cultural Heritage Management Plan** and **Chance Find Procedure**, have been integrated to protect tangible and intangible assets.

The ESMP defines roles, responsibilities, timelines, and monitoring requirements, and provides estimated budgets to guide implementation. Mitigation responsibilities are distributed across the PMO, contractors, and the FIDIC PMC Engineer, with oversight mechanisms embedded in institutional arrangements.

17.3 Implementation Arrangements and Responsibilities

The successful implementation of the ESMP will rely on clearly defined roles, institutional coordination, and dedicated resources throughout all phases of the Project. The following structure outlines the core responsibilities across key entities:

Project Management Organization (PMO): The PMO will lead ESMP oversight, compliance monitoring, and coordination between stakeholders. It will house a full-time Environmental and Social (E&S) Unit, including specialists in biodiversity, OHS, stakeholder engagement, gender, and resettlement. The PMO

will ensure that all contractors and consultants adhere to the ESMP, and that periodic reporting to government and financiers is timely and complete.

FIDIC PMC Engineer: Acting as the Engineer under FIDIC provisions, the PMC will supervise the day-to-day implementation of the ESMP at construction sites. The PMC's ESHS team will verify the adequacy of the Contractor's Construction Environmental and Social Management Plans (CESMPs), monitor field performance, and escalate non-compliance. It will also play a key role in site inspections, audits, and validation of mitigation measures.

Contractors: Engineering Procurement and Construction (EPC) Contractors will be responsible for implementing ESMP mitigation measures on the ground through Contractor ESMPs (CESMPs) aligned with the ESIA and national regulations. They must appoint qualified ESHS staff, carry out pre-construction surveys, ensure safe working conditions, maintain environmental controls, and submit regular monitoring reports.

Government and Regulatory Authorities: Ministries such as the Ministry of Environment (MoE), Ministry of Labor and Social Protection, and other sectoral regulators will exercise oversight through permitting, inspections, and compliance reviews. Coordination with local authorities will be essential for land acquisition, grievance resolution, and community interface.

Communities and Civil Society: Local communities, including affected persons and representative organizations, will participate in monitoring, grievance resolution, and consultation processes. Their feedback will be integrated into Project planning through mechanisms defined in the SEP and GRM.

Coordination with riparian state institutions: The CIA underscores the importance of inter-agency coordination, particularly in managing downstream sediment flow and transboundary water sharing—issues that fall outside the remit of any one project entity

Implementation will be phased to align with the construction schedule, with special attention given to early mobilisation of E&S teams, site-specific risk assessments, and pre-clearance planning. Integration with the broader Project procurement, supervision, and reporting systems will help ensure accountability and traceability across all ESMP activities.

17.4 Monitoring and Adaptive Management

Robust environmental and social monitoring is essential to ensure that mitigation measures outlined in the ESMP are effectively implemented and adjusted as needed. The monitoring framework for the K1 HPP has been designed to capture both compliance with regulatory requirements and the performance of mitigation strategies over time.

Monitoring Objectives:

- Verify implementation of ESMP commitments and contractor CESMPs,
- Track environmental and social indicators linked to key VECs (e.g. air quality, biodiversity, livelihoods, safety)
- Identify unforeseen impacts or risks that require corrective action
- Provide early warning signals to avoid threshold exceedances
- Inform adaptive management decisions through periodic data review

Key Features of the Monitoring Program:

Parameters and Frequency: Monitoring will cover physical, biological, and social parameters (e.g. PM2.5, BOD, vegetation loss, GBV incidents) at specified intervals, as outlined in each ESMP sub-plan.

Roles and Responsibilities: Primary monitoring responsibility rests with the EPC Contractors during construction, under PMC supervision. Independent experts will be engaged for periodic audits, particularly for biodiversity, heritage, and site restoration components.

Data Management and Reporting: Monitoring data will be consolidated by the PMO's E&S Unit, verified by the PMC, and reported quarterly to regulatory bodies and financiers. The data will also be used to update the Environmental and Social Management Information System (ESMIS).

Adaptive Management: Monitoring results will feed into a structured feedback loop. Where non-compliance or unexpected impacts are identified, the PMO will require corrective measures and revise mitigation

strategies as needed. Sub-plans may be updated during implementation based on new information or changing site conditions.

Community Involvement: Local communities and Civil Society Organizations (CSOs) will participate in select aspects of monitoring, such as grievance tracking, social safeguards validation, and biodiversity surveillance, in accordance with the Stakeholder Engagement Plan.

