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Burundi – DRC - Rwanda

Ruzizi III Hydroelectric Power Project

Environmental & Social Impact Assessment

Vol. I: ESIA Summary

Prepared for

REL
Ruzizi III Energy Limited

Draft version (Version F)

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Making Sustainability Happen

Contents

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Abbreviations and Acronyms

Acronym	Full text
ABAKIR	Lake Kivu and Ruzizi River Basin Authority
AFD	*Agence Française de Développement* (French Agency for Development)
AfDB	African Development Bank
BAP	Biodiversity Action Pla,
BII	British Investment International
BOOT	Build, Own, Operate, Transfer
CESMP	Construction Environmental and Social Management Plan
CIA	Cumulative Impact Assessment
DRC	Democratic Republic of Congo
E&S	Environmental and Social
EGL	Energie des Grands Lacs (Energy of the Great Lakes)
EHS	Environment, Health and safety
EIB	European Investment Bank
EPC	Engineering, Procurement and Construction
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESMS	Environmental and Social Management System
ESS	Environmental and Social Standard
EU	European Union
GBV	Gender-based Violence
GHG	Greenhouse Gas
HEPP	Hydro Electric Power Project
HIV	Human Immunodeficiency Viruses
HMP	Historically Marginalized People
HMPDP	Historically Marginalized People Development Plan
ICOLD	International Commission on Large Dams
IFC	International Finance Corporation
IFI	International Financial Institution
IHA	International Hydropower Association
IPP	Independent Power Project
IPS K	Industrial Promotion Services Kenya Ltd
IUCN	International Union for the Conservation of Nature
JIU	Joint Implementation Unit
KfW	*Kreditanstalt für Wiederaufbau* (German Development Bank)
LADP	Local Area Development Plan
NGO	Non-Governmental Organisation
PAP	Project Affected People
PPA	Power Purchase Agreement
PPP	Public-Private Partnership
RAP	Resettlement Action Plan
REL	Ruzizi III Energy Limited
SEA	Sexual Exploit
SINELAC	*Société Internationale d'Électricité des Pays des Grands Lacs*
STD	Sexually Transmitted Diseases
VEC	Valued Environmental Component
VU	Vulnerable IUCN status
WHO	World Health Organization

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Units

Unit	Full text
km^2	Square kilometre
W/m^2	Watts per square metre
gCO_2e/kWh	Grams of equivalent carbon dioxide per kilowatt hour
%	Percent
t/km^2	Tonnes per square kilometre
GWh	Gigawatt hour
MW	Megawatt
m^3/s	Cubic metres per second

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1 Introduction

This document is the summary of the Environmental and Social Impact Assessment (ESIA) for the Proposed 206 MW Ruzizi III Hydroelectric Power Project (HEPP) and 7-km-long 220 kV transmission line (the Project). The Project is developed by Ruzizi III Energy limited (REL). The summary presents the policy, legal and administrative framework, a description of the Project including its justification and alternative analysis. It discusses the environmental and social baseline situation as well as the potential and residual impacts. A summary of proposed mitigation measures, monitoring programme, Environmental and Social Management Plan, public consultations, Greenhouse Gas (GHG) emissions and climate resilience is presented. A more detailed discussion of these issues is provided in the main ESIA report.

2 Policy, Legal & Administrative Framework

2.1 National Frameworks

The main legislation relating to ESIAs in Rwanda, DRC and Burundi and applicable to the Project are:

- Rwanda: The Organic Law (2005) and Environmental Law (2018) defines the procedures for the protection, conservation, and promotion of the environment and lays down the rules for environmental assessment. A Ministerial Order dated 2019 sets out the ESIA procedure.
- DRC: The Law on the fundamental principles of environmental protection (2011) defines the principles and tools for environmental management to be applied in the DRC. Several Ministerial Order (2006) and Decree (2013, 2014) set out the principle of environmental assessment and associated ESIA procedures. Other main texts applicable to the project include the Water Code (2015) and the Forestry Code (2002).
- Burundi: The Environmental Law n° 1/09/25 of May 2021 (2000) lays down the fundamental rules for managing the environment and protecting. Other main texts applicable to the project include the Water Code (2012), the Forestry Code (2016) and the Law on the creation and management of protected areas (2011).
- All three countries are also a signatory of numerous International Conventions on the environment including the Convention on Biological Diversity, the Ramsar Convention on Wetlands, the Convention on International Trade in Endangered Species of Wild Fauna and Flora and The Kyoto Protocol on climate change among others.

The Project will not require physical or economic resettlement in Burundi. However, this will be required in DRC and Burundi. The key legal texts regarding expropriation in DRC and Rwanda are as follows.

- DRC: The procedure for expropriation for reasons of public utility is described in Law n° 73-021 of 20 July 1973 and in Law n° 77-001 of 22 February 1977. It is noteworthy that the procedure starts with a decision pronouncing the public utility of the project and ordering the expropriation.
- Rwanda: The Organic Law no. 08/2005 of 14/07/2005 sets out that the state has the right to own and use land for public interest and to expropriate, if necessary. Procedures for expropriation for reasons of public interest are set out in Law n°. 32/2015 of 11 June 2015.

2.2 International Framework

Several International Financing Institutions are considering providing financial support for the Project and comprise the African Development Bank (AfDB), the French Agency for Development (AFD), British International Investment (BII), the European Investment Bank (EIB), the European Union (EU), the German Development Bank (KfW) and the World Bank. The AFD, KfW and BII have adopted the International Finance Corporation (IFC) environmental and social (E&S) policies.

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The Project has been categorized as Category A underpotential Lender policy requirements, and as such, a comprehensive ESIA, Resettlement Action Plan (RAP) and an Environmental and Social Management Plan (ESMP) have been prepared in alignment with the following standards:

AfDB	• Integrated Safeguards System - Policy Statement and Operational Safeguards (2013).
EIB	• Environmental and Social Sustainability Framework (2022).
IFC	• Environmental and Social Performance Standards (2012). • General Environment, Health and Safety Guidelines (2007). • Good Practice Note regarding Environmental, Health, and Safety Approaches for Hydropower Projects (2018).
World Bank	• Environmental and Social Framework (2016) • Good Practice Handbook for Environmental Flows for Hydropower Projects (2018). • Environmental, Health and Safety Guidelines for Electric Power Transmission and Distribution • Environmental, Health and Safety Guidelines for Construction Material Extraction

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3 Project Description and Justification

3.1 Project Location

The Project is situated on the 168-km-long Ruzizi River which flows from Lake Kivu to Lake Tanganyika. At the Project location the river forms part of the border between Rwanda and DRC and the administrative limit between the Rusizi District of the Western Province of Rwanda and the Walungu Territory of the South Kivu Province of DRC (See Figure 1).

The Project dam site is situated 31 km from the Lake Kivu outflow, 16 km downstream from the existing 29.8 MW Ruzizi-I, and 12 km downstream from the existing 36 MW Ruzizi-II hydroelectric schemes, which started operation in 1959 and 1989, respectively. The Project powerhouse is situated 131 km upstream from Lake Tanganyika.

3.2 Project Justification

The Project will generate clean and renewable power, reducing the region's reliance on expensive thermal generation. It will also reduce the local communities' dependence on wood fuel and charcoal which represents a major threat to the countries' forests and biodiversity. Availability of the renewable power will support efforts to extend electrification to the region. It would be making available 206 MW of renewable power capacity in a region that has a total of just 284 MW installed capacity (including 75 MW diesel or Heavy Fuel Oil) serving a total population of 37 million people, 54% of whom are living under the poverty line and 17% of whom have access to electricity. Once commissioned, the Project will almost double Burundi's current capacity, increase Rwanda's installed capacity by nearly 30% and provide much needed baseload power in Eastern DRC, a region that is otherwise isolated from DRC's interconnected grid. The Project will be constructed and owned as a public-private partnership (PPP) among the Republic of Burundi, DRC, and the Republic of Rwanda (together as the Contracting States) and the Project Sponsors (Industrial Promotion Services Kenya Ltd (IPS K), SN Power BV). It is an Independent Power Project (IPP) based on a Build, Own, Operate, Transfer ("BOOT") structure and underpinned by a 25-year concession agreement and Power Purchase Agreements (PPAs).

3.3 Key Project Components

The Project's dam is a 51-m-high rockfill embankment dam creating a small 46-ha reservoir and inundating areas of agricultural land in both Rwanda and DRC. However, no dwellings or structures are impacted by the dam construction and reservoir impoundment.

Project components to be situated on the left bank (Rwanda) are as follows:

- Spillway, designed for 10,000-year return period flood (985 m^3/s) and checked for the Probable Maximum Flood which has a 100,000-year return period (1,420 m^3/s).
- Bottom outlet with a capacity of 200 m^3/s.
- Two river diversion tunnels (used during construction, one of which is reused as the bottom outlet tunnel during operation).
- Power waterway components: water intake, 3.8 km headrace tunnel, penstock and an aboveground powerhouse.
- Permanent accommodation facilities with capacity for 100 employees.
- Access roads comprising completion of the existing road between the township of Bugarama and existing bridge upstream of the powerhouse site, new road from the bridge to the dam site following the left bank of river.
- Temporary infrastructure for construction purposes including quarries, borrow area, river diversion, worker accommodation facilities.

Project components to be situated on the right bank (DRC) are as follows:

- 220 kV switchyard (on the opposite side of the river to the powerhouse).
- 220 kV transmission line (7 km in length) from the 220 kV switchyard to the Kamanyola substation.
- 30 kV power line from the 220 kV switchyard to the dam site, following the dam access road.
- Permanent access roads and bridges comprising a dam access road following the right bank of the river from the outskirts of Kamanyola, and completion of the existing bridge upstream from the powerhouse site. The construction workers' accommodation camp adjacent to the 220 kV switchyard in DRC will continue to be used during operation as REL's DRC offices.
- Temporary infrastructure for construction purposes, including a bridge at the dam site and storage areas near the river between the dam site and the 220 kV switchyard.

There are no permanent Project components located in Burundi. Some of the Project's quarries and borrow areas may be located in Burundi, and potential sites have been identified by REL. However, the final choice of the location of quarries and borrow area will be made by the EPC Contractors, subject to approved by REL. Consequently, in view of the uncertainties with regard to the location of quarries and borrow areas, they are not included in the scope of this ESIA (see Section 3.4). Separate ESIA and RAP studies will be conducted for the quarries and borrow areas by REL once more information on locations is available.

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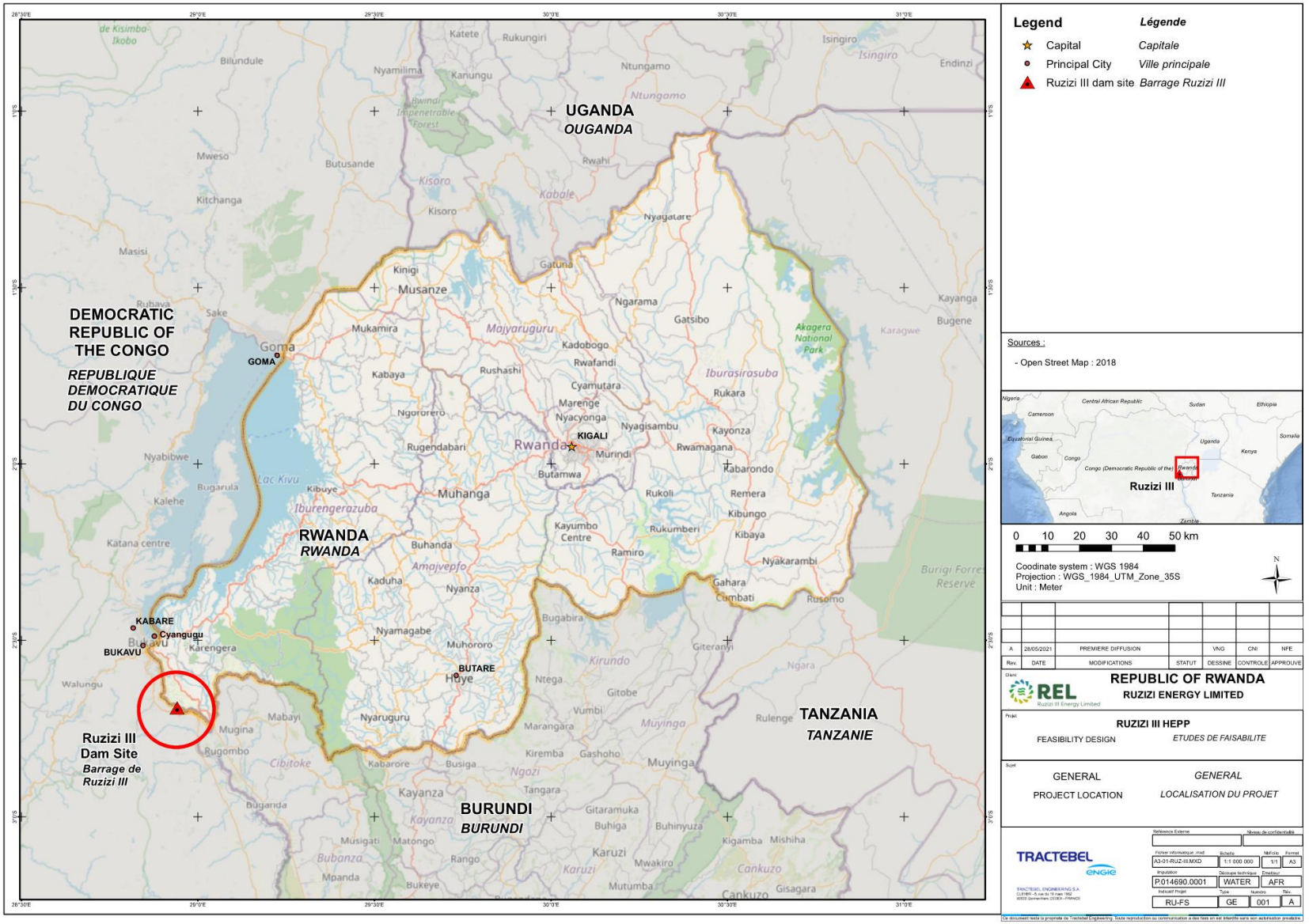

Figure 1 - Project Situation Map

3.4 Facilities & Activities Included in the ESIA Scope

The Project facilities and activities that are included in the scope of the ESIA comprise the following:

- Construction and operation of the power production facilities comprising the dam, headrace tunnel, power waterways, powerhouse, 7-km-long 220 kV transmission line, access roads, and operators' village.
- Facilities required for construction including worksite and construction camp and worker accommodation camp.
- Reservoir impoundment.
- Impacts from operation of the facilities, including impacts from the creation of a 5.5-km-long bypassed reach of the Ruzizi River and downstream impacts from hydrological changes to the Ruzizi River caused by the Project.

Project facilities and activities that are not included in the scope of this ESIA comprise quarries and borrow areas developed for the construction phase and Associated Facilities.

- Quarries and borrow areas are not included in the scope of the ESIA because the sitting will be defined at a later stage. Chapter 4 - project description provides the locations of potential sites for quarries and borrow areas that have been identified by REL. However, it will be the EPC Contract that selects site locations, and they may correspond to sites identified by REL or alternative sites. Vol. IV - ESMP includes the process for REL's review and approval of the sites proposed by the EPC Contractor so that there is avoidance or minimisation of E&S impacts. REL will engage an ESIA consultant to conduct the E&S impacts for the establishment and exploitation of the quarries and borrow areas and any necessary access roads. The ESIA and RAP will meet international standards and demonstrate alignment with lenders' E&S policies.
- Associated facilities are not included in the scope of this ESIA. The ESIAs and RAPs for the Kamanyola substation and transmission lines that transport electricity produced by the Project to Rwanda, DRC and Burundi are prepared by the developers of the these projects. However, the projects to develop associated facilities are also receiving support from IFIs (AfDB, KfW, EIB) and as a consequence the ESIAs and RAPs shall also be prepared in in alignment with lenders' E&S policies.

3.5 Project Progress and Implementation Schedule

The Project has completed a Feasibility Study, and the detailed design and construction will be managed by an EPC Contractor in the next stage of the Project. Site preparation works are planned to start Q2 2026, and reservoir filling is anticipated in Q2 2030. Power production is planned to commence in end of Q4 2030. The construction works are expected to require an estimated workforce of 500-1,000 workers during the period of peak activities. On completion of the Project construction, the operation of the scheme will be handed over to an operating company that will be created or nominated at a later stage.

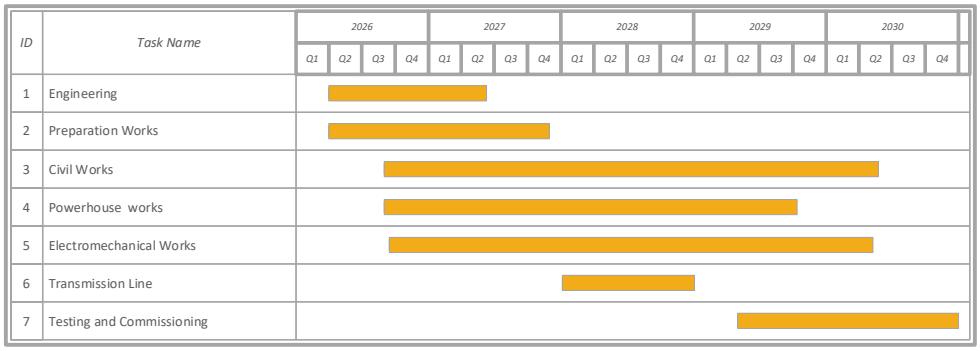

Figure 2 - Project Implementation Schedule

3.6 Operation in Coordination with Existing Ruzizi-I and -II HEPPs

The Project will operate in a coordinated manner with the existing Ruzizi-I and -II hydroelectric schemes upstream which both operate with periods of peak and off-peak flows. The Project's peak flows (150 m^3/s) are identical to the peak flows from Ruzizi-I and -II. However, it is noteworthy that the storage capacity (and capacity to operate with peak flows) of the Ruzizi-I and -II reservoirs have been significantly reduced because of accumulation of sediments. At the time of writing dredging operations are underway to remove accumulated sediment from the Ruzizi II reservoir and if sufficient sediment is removed, it may be possible that sediment flushing is undertaken in the future to improve the storage capacity of the reservoir.

Ruzizi-III operation has been designed to align with the operating modes of Ruzizi-II. If the current dredging operations at Ruzizi-II are ineffective and the available storage volume continues to decrease in the coming years, the reduced storage volume will result in shorter time intervals with peak flows and longer intervals with off peak flows (i.e. tending towards a run-of-river mode of operation). However, this will not affect the Ruzizi-III power production capacity because of overall volume of water released downstream from Ruzizi-II during the Ruzizi-III reservoir filling time interval will be unchanged. Likewise, if the Ruzizi-II sediment dredging is effective, the reservoir storage capacity will increase, and this will enable longer periods of peak flows. Nevertheless, this will not affect Ruzizi-III power production because the Ruzizi-III reservoir has a much larger volume than that of Ruzizi-II.

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3.7 Associated Facilities

The Project's Associated Facilities comprise the proposed Kamanyola 220 kV substation and the transmission lines that transport electricity from the substation to tie-in point on the existing national power distribution networks in Burundi, DRC and Rwanda. These facilities are required as part of regional inter-connection projects and are developed with financial assistance from EIB, KfW and AfDB, who have similar E&S requirements to the World Bank. The Associated Facilities will need to comply with the same Environmental, Social, Health and Safety requirements as the Ruzizi-III Project.

The Project's 220 kV Transmission Line (not an associated facility) will transport electrical power generated by the Project to the proposed Kamanyola 220 kV substation, which will be developed, financed, constructed, owned, ensured, operated and maintained by the Contracting States with financial support from KfW and which will be operated by SINELAC. A Feasibility Study, ESIA and RAP in alignment with international standards has been prepared with funds from the KfW. However, it is planned that these studies be updated to reflect recent developments in the Ruzizi III Project. With regard to the ESIA, an updated version of the ESIA/RAP Terms of Reference has been approved by lenders and the ESIA/RAP is expected to be available Q3 2025. The Kamanyola substation will act as the dispatching centre, and SINELAC will coordinate the equal sharing of the electrical power with Burundi, DRC and Rwanda.

The following Transmission Lines will be connected to the Kamanyola substation:

- Kamanyla – Bujumbura (Burundi) 220 kV line (77 km). The project is developed with financial support from AfDB and KfW. Feasibility studies, ESIA and RAP have been prepared and project affected people have been compensated. The start of construction works is programmed for Q2 2022 and completion scheduled for Q4 2024.
- Kamanyola – Buhandahanda (DRC) 220 kV line (68.5). The Projec is developed by EGL with financial support from the EIB and KfW. The Terms of Refence for the updated ESIA/RAP have been approved by KfW and the ESIA/RAP is expected to be available Q3 2024.
- Kamanyola – Kibuye (Rwanda) 220 kV line (82 km). The project is developed by Rwanda Energy Group (REG) with financial support from the EIB. A pre-feasibility study and ESIA were prepared in 2014. The feasibility study and ESIA will be updated and a RAP prepared.
- Kamanyola – Kiliba and Uvira (DRC) 220 kV line (~80 km)

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4 Description of the Project Environment

4.1 General Setting

The Project's dam site is situated on the Ruzizi River, 31 km downstream from the Lake Kivu outflow. The hydrology of Lake Kivu directly determines the supply of the Ruzizi River at its outflow. The Lake Kivu basin has a population of 2 million people – mainly in the cities of Goma and Bukavu - many of whom are living in poverty. The lake's water quality and the water quality of the Ruzizi River is degraded by bacteriological and chemical contamination caused by the generalised lack of collective sanitation infrastructure and solid waste collection in the Lake Kivu basin.

The Ruzizi-I and -II hydropower schemes are situated upstream from the Project's dam site, situated 3 km and 19 km from the Lake Kivu outflow respectively and Ruzizi-III is situated 12 km downstream from Ruzizi-II. Ruzizi-I and -II started operation in 1959 and 1989 respectively and both operate with hydropeaking with peak flows of 150 m^3/s, as will the Project. The hydropeaking has resulted in significant degrading of the aquatic biodiversity of the river.

The dam and reservoir are situated in a deep, steep sided valley. Between Ruzizi-II and -III dam sites there are a total of 22 areas (on both sides of the river) where slopes are subject to landslides which contribute to the sediment load in the Ruzizi River.

Currently, there are no roads to access the project dam site. There are no dwellings or structures in the valley in or near the footprint of the proposed dam and reservoir. The land is used predominantly for agriculture and land cover comprises a mosaic of agricultural land/modified natural habitat, steep rocky outcrops and riverine habitat at the edge of the riverbanks. All land that can be cultivated is being cultivated – even very steep land – and the only land that is not cultivated is that which is too steep and rocky. The site for the powerhouse is situated 5.5 km downstream from the dam where the valley sides are less steep and the valley bottom wider. The powerhouse site can be accessed by road on the left bank following the river from Bugarama, Rwanda. The predominant land use in the powerhouse area is agriculture, and there are almost no areas of natural vegetation.

The site of the 220 kV switchyard in DRC is situated close to a village where surrounding land is used predominantly agricultural land. The 220 kV Transmission Line crosses land that is also predominantly used for agriculture with almost no area of natural vegetation.

The Ruzizi River downstream from the Project flows to Bugarama, Rwanda and then crosses the Ruzizi plain and flows into Lake Tanganyika 131 km downstream from the Project powerhouse. Land use in the plain is predominantly cattle grazing and agriculture and there are several large irrigation projects planned – which divert water from the Ruzizi's tributaries. The Ruzizi delta area at the outflow into Lake Tanganyika is a RAMSAR site.

Ruzizi gorge and future by-passed reach of the Ruzizi River (view from left bank)

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Ruzizi floodplain (view from left bank of the Ruzizi downstream from Bugarama)

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4.2 Physical Environment

Climate: There is a long dry season occurring June–August, a long-wet season February-May/June, and a short-wet season September-December. Average annual rainfall in the Lake Kivu and Ruzizi River basin is 1,279 mm (1991-2019), with 1,600-1,700 mm in the Lake Kivu area, and 850-900 mm in the south. Temperature is relatively constant with an average monthly temperature of 21°C.

Geology, Tectonics and seismicity: The Project is situated in the West African Great Rift in geological substratum consisting of highly metamorphosed sedimentary rocks. It is on the western branch of the East Africa Rift System, which is seismically active. Nine earthquakes equal or higher than 6.0 on the Moment Magnitude Scale have been recorded within 300 km of the Project site.

Groundwater: The largest aquifer in the Project area is the alluvial aquifer of the Ruzizi plain which extends over the whole of the Ruzizi alluvial plain and at the level of the low valleys of its tributaries. The thickness of this aquifer can reach 50 to more than 150 m in the Ruzizi plain, and 10 to 30 m in the alluvial deposits of the lower inland valleys.

Hydrology: The Ruzizi River is 168 km long and the first 40 km flows through a steep confined gorge surrounded by steep mountain slopes, where the dam will be constructed. Downstream from the Project's powerhouse, the valley opens up, the gradient lowers, and the river flows across the broad sedimentary Ruzizi Plain before flowing into Lake Tanganyika. The average annual flow of the river at the Project dam site is 110 m^3/s and 206 m^3/s at the outflow into Lake Tanganyika. The flow rate of the river is determined by the water level of Lake Kivu, but because the Project is situated downstream of Ruzizi-I and -II hydroelectric schemes which operate with a hydropeaking mode of operation, the hydrology at the Ruzizi III dam site and downstream has been altered for the last 50 years.

Sediment: Overall, the Lake Kivu and Ruzizi River basins are faced by problems of deforestation, soil erosion and ever-increasing quantities of sediment in the Ruzizi River. The capacity of the reservoirs of Ruzizi-I and -II hydroelectric power schemes have been severely reduced by the accumulation of sediment that originates from soil erosion and slope instability in the upstream reach between the reservoirs and Lake Kivu.

Water Quality: The quality of the Ruzizi River water is characterised by a slightly alkalinity (pH ~9), high electrical conductivity because of the high ion concentrations. Phosphates are observed in non-negligible quantities, while nitrate and nitrite concentrations are very low. The water quality is also significantly degraded by presence of high levels of faecal coliforms originating from the discharge of untreated sanitary wastewater from the urban centres of Bukavu and Goma.

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Ruzizi River reach within the 5.5-km-long dewatered reach

Ruzizi River reach between the Ruzizi III powerhouse and Bugarama

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4.3 Biological Environment

Fish: The aquatic habitat and its fish population have been significantly modified by the past 50 years of hydropeaking mode of operation of Ruzizi-I and -II. All of the fish detected in recent surveys in the Ruzizi River over the past five years are non-threatened species, but which include some migratory species that migrate up the Ruzizi River and its tributaries for spawning (mostly *Labeobarbus* species). Two threatened species recorded historically in the Ruzizi Basin include the Critically Endangered *Chiloglanis ruziziensis* and the Endangered *Chiloglanis asymmetricaulis* species, but which were not recorded in the Ruzizi River mainstem and appear to occur mainly in tributaries.

While the Ruzizi Basin as a whole - extending 6,000 km^2 between Lake Kivu and Lake Tanganyika - is critical habitat for several fish species, five species are potential critical habitat qualifying species on a precautionary basis (the two *Chiloglanis* species and three migratory species). However, despite several surveys, there is a lack of confirmed field evidence for the presence of all but one of these species (the migratory *Labeobarbus caudovittatus*) in the middle-upper mainstem of the Ruzizi River. *L. caudovittatus* is assessed as least concern and appears to be reasonably widespread, and it is questionable whether it would qualify, while the other two migratory species (*Acanopoeta tanganicae* and *L. leleupanus*) have not been recorded in the project-affected reach and are considered more likely to occur further downstream, in tributaries and in Lake Tanganyika. Further surveys are required pre-construction to confirm fish presence. Project impacts on these five species are assessed as non-significant even if individuals of these species are found to occur. Although no fish pass is feasible or recommended for migratory fish, other fish protection measures are proposed to mitigate risks to fish and to compensate or offset any confirmed fish impacts.

Terrestrial habitat and flora: Vegetation in the Project footprint comprises mainly modified habitat (mostly cultivated land and tree plantations) with some degree of alien invasive plant presence and small portions of riparian thicket, riparian wetland, secondary shrubland mosaic, and hillslope thicket/forest. Only some areas of hillslope grassland/savannah are assessed as largely natural habitat with a total area of approximately 18 ha. Alien species comprise roughly 21% of recorded plant diversity. No threatened or restricted range plants were recorded that would qualify for critical habitat.

Large mammals: Mammals are poorly represented in the project area. Most large mammals have been eradicated through hunting and habitat loss and local people report that mammals such as antelope species, carnivores and elephants have not been seen in many years. Only one threatened mammal species is present, namely hippopotamus (VU), which is present in river reaches near Bugarama. Villagers reported that colobus monkeys occasionally enter the area and are subject to hunting.

Birds: The project area is located in the southern part of the Albertine Rift Montane Forests terrestrial ecoregion, which supports an estimated 732 avifauna species. However, many of the habitats and landscape of the ecoregion are absent in Project area and avifaunal species richness is significantly lower. However, species richness is still moderately high, and 115 species were recorded during the biodiversity survey in February 2022, mostly widespread and common species. Fish-eating birds such as kingfishers, herons and cormorants were either absent or present in remarkably lower numbers than would be expected along a large river, reflecting the low aquatic species diversity reported by the aquatic specialists. Only bateleur (*Terathopius ecaudatus*) (IUCN endangered status) and the pallid harrier (*Circus macrourus*) (IUCN Near Threatened status) have a moderate likelihood of occurring in the project area but were not observed during the field survey.

[A) Solid Waste; B) Ruzizi II spillway – River Regulation; C) Riparian Cultivation; D) Fishing; E) Aquaculture; F) Washing and Ablutions; G) Alien Fish Species.]

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Protected and Globally Important Biodiversity Areas: The Project area of influence does not encroach on any formally protected areas or globally important biodiversity areas (e.g. Key Biodiversity Areas). The nearest protected areas are the Nyungwe National Park (22 km to the North) and the Rusizi River National Park (88 km downstream) which is also a Ramsar site (wetland of international importance). The Rusizi National Park is located north-west of Bujumbura on the border with the DRC. It comprises a floodplain of about 2 km wide and 35 km long along the east bank of the Ruzizi River and a smaller area of delta where the Ruzizi enters Lake Tanganyika. The delta is a mixture of islands and channels and is an important area for migratory waterbirds. Biodiversity features of both these two parks will not be affected by the project.

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4.4 Socioeconomic Environment

Administrative organisation: The Project area is located across the Rusizi District in Rwanda, Western Province, and the Walungu Territory in DRC, Sud-Kivu Province. Within Rusizi District, the Project will have direct and indirect impacts on the populations living in the Sectors of Nzahaha and Bugarama, spanning across the cells of Murya, Nyenji, Nyange, Pera and Ryankana. Within Walungu in DRC, the Project will have direct and indirect impacts on the local communities living in the Groupements of Kamanyola and Karhongo.

Demographics: In Rwanda, the villages in Nzahaha Sector which will be impacted by land acquisition (Nyagahanga, Ruganzu and Ryagashyitsi) are organised settlements with an overall population of 2,136 people. In semi-urban Bugarama, from which the access road will begin, the villages of Gatebe and Kabusunzu are more densely populated, with an overall population of around 2,037 people. The most populated villages are found in the downstream area of the Project, where the villages of Gombaniro, Mubombo and Mwaro have a total population of around 4,524 people. In DRC, the villages of Kafunda and Bugano, which will be impacted by land acquisition for the access road and powerhouse, are characterised by a sparsely populated and decentralised settlement style and have a total population of around 530 people. The transmission line in DRC will cross Kayenge, the largest neighbourhood of the semi-urban city of Kamanyola with a dense population of 10,000 people. Finally, the villages of Ruduha, Rushebeyi, Nachirongwe, Bujenjeri and Nachihembe in DRC surround the reservoir and dewatered stretch area with a population of around 3,865 people.

Land use and land ownership: Land is a scarce resource throughout the Project area, with on average 0.5 hectares of land cultivated by each household. While the majority of the population in Rwanda has legal landholding titles which are either individual or shared between husband and wives, renting and sharecropping through an informal social practice called nyiragabura are widespread amongst all households. In DRC, legal landholding titles are infrequently found, while customary ownership rights and usage rights are more popular, alongside renting and a sharecropping social practice called bwasa. There are no specific areas used for grazing in Rwanda and only small tracts of land reserved for this use in the village of Manda, DRC. Beyond agriculture, the only other types of land use present in the area are (i) a large plantation of rice in Bugarama Sector (Rwanda) covering a total size of 130 hectares, and an area of Kayenge (DRC) which is used for fish farming activities. Both of these places are not impacted by land acquisition for the Project and are instead located in the downstream reach of the river.

Education: Schools are scarce in quantity and poorly equipped in the villages which will be directly and indirectly impacted by the Project. Within the Project area, 4 villages in DRC and 3 villages in Rwanda are currently not covered by a school. The socioeconomic survey performed in 2022 found that in DRC around 35% of females and 20% of men affected by land acquisition are illiterate, while in Rwanda respectively 20% and 15% never received any education. Only just under 5% of people living in affected households have attended university-level education in both countries.

Health: The Project area has little access to basic health facilities. Although in Rwanda the 'health worker' system promotes access to basic medicine and counsel at the village level through a compulsory presence of 4 health workers in each village, health centres are still badly equipped and suffering from various infrastructural and human resources constraints. In DRC, health centres are in much worse-off conditions and have extremely low capacity for hospitalisation and treatment. Acute respiratory infections, malaria, and diarrhoea were the most common diseases in the Project area. In both Congo and Rwanda, STDs and HIV are major challenges. The most frequent STDs are syphilis, gonorrhoea and gonococcal disease. Malnutrition is also an issue in the region, especially in DRC.

Language, religion, ethnicity: Christianity is the dominant religion in the Project area, with a majority of people with a Methodist, Pentecost, Catholic and Protestant affiliation. A small minority of Muslims and Jews is also observed in Bugarama Sector (Rwanda). The whole population speaks Kinyarwanda in Rwanda and a mix of Swahili and Mashi in DRC. While in Rwanda ethnic labels have been outlawed in 2003, in DRC the dominant ethnic group in the Project area is the Bashi, mixed with minorities of Bafuliru, Banyarwanda, Murega and Barega which live well integrated in Bashi villages. Some households belonging to the Historically Marginalised Community in Rwanda and the Batwa ethnic group in DRC have also been identified in the Project area in 2022. An anthropological study conducted by Anthropolinks in 2023 has

confirmed that PS 7 and ESS 7 on indigenous people apply for this community. A Historically Marginalised People Development Plan (HMPDP) will be prepared to assess and mitigate impacts on the community.

Gender: The villagers in the Project area live in traditional communities whose socioeconomic functioning relies on patriarchal practices. Women participate in village-level decision making but often have less influence on domestic affairs and on the management of income and expenses at the household level. Gender-based violence and polygamy are widespread practices throughout the Project area, equally in DRC and Rwanda: due to the latter, unmarried or divorced women with children are left with little land security or money all across the Project area.

Vulnerable people: Vulnerable people in the Project area are perceived to be those that fall into one or more of the following categories: (i) household headed by someone older than 65 with no other over-18 household member, (ii) household headed by someone disabled with no other over-18 household member, (iii) household headed by a woman, (iv) household not owning any land, whether through a land title OR through customary rights, and (v) households including one or more members from the Historically Marginalised (Rwanda) / Batwa (DRC) Community. The socioeconomic survey performed in 2022 found that 38% of households affected by land acquisition are vulnerable according to these criteria.

Cultural heritage: There are no nationally or internationally recognized cultural heritage sites within the Project footprint. Nevertheless, cultural heritage sites which are considered important by local communities around the Project area are churches, tombs and praying spots secluded in nature. Only one hut used for praying by the villagers of Kafunda (DRC) will be affected by land acquisition.

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Examples of houses in the Project area

5 Project Alternatives

Do nothing option: With the do-nothing scenario, the Project is not implemented, and the project's negative impacts can be avoided, but benefits and positive impacts will not be realised. There would be a gap in the power production strategy and a lack of access to reliable power supply services which hampers economic growth and contributes to poverty and isolation of rural population would continue.

Alternative technologies: These comprise thermal power plant fuelled with diesel, natural gas, methane (from Lake Kivu) and peat. The government of Rwanda is promoting some limited investment in some renewable energy projects such as solar (but not wind) but is focusing on hydropower.

Alternative modes of operation: The run-of-river mode of operation would turbine the discharges from Ruzizi-II without storing water. This option would avoid creating the reservoir, but in order to be economically feasible the headrace tunnel creating a bypassed reach of Ruzizi River would still be required. This configuration would have approximately 30% less power production capacity and only a small environmental and social gain compared to the adopted design. Functioning with this mode of operation the Project is probable not economically viable.

Alterative peaking mode: The Project has a peak flow of 150 m^3/s, which aligns with the peak flows discharged from the upstream Ruzizi-I and -II hydropower scheme that have been in operation for over 50 years. The purpose of the Project is to increase regional power production capacity to meet an ever-increasing power demand, including periods of peak demand. The Project's peak flow rate enables the Project to achieve its full hydropower potential without causing a significant incremental increase to downstream hydrological conditions over and above those caused by the operation of Ruzizi-I and -II. One alternative to the proposed peak flows would be to design the Project with a capacity to discharge peak flows >150 m^3/s. This would incur additional Project costs but enable peak power production to be higher, but for a shorter period. However, this would expose the downstream river flow conditions to a higher degree of alteration compared to the proposed Project and current conditions. The gain in terms of peak power production capacity would be offset by the reduced duration of peak power and increased environmental impacts. This configuration has therefore not been considered by the Project. Another alternative would be to design the Project with peak discharge flows <150 m^3/s. This would result in lower peak power production and reduce the degree of alteration to river flow conditions caused by the existing Ruzizi-I and -II hydropower schemes that have been in operation for over 50 years. However, there would probably not be a significant rapid environmental gain from adopting the lower peak discharge. In the long-term, the river may recover to a certain extent from the impacts caused over the last 50 years by the operation of Ruzizi-I and -II. However, unless Ruzizi-III were to operate as a regulation reservoir, any recovery would be negligible-minor. This configuration has therefore not been considered by the Project.

Regulating Dam-Reservoir: The dam-reservoir could be used to regulate the flow of the Ruzizi River by acting as a buffer reservoir absorbing the peak flows discharged from Ruzizi-II (or Ruzizi-IV once built) and discharging a flow that is similar to that of the natural conditions of the river. This would avoid any negative hydrological effects from alternating peak and off peak flows, but will have reduced power production capacity, and would not be able to meet the requirements for peak power demand. Functioning with this mode of operation the Project is probably not economically viable.

Alternative 220 kV transmission line route: The selected 7-km-long transmission line takes the shortest distance between the Project's switchyard and the planned Kamanyola 220 kV substation (an associated facility to be operated by SINELAC). The route avoids houses and so no physical displacement is required. Alternative routes would increase the length of the line and either (i) cross an area of hillslope grassland, presenting technical difficulties because of the relief, require additional temporary access tracks to be created during construction, and increase the area of natural habitat affected, or (ii) cross agricultural land and incur higher construction costs. Therefore, alternative have no environmental or social gain.

Alternatives to avoid cultural heritage elements: The social baseline survey identified tangible and intangible cultural heritage elements in near the Project infrastructure. No significant impacts on the tangible and intangible cultural heritage sites are expected during construction and operation. Consequently, the Project has not explored alternatives to further distance infrastructure from cultural heritage elements.

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Alternatives for avoidance and minimisation of involuntary resettlement: To minimize involuntary resettlement impacts, two design changes were implemented. In DRC, the right-of-way for the transmission line was reduced from 50 m to 30 m[1], which avoided the resettlement of 2 houses and reduced the area to be acquired from 34.5 ha to 21.06 ha. In Rwanda, the width of the access road was reduced, avoiding impacts on about 20 houses and 83 land plots in the outskirts of Bugarama.

Results of Comparison of Alternatives: The preferred alternative is the 206 MW hydroelectric power scheme with hydropeaking mode of operation. The rationale for the selection is that this is the alternative that aligns best with Rwanda's power strategy, is the cheapest technology that is able to produce the forecast peak power demand, results in reduced GHG emissions compared to the thermal power alternatives and offers the best compromise in terms of environmental impacts for energy produced.

[1] As per the Ministerial Order N°. 0032/CAB/MIN/AFF.FONC/ASM/2023 dated 18 February 2023 which specifically authorises, for reasons of public utility, a wayleave width of 30 m for the Project

6 Potential Impacts

6.1 Positive Impacts

The construction activities will generate temporary employment opportunities. Construction duration is estimated at 56 months, requiring an estimated workforce of 500-1,000 workers during the period of peak activities. A key positive impact will be the provision of an income source for workers and their families contributing to their well-being. Based on comparison with similar projects in the region, it is estimated that unskilled job opportunities will be available for local people during the construction period. The supply of goods and services along the Project's supply chain will also create economic opportunities.

During operation the Project will power generation will support efforts to extend electrification to the region, benefiting a population of 30 million people. Permanent employment opportunities during operation will be more limited than during construction. The operation of the scheme will require only a small number of staff, probably in the order of 50 people. The Project will reduce GHG emissions and reduce deforestation by reducing the need for collecting and burning firewood for household cooking and heating.

6.2 Negative Environmental Impacts and Risks

The key negative environmental impacts and risks are summarised as follows:

Air Quality, Dust and Odour: The project is expected to cause localised alteration to air quality and ambient dust levels in the immediate vicinity of worksites during construction, and along access roads both during construction and when used by contraction vehicles. Some of the areas affected by the alteration are considered as sensitive because they are close to residential area or are in areas where people are working in the field and significant potential impacts are possible without mitigation measured. During operation, there will be air emissions from power generators at the operators' village and from small diesel-fuelled equipment items and vehicles. However, the impact is not expected to be significant.

Noise and Vibration: The project is expected to cause localised increase in ambient noise levels in the immediate vicinity of worksites during construction, and along access roads both during construction and when used by contraction vehicles. Some of the areas affected by the alteration are considered as sensitive because they are close to residential area or are in areas where people are working in the field and significant potential impacts are possible without mitigation measured. During operation, the powerhouse will be a source of noise emissions which is also potentially significant without adequate mitigation measures.

Soils, Groundwater and Surface Water: During the construction, without adequate and effective pollution prevention and control measures there is a risk of contamination of soil, groundwater from accidental spills and leaks of hazardous substances such as fuel and oils. Surface water maybe contaminated by runoff from the contaminated soils and from the discharge of sanitary wastewater from the worker accommodation camp. The impacts are potentially localised and significant, but the risk of these impacts can be mitigated through the implementation of good practice measures for pollution prevention and control and treatment of sanitary wastewater.

Hydrology: During construction a 500 m reach of the Ruzizi River will be bypassed by the diversion tunnel leaving a dewatered stretch, this is not considered as significant.

During operation a 5.5 km dewatered reach between the Project dam and powerhouse will be created and an environmental flow of 10 m^3/s (9% Mean Annual Flow) will be maintained in this reach.

Downstream of the powerhouse there will be alteration of the river's flow regime with the discharge of peak and off peak flows – which cause intermittent pulses of high flow (high water level) and low flow (lowered water level) to descend the river, but with amplitude decreasing with distance downstream. It is noteworthy that the high flows (high water levels) do not exceed the upper range of inter-annual

variations for natural conditions, whereas the low flows (and low water level) are lower than those of natural conditions.

It is important to note that the assessment of the significance of the Project's impact on hydrology needs to take into consideration that the Project causes change that is an addition to the changes caused by the operation of Ruzizi-I and II HEPPs over the last 50 years. The operation of Ruzizi-I and II has caused a significant impact on river hydrology, ~60 km of river (36%) of the total Ruzizi River length has been affected by a significant (>10%) lowering of minimum water level. The operation of the proposed Ruzizi-III Project is expected to cause minor (<10%) lowering of water levels along an additional 40 km (24%) of the river. The degree of alteration decreases with distance downstream from the Project due to flow from inflowing tributaries.

At the confluence with the Ruhwa tributary (9 km downstream from the Project powerhouse), the minimum water levels will be approximately 20 cm lower than the current conditions, and 20 km and 40 km further downstream, the minimum water level are expected to be lowered by approximately 8 cm and 5 cm respectively. At the Rusizi National Park, the lowering of the minimum water level is expected to be negligible.

Geomorphology and Sediment: During construction there is a risk that there will be increased sediment load in the river downstream from the dam construction site. However, with sediment management measures this is not expected to be significant. During operation sediment will be trapped by the reservoir resulting in a mean annual loss of reservoir volume of 78,100 m^3 without the implementation of mitigation measures. This would result in the loss of 50% of the reservoir's total storage volume after 50 years and all storage volume after 92 years. The trapping of sediment in the reservoir will cause lowered sediment loading in the river reaches downstream for the dam with potential impacts on riverbanks and channel geomorphology caused by erosion. However, the sediment load reduction is expected to be balanced by the general increase in sediment load in the river from catchment runoff high in sediment cause by deforestation and soil erosion. Therefore, river channel and riverbank erosion are not expected to be significant. In addition, sediment trapped in the reservoir will be flushed downstream periodically, slope stability and erosion control measures within the Ruzizi-III reservoir catchment will be implemented, and the Project will coordinate with government agencies and regional institutions with regard to watershed scale management plans to reduce soil erosion.

Wastes: The project construction will produce inert spoils, hazardous and non-hazardous waste that will need to be managed correctly. Waste management facilities are available in Rwanda, but not in DRC. It will be the EPC contractor's responsibility to manage waste appropriately and of necessary to create landfill for non-hazardous waste. Quantities of waste generated during operation will be significantly less than during construction. However, domestic trash from Bukavu and Goma that is transported by the Ruzizi River may accumulate in the Ruzizi III reservoir and will need to be collected and managed appropriately.

Aquatic Habitats and Biodiversity: Due to the severe modification of the river flow over the past 50 years by the hydropeaking mode of operation of the upstream Ruzizi-I and -II hydroelectric power schemes, the incremental direct impacts of the Project on the aquatic biodiversity is not predicted to be significant. In the 5.5 km dewatered (or bypass) river reach, the minimum environmental flow[2] of 10 m^3/s (about 9% Mean Annual Flow) will lead to a reduced but constant flow of water which is expected to provide a more stable environment for aquatic life compared to baseline conditions which experience daily fluctuations in flow rate and water level. During operation, fish in the bypassed reach may benefit from these more stable flows and improved food availability if river depths remain sufficient to maintain continuity between pools. However, this will depend on whether the shallow water does not result in significant increase in human fishing pressures. Mitigation to exclude fishing from this reach is proposed.

In addition, periodic pulses of water (freshets) are recommended to be released from the dam into the bypassed reach to maintain flow continuity, reduce sediment accumulation from landslides and erosion and potentially stimulate migration and/or spawning. In the hydropeaking reach downstream from the project powerhouse, fish will be exposed to changes in flow rate and water level in much the same way as for the baseline conditions although with lower minimum baseflows during peaking periods. Sudden

[2] The ESIA has been approved by environmental authorities in Burundi, DRC and Rwanda and consequently the EFlow can be considered to have been agreed with stakeholders.

turbine shutdown after daily peaking may result in fish stranding in the reach below the powerhouse / tailrace, but monitoring and adaptive management is required to confirm this in order to adjust ramp down rates if required to prevent fish stranding. The physical presence of the 51 m high dam will represent a barrier to fish migration which cannot be practically mitigated, and which would anyway be rendered inefficient due to the presence of the two existing hydropower plants and a fourth proposed hydropower station immediately upstream of the Ruzizi III HEPP. While the upper Ruzizi River comprises a number of rapids and pools for spawning fish, the fish habitat upstream to which access will be lost is relatively small compared to the available habitat downstream of the Project and its tributaries.

The alteration to downstream flows from hydropeaking will have a small incremental effect on water level variations attenuating with distance downstream (as described above). By the time the flow reaches the Rusizi National Park and Ramsar site (80 km and 100 km downstream from the powerhouse respectively), these variations will have reduced and are predicted to be within the range of normal variability. No impact on fish through fish stranding is expected due to the slow rate of fall in water levels which will remain well below the threshold for fish stranding.

Taking into account the modified habitat status of the Middle to Upper Ruzizi River system and lack of threatened fish species confirmed in the project-affected area of influence, the overall conclusion is that the Project's incremental and direct impact on fish is not significant if the proposed monitoring and mitigation measures are implemented.

Terrestrial Habitats and Biodiversity: Loss and fragmentation of habitats in the Project footprint are predicted to be non-significant, especially as the majority of the terrestrial areas affected by the Project is modified habitat. However, loss of 18 ha of largely natural habitat may be impacted by the reservoir and transmission line, and in other construction footprints, and will be compensated through sub-catchment management and restoration focussed on the project acquired 50-m wide buffer zone around the reservoir and along the dewatered reach.

Landscape and Visual Amenity: The Ruzizi River at the dam site has a high aesthetic value, but low sensitivity because few people are able to view the bottom of the gorge. Impacts on landscape and visual amenity are consequently expected to be non-significant.

Transboundary Impacts: The Project, situated on the river which forms the border between DRC and Rwanda and consequently causes impacts in both DRC and Rwanda as discuss in this ESIA Summary. The Burundi-Rwanda-DRC tripoint is situated on the Ruzizi River 10 km downstream from the Ruzizi-III powerhouse. Downstream from the tripoint, the river forms the Burundi-DRC border. Some alteration to the current hydrology of the Ruzizi downstream from the tripoint is expected. However, the flow conditions in the reach are already modified by the operation of Ruzizi-II. The alteration to flow conditions cause by Ruzizi-III are considered to be non-significant.

Cumulative Impacts: The ESIA includes a Cumulative Impact Assessment, and this is discussed in Section 6.4.

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6.3 Negative Social Impacts and Risks

The key negative social impacts and risks identified are summarised as follows. Key mitigation and management measures for environmental and social impacts are summarised in section 7. A summary of risk management and emergency situations is provided in section 8.2:

Land Acquisition: The proposed Project land requirements total 205.24 hectares.

Physical and Economic Displacement: A preliminary census and asset inventory was undertaken in 2022 and will be updated as part of preparation of a Resettlement Action Plan. The preliminary census indicates that 2,249 households will be affected by physical and economic displacement, 1,546 in DRC and 703 in Rwanda. Only 50 households will be physically displaced, all of them located in DRC.

Community Health and Safety: The Project construction phase represents several risks to community health and safety, and these are related to noise and dust from worksite and Project traffic. Project induced in-migration is likely during construction and an influx in the order of 300-900 opportunity seekers. Such influx could induce risks of anti-social behaviour, pressure on social services, increase in sexually transmitted diseases, and local inflation. These risks are also relevant for the construction workforce. Other risks include Gender-Based Violence (GBV), Sexual Exploitation and Abuse (SEA), health risks related to increased waterborne diseases and exposure to electromagnetic fields within the transmission line right of way. The permanently flooded reservoir area could create favourable habitat for the development and spread of vectors of waterborne diseases.

Cultural Heritage: Cultural heritage impacted by the Project comprises 7 graves and 1 church. The cultural heritage elements that are in the close vicinity comprise 2 prayer sites (including a grotto), and 2 churches / baptism sites. These sites can be protected to prevent impacts and access shall be maintained if there are no health and safety risks.

Infrastructure, Commerce and Local Economy: The Project is not expected to have direct impacts on public infrastructure and businesses. However, there will be increased opportunities for employment and business opportunities which will boost the local economy, but with the possibility of an increase in prices of land, commodities and local produce.

Natural Resources: The Project is not expected to have any significant impact on access to natural resources. Twenty-eight fishponds were identified along the reservoir and 12 beehives, which can be moved, were observed inside the land take area in DRC.

Technological risks: The physical presence of the dam-reservoir represents a technological hazard with potential effects on downstream communities in the unlikely event of an accidental dam break. The dam has been designed in alignment with international safety standards with safety margins included in the design. An International Panel on Experts on Dam Safety will review the Project Dam to ensure that risk of dam break is acceptable. Dam break could occur in the very unlikely case of landslides, seismic events and flood events which exceed the design considerations. The Project has prepared an Emergency Preparedness Plan and undertaken flood modelling, which are provided in Vol. III Annexes, and Section 8.2 of this ESIA summary.

Occupational Health and Safety: Hazards to which workers may be exposed during construction are expected to include general worksite hazards including (but not limited to) noise, dust and vibrations, potential exposure to hazardous substances such as fuel and chemicals, potential exposure to effects of accidental fire, working at heights, mobile machinery, rotating machinery. During operation, hazards to which workers may be exposed include (but not limited to) electrical hazards, fast flowing water, high-pressure equipment, rotating machinery, working at heights, hazardous materials.

6.4 Cumulative Impacts

The ESIA includes a cumulative impact assessment that follows the approach and steps set out in the Good Practice Handbook on Cumulative Impact Assessment and Management for the Private Sector in Emerging Markets (IFC, 2013). The assessment focuses on the environmental and social aspects of the receiving environment that are considered important for assessing risk and which are referred to collectively as "Valued Environmental and Social Components" (VECs).

The overarching conclusions of the CIA are as follows:

- A comprehensive list of initial VECs have been considered, including VECs identified by the ESIA team, institutional stakeholders and communities. VECs include receptors from the physical, biological and social environment.
- A VEC screening process has been undertaken and three VECs (and corresponding metrics) have been identified for detailed assessment.
- Other VECs have been screened out of the detailed assessment because there is no spatial and temporal overlap of Ruzizi-III impacts with impacts from other projects, regional development activities, environmental stressors and external factors.
- The VECs (and metrics) assessed in the detailed CIA are as follows:
  - River hydrology (% alteration to natural conditions minimum water level).
  - River geomorphology (% alteration to sediment transported by the river under natural conditions).
  - Fish and aquatic habitat (% of total river length affected by alteration to minimum water level, and % of total river length that migrating fish are prevented from reaching).
- There have been significant impacts on hydrology from the operation of Ruzizi-I and -II. However, the incremental change predicted to be caused by Ruzizi-III alone is minor.
  - Operation of Ruzizi-I and -II has caused intermittent significant (>10%) lowering of minimum water levels along 61 km of the Ruzizi River, corresponding to 36% of the total length of the river.
  - The proposed Ruzizi-III project will cause an additional lowering of water levels along 40 km (24%) of the river already impacted by Ruzizi-I and -II, but the degree of alteration is minor (<10% lower).
- The incremental increase in impacts on hydrology caused by the combined effects of Ruzizi-III, irrigation and climate change is assessed as significant, because of effects of the most plausible climate change scenarios. However, there are uncertainties with regard to the magnitude of climate change, and the less likely climate change predictions would cause significant changes, that either attenuate or augment the combined changes caused by Ruzizi III and irrigation.
- The cumulative impacts on river geomorphology are assessed to be significant. Overall, there is a significant increase in sediment load in the Ruzizi downstream from the Ruzizi-III Project – caused by soil erosion in the watershed. However, the alteration caused by sediment trapping in the Ruzizi-III reservoir has an attenuating effect, reducing the degree of alteration caused by soil erosion in the watershed.
- The cumulative impacts on fish and aquatic habitat are assessed to be significant. There are significant impacts from the operation of Ruzizi-I and -II. However, the incremental change caused by Ruzizi-III is minor:
  - The incremental lowering of water levels caused by Ruzizi III alone is minor (see above), and this is considered a suitable proxy for assessing impacts on fish and fish habitat. However, when considering the combined effects of Ruzizi III, irrigation and climate changes, significant impacts on fish are expected to be significant.
  - The physical presence of the Ruzizi-I and -II dams has prevented migrating fish reaching the uppermost 19 km (11%) of the Ruzizi River, because fish ladders are no longer operational. The Ruzizi-III project will cause a loss of access to an additional 12 km (7%) of river, but this loss is expected to have a minor incremental impact.

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- The plans to rehabilitate the Ruzizi-I and -II fish ladders would mean that the Ruzizi-III Project will prevent fish from reaching 31 km of river upstream, i.e. reducing the benefits of the fish ladder rehabilitation.

The framework for the management of significant cumulative impacts are managed through the control and mitigation measures for the Project impacts assessed elsewhere in the ESIA.

The framework for the management of the significant cumulative impacts includes (i) measures implement by REL, comprising conducting a CIA for the Project's quarries and borrow areas, monitoring, coordination with ABAKIR and Rusizi National park Authorities and coordination with developers of projects within the Ruzizi III area of influence, (ii) coordination with developers of associated facilities, (iii) coordination with third parties responsible for managing cascade impacts (cascade management plan and cascade E Flow Assessment, and (iv) coordination with third parties to manage basin-wide issues (basin-wide comprehensive CIA, Integrated River Basin Management Plan, basin-wide waste management plan).

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7 Mitigation/Enhancement Measures & Complementary Initiatives

7.1 Key Mitigation Measures

Key measures for management of impacts summarised in Section 7 are as follows:

Receptor / impact	Key Mitigation and Management Measures	Phase*
Environmental Impacts		
Hydrology	Reservoir filling plan	F
	Reservoir operating plan	O
Water quality	Vegetation clearing prior to reservoir filling	C
	Contingency planning for the removal of any invasive weeds	O
	Removal of domestic trash from upstream that accumulates in the reservoir	F, O
Sediment and Geomorphology	Sediment management plan (sediment flushing/venting) Monitoring and adaptive management	O
Fish and aquatic habitats	Definition of minimum environmental flow and evidence-based validation	F, O
	Fish monitoring and adaptive management including modification of operational regime if required (e.g. release of freshets, adapting turbine ramp-up and ramp-down rates at the start/end of peak/off peak discharges, river engineering to maintain connectivity in dewatered and downstream reaches if required)	O
	Monitoring of endemic and alien fish species	Pre-C, O
	Enforcing a fishing exclusion zone in the dewatered reach and for 1 km downstream of the powerhouse to reduce fishing pressures and enable migratory fish to spawn and disperse	O
	Employing fish monitors to enforce fishing restrictions and promote sustainable fishing practices and reduce use of illegal fishing gear downstream of the exclusion zone.	O
	Implementation of restoration measures and reduced cultivation of riverbanks in Ribyiro catchment to protect habitat for threatened *Chiloglanis* species (if presence in Ruzizi mainstem and impacts confirmed through monitoring)	O
Vegetation and flora	Minimisation of project footprint at worksites requiring vegetation clearing through pre-construction walk-over surveys	C
	Terrestrial alien invasive plant management and control plan	C
	Implementation of biodiversity compensation actions for impacts on natural habitat through sub-catchment management and restoration (including nursery establishment, replanting, alien control), construction of berms/embankments to reduce sediment inputs with potential additional benefits for aquatic habitats and biota in dewatered reach	O
Fauna	Traffic management plans (e.g. speed control)	C
	Faunal protection measures, e.g. snake rescue, faunal escape measures and checks in open trenches; awareness raising of wildlife encounters with local residents and relocation if threatened or priority species encountered	C
	Wildlife management and control	C
	Transmission Line design includes bird protection measures in sections crossing over ridges or near confirmed raptor nesting sites	O
Cumulative impacts	Coordination with ABAKIR, operators of Ruzizi-I, II and -IV, developers of associated transmission line projects and the operator of the Gishoma peat-fuelled power plant.	C
Transboundary impacts	Coordination between the Contracting States (Burundi, DRC and Rwanda)	C, O
Other impacts (air quality, noise, operational discharges and accidental spills and leaks	Soil and erosion control	C
	Stormwater management	C
	Pollution prevention and control	C
	Sediment management	C
	Hazardous substances management	C

Receptor / impact	Key Mitigation and Management Measures	Phase*
Social Impacts		
Land acquisition	Resettlement Action Plan	C
Agriculture	Agricultural enhancement measures – through the Local Development Plan	O
Fisheries	Reservoir Fisheries Feasibility Study	O
	Reservoir Fishery Management Plan	O
Community health and safety	Influx Management Plan	C
	Local recruitment and skills development	C
	Community Investment Programme	C, O
	Community Health Programme	C, O
	Compliance with DRC and Rwanda and International standards for noise, vibration, dust, effluent, Electromagnetic Radiation	C
	Dam safety measures	O
Cultural heritage	Grave reinstatement	C
	Chance finds procedure	C
* C=Construction, F=Reservoir Filling, O=Operation		

Environmental and Social Management System (ESMS)

REL will establish an Integrated Environmental, Social and Health and Safety Management System in compliance with ISO 14001 and ISO 45001:2018 or equivalent and recruits experienced Environmental and Social Specialists, as well as a very experienced and ISO 45001:2018 certified Health and Safety Specialist.

The EPC Contractor will also establish an Integrated Environmental, Social and Health and Safety Management System in compliance with ISO 14001 and ISO 45001:2018 or equivalent. The Contractor will also recruit a very experienced Environmental Specialist and a very experienced Social Specialist as well as a very experienced and ISO 45001:2018 or equivalent certified Health and Safety Specialist. These 3 specialists will be full time present at the construction sites during working hours.

The Owner's Engineer (Tractebel) will be responsible for the quality and adequate implementation of the CESMP and Contractor OHS Plan. For this purpose, the Owner's Engineer will establish an Integrated Environmental, Social and Health and Safety Management System in compliance with ISO 14001 and ISO 45001:2018 or equivalent. The Owner's Engineer will recruit a very experienced Environmental Specialist and a very experienced Social Specialist as well as a very experienced and ISO 45001:2018 or equivalent certified Health and Safety Specialist (no junior). These 3 specialists will be full time present at the construction sites during working hours.

An Independent Environmental and Social Panel of Experts will be appointed to (i) provide independent advice and guidance to support objectivity and credibility in the environmental and social assessment process, (ii) share expertise and knowledge, (iii) assure a level of international confidence in the quality and integrity of the environmental and social assessment process and findings.

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7.2 Local Area Development Plan

The Project recognizes that the economic benefit at the national level will be produced using the natural resources of the Ruzizi River and that communities have a right to share in that benefit – and that this is not compensation for negative impacts. For that purpose, REL has prepared a Local Area Development Plan (LADP), that will be implemented by the Contracting States. The term "Local Area Development Plan" is chosen for the Project. On other projects, the terms 'Corporate Social Responsibility Programme' or 'Community Investment Programme' are used. The LADP has the same objective as such programmes. It is a tool proposed by the Project to support the local communities to improve their living conditions, address development challenges and to take advantage of emerging opportunities. As the LADP is going beyond impacts avoidance and mitigation, its budget is not included in the ESIA/ESMP. The LADP will fund local development activities during the construction period and the operation phase to achieve sustained sharing of benefits with the project-affected communities. The LADP will be implemented in 2 phases: a first phase of 5 years, (year 1 to year 5) followed by a second phase of 5 years (year 6 to year 10). It will start as soon as the construction activities start. The second phase will be funded after evaluation of the activities implemented during the first phase.

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8 Expected Residual Effects and Environmental Hazard Management

8.1 Residual Impacts

The potential impacts and risks described in Section 6 can be mitigated and the significance of impacts are expected to be minor or negligible. The key residual, not significant impacts, expected during construction are expected to comprise localised alteration to air quality, noise levels, surface water quality and soil quality. A 500 m reach of the Ruzizi River will be dewatered for river diversion for dam construction. There will be a loss of 223 hectares of mostly modified habitat caused by land use change for the construction of dam, roads, powerhouse, transmission line and impoundment of the reservoir. Approximately 18 ha of natural habitat comprising hillslope grassland is predicted to be impacted. To achieve a no net loss of natural habitat, compensation can be achieved through restoration of the reservoir 50 m buffer zone acquired by the project, and river margins along the 5.5 km dewatered reach. This would involve nursery establishment and replanting and can provide job creation and livelihood support for local communities.

There will be 2,249 households affected by physical and economic displacement (1,546 in DRC and 703 in Rwanda), 50 households are affected by physical displacement only (50 in DRC and non in Rwanda and Burundi). The affected people will be compensated and will benefit from local development implemented through the LADP.

During operation, the key residual impact is the inundation of 3 km of flowing river with rapids and pools to create a lake-like system, and a diminished flow in the 5.5 km dewatered or bypassed reach of the Ruzizi River. Reduced baseflow in the dewatered reach and possibly downstream of the powerhouse will increase fishing pressures on fish using these reaches, possibly at unsustainable levels. Mitigation proposed for fish protection includes maintenance of a minimum environmental flow of 10 m^3/s and periodic release of freshets to remove accumulated sediments, enforcement of a fishing exclusion zone in the dewatered reach and downstream of the powerhouse, and monitoring and adaptive management (which could include alteration of ramp down rates to mitigate any confirmed impacts of fish stranding, if required). These measures are predicted to reduce the residual impacts on fish to non-significant. Alteration to flow regime downstream from the powerhouse will be within baseline inter-annual variations and impacts on fish and the downstream river, including the Rusizi National Park and Ramsar site in Burundi are also predicted to be non-significant.

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8.2 Risk Management and Emergency Situations

The key risk management of emergency situations are as follows:

- An Independent Panel of Experts for dam safety. The panel for dam safety will be required to review the design and all aspects of the work, including flood hydrology, hydraulics, seismology, geology, concrete technology and turbines designed to operate in sediment laden water.
- A dam break risk assessment will be undertaken in alignment with the approach recommended by the International Commission on Large Dams (ICOLD). Risk reduction measures will be integrated into the design to ensure that the overall risk of dam break is tolerable as per ICOLD risk acceptability criteria.
- An Emergency Response Plan including a dam failure or gate failure/malfunction will be prepared and include flood modelling of the worst-case scenario.
- A comprehensive Dam Safety and Operation Manual will be developed and maintained. The manual will meet the World Bank's Dam Safety Policy concerning the design, construction, operation and maintenance of the Project and downstream users.
- Dam inspection and maintenance procedures will be developed and implemented to ensure the integrity of the Project structures and equipment as per ICOLD guidelines.

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9 GHG Assessment and Climate Resilience

9.1 GHG Emissions

Construction Greenhouse Gas (GHG) emissions represent 244,187 t/year of equivalent carbon dioxide (CO_2e). The reservoir emissions (averaged over 100 years) represent 102,216 t/year. The average annual combined construction and reservoir emissions (over 100 years) represent 2.80 gCO_2e/kWh, which is low compared to typical values for hydropower projects reported by the Intergovernmental Panel on Climate Change. The national GHG emission intensity (tCO_2e/MWh) has been calculated for the situation with and without the Project. Implementing the project in place of producing the power with Rwanda's current energy mix will reduce Rwanda's GHG emissions by 320,000 tCO_2e per year. When considering the current GHG emission intensity of the energy mix in Burundi, DRC and Rwanda together, GHG emissions are reduced by 780,000 tCO_2e per year. The Project would therefore contribute positively to efforts to reduce GHG emissions. The Project will explore the opportunities to benefit from carbon credits.

9.2 Climate Resilience

A Climate Change Resilience study that follows the Hydropower Sector Climate Resilience Guide published in 2019 by the International Hydropower Association (IHA) was undertaken as part of the Project's Feasibility Study. The assessment concludes that the most plausible scenario is for only small changes in river flow (<1%) because although there is an increase in precipitation and temperature, there is also an increase in evaporation from Lake Kivu and evapo-transiration. However, it is also plausible that river flow may be altered in the range of - 7% to +6% in the near-term and -10% to +13% in the long-term. The magnitude of the 100-year flood is expected to increase by 23% in the near-term and 43% in the long-term. The Project design was therefore revised to increase the capacity of the spillway.

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10 Public Consultations and Public Disclosure

Public consultation and public disclose will take place as part of the ESIA permitting process as the Project moves forward. Stakeholder engagement that has been undertaken so far comprised actions in 2010 when the Project was initially developed and then 2020/2021 when the Project re-started after a period of hiatus. In 2010 meetings were held with institutional stakeholders in Burundi, Rwanda and DRC (including Ministries of Environment, Ministries of Energy, local authorities, and NGOs). Scoping workshop was held with EGL. Information and consultation sessions were held in localities affected land acquisition. Resettlement committees of project affected people were established and Project information provided to potentially affected communities and local authorities. In 2020, 2021 workshops were held with administrative stakeholders and population potentially affected by land acquisition. During the qualitative socio-economic survey in 2022 (conducted as part of the ESIA baseline surveys) villagers raised a number of concerns about the land acquisition process and the consequences that this may have on their livelihoods. The constraints mentioned by the consulted populations were: fear that (i) they would be unable to afford buying new land after the losses due to land acquisition, (ii) men would take control of the money from compensation (expressed by women only, (iii) that compensation money would not cover the costs of moving away, finding new land and either re-building a house or cultivating new crops, (iv) of being left with the least fertile lands, (v) of losing income while trying to find new lands to cultivate, (vi) of their house or part of their field not being counted (especially the 50 m riverside stretch that they are not allowed to cultivate on).

Stakeholder consultation on the biodiversity protection measures proposed in the framework Biodiversity Action Plan (in ESMP) still need to be undertaken with relevant communities, authorities, and NGOs, to confirm the measures. The measures are, however, considered feasible and it is proposed that this will be done post financial close in order to avoid raising expectations in advance of the project.

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11 Environmental and Social Management

11.1 Management during Construction

Environmental and Social (E&S) management of the construction of the Project facilities is the responsibility of REL, who will delegate to the EPC Contractor the implementation of the E&S measures relating to the construction works. E&S specifications that form part of the EPC Contract have been prepared and which include the measures and objectives for E&S management. REL will monitor the EPC Contractor's E&S performance during construction.

The measures for E&S management are provided in Vol. III Environmental and Social Management Plan (ESMP), and the main components and topics and sub-plans to be prepared by the EPC Contractor are listed in the table below.

ESMP Component	Key topics	Sub-plans to be prepared by the EPC Contractor
Management systems, monitoring and reporting	• Requirements of the management system • Human resources, qualifications, training • Data management system • Monitoring equipment • Reporting	• Construction ESMP (C-ESMP) • E&S Monitoring plan •
Ecology	• Requirements of the management plan • Wildlife protection • Ecological clerk of works • Terrestrial alien invasive species	• Biodiversity awareness plan • Terrestrial alien invasive plant management, monitoring and control plan
Environmental flow	• Requirements regarding maintaining river flow continuity • Monitoring river flow and sediment during construction works • Installation of river flow and sediment monitoring equipment required for the operation phase	•
Pollution prevention and control	• Requirements of the management plan • Wastewater discharges • Worksite runoff • Tunnel seepage water • Sediment ponds • Monitoring	• Pollution prevention and control plan
Waste management	• Requirements of the management plan • Segregation of waste • Waste register • Recycling • Temporary storage • Management of non-hazardous waste • Management of hazardous waste	• Site waste management plan
Management of hazardous substances	• Transport • Handling and storage • Refuelling • Spill clean-up	• Hazardous substance handling and storage management plan • Spill contingency plan
Management of vegetation clearing	• Requirements of the management plan • Management of green waste • Clearing methods • Floating vegetation debris in the reservoir during filling	• Vegetation clearing and debris management plan
Soil and erosion control	• Requirements of the management plan • Planning of earthworks • Management of topsoil	• Soil, slope stability and erosion control plan

ESMP Component	Key topics	Sub-plans to be prepared by the EPC Contractor
	• Stormwater drainage • Silt fences • Erosion control on steep slopes • River-channel works	
Material management and spoil disposal management	• Excavation of materials • Spoil disposal • Non-waste spoil • Treatment and reuse	• Materials management plan • Spoil disposal plan
Management of atmospheric emissions and dust	• Requirements of the management plan • Dust suppression measures	• Air quality and emissions management plan
Management of noise and vibration	• Requirements of the management plan • Noise reduction measures	• Noise and vibration control plan
Quarry and borrow area management	• Requirements of the management plan	• Quarry and borrow area management plan
Site reinstatement	• Requirements of the reinstatement plan • Landscaping and revegetation	• Site reinstatement plan
Cultural heritage and chance find procedure	• Requirements of the plan and procedure • Human resources • Protection measures	• Cultural heritage and chance find procedure
Management of community grievances	• Process for management of community grievances • Responsibilities	-
Management of land acquisition	• Process for management of land acquisition • Responsibilities	-
Traffic management	• Requirements of the management plan • Public information • Traffic safety requirements	• Traffic management plan
Management of community health and safety	• EPC Contractor's support for community health and safety planning by REL • Reservoir filling • Reservoir access and access restrictions • Public safety booms, alarms, signage • Flood management • Groundwater • Requirements for emergency response	• Reservoir filling plan • Flood management plan • Emergency response plan
Local recruitment and skills development	• Requirements regarding recruitment policy, targets, local content and recruitment process • Requirements regarding human resources policy, including policy on working conditions • Requirements for the local skills development programme • Requirements for the worker grievance mechanism • Requirements for the demobilisation plan	• Recruitment policy • Local skills development programme • Human resources policy • Worker grievance mechanism • Demobilisation plan
Management of occupational health and safety	• Requirements of the management plan • Requirement for health, safety and hygiene at worker accommodation camps (food, water supply, sanitary conditions, health/medical resources • Safety resources • Personal protective equipment • Storage and use of explosives • Management of fire and explosion hazards • Emergency response • Security	• Occupational health and safety plan
Management of primary suppliers	• Requirements for compliance with REL's supply chain policy which aligns with of World Bank ESS2: Labour and Working Conditions, EIB ESS 8 – Labour Rights and ESS6: Biodiversity Conservation and Sustainable	-

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ESMP Component	Key topics	Sub-plans to be prepared by the EPC Contractor
	Management of Living Natural resources. Particular attention made to risk of child labour, forced labour, human rights, safety and impacts on biodiversity.	
Emergency preparedness and response	• Requirements for the emergency response plan • Informing the public • Hazards present during construction	• Emergency response plan

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11.2 Management during Operation

Environmental and Social (E&S) management of the operation of the Project facilities is the responsibility of REL. The measures for E&S management are provided in Vol. III Environmental and Social Management Plan (ESMP), and the main components and topics and sub-plans to be prepared are listed in the table below.

ESMP Component	Key ESMP sub-components	Key sub-plans and strategies to be prepared by REL
Environmental and social management system	• System development: policies, procedures, complementary studies, compliance execution plan, • System implementation: resource scheduling, human resources, training, coordination with government agencies, reporting and communication • E&S technical assistance: recruitment of E&S technical assistants and Independent Panel of Experts on Environmental and Social Safeguards	• Compliance execution plan • Code of conduct • E&S policy • Community investment plan
Management of change procedure	• Screening • Assessment and approvals • Public disclosure	-
Detailed design and E&S surveillance