Together, these measures are designed to ensure that environmental and social commitments remain relevant, effective, and responsive across the lifecycle of the Project.

17.5 Residual Impacts and Risk Disclosure

Despite comprehensive planning, mitigation, and management efforts, certain environmental and social risks and impacts associated with the K1 HPP cannot be fully avoided. These residual impacts have been identified through the ESIA and disclosed transparently to ensure that decision-makers, affected communities, and stakeholders are fully informed of the Project's long-term footprint.

Key Residual Impacts Identified are as follows:

Land Use Change and Involuntary Resettlement: Permanent inundation and acquisition of land will result in loss of pastures impacting multiple households. While livelihood restoration measures are planned, full restoration of pre-Project conditions cannot be guaranteed for all affected persons.

Ecological Impacts: Altered flow regimes, habitat fragmentation, and barrier effects for aquatic species will continue to exert long-term pressure on biodiversity, fish passage systems, and conservation offsets.

Cultural Landscape and Visual Character: Permanent transformation of the Naryn River Valley's landscape and the submergence of areas with archaeological or cultural value will result in irreversible loss of heritage and landscape continuity, even with documentation and preservation efforts.

Community Health and Safety Risks: Worker influx and heavy vehicle movement will increase risks related to road safety, communicable diseases, and gender-based violence. Residual risks remain, particularly in remote or underserved areas, despite prevention and awareness programs.

Unresolved Project Elements: As noted in **Section 15.4**, key design features—such as the final location of the workers' camp, full details of the cement and fly ash supply chain, and dam break risk modelling—have yet to be finalized. These carry associated uncertainties that will need to be addressed during implementation.

Cumulative Impacts: Residual risks related to basin-scale sediment transport disruption, aquatic biodiversity loss, and climate-sensitive flow regimes are cumulative in nature and were specifically flagged in the CIA.

Disclosure and Management Approach:

The ESIA adopts a precautionary approach, disclosing these residual risks openly and proposing monitoring mechanisms and adaptive management strategies. The Environmental and Social Commitment Plan (ESCP) and lender supervision missions will provide oversight to ensure residual risks are managed throughout Project implementation.

This section serves as a formal disclosure of unavoidable and uncertain impacts, emphasizing the proponent's commitment to transparency, accountability, and continuous improvement in environmental and social performance.

17.6 Conclusion and Recommendations

The K1 HPP represents a nationally strategic investment in the Republic of Kyrgyzstan's energy future, with the potential to improve regional energy security, increase renewable electricity generation, and support economic growth. This ESIA has evaluated the Project's anticipated impacts across biophysical, socio-economic, cultural, and institutional dimensions, applying international best practices and the WB's ESF.

The assessment finds that while many impacts can be effectively mitigated through the ESMP and associated frameworks, several residual and irreversible impacts remain—particularly in relation to land acquisition, biodiversity, cultural heritage, and long-term changes to landscape and hydrological regimes. These have been disclosed transparently, and mitigation actions have been proposed to the extent feasible.

Key Recommendations:

Finalize Unresolved Design Elements: Outstanding aspects such as the location of workers' camps, supply chain sources and routes, and dam break risk assessments must be addressed early in Project implementation, with supplemental impact assessments and mitigation plans developed as necessary.

Strengthen Institutional Capacity: Continued investment in the staffing, training, and coordination capacity of implementing agencies—particularly within the PMO, regulatory bodies, and contractors—is essential to ensure the ESMP is implemented to required standards.

Enhance Monitoring and Feedback Loops: A robust environmental and social monitoring system, supported by real-time data collection and adaptive management, should be established to detect emerging risks and facilitate timely corrective action.

Prioritize Community Engagement and Grievance Redress: Ongoing, inclusive stakeholder engagement and a well-functioning grievance redress mechanism will be critical to maintaining community support and responding to concerns during all phases of the Project.

Ensure Accountability through Oversight and Disclosure: Regular audits, reporting to lenders, and public disclosure of performance results should be maintained to uphold transparency and drive continuous improvement.

In conclusion, the Project is considered environmentally and socially feasible, provided that the recommended mitigation measures are implemented effectively and in good faith, and that institutional arrangements are supported through adequate resources and oversight mechanisms. This ESIA provides a foundation for informed decision-making and responsible Project implementation.

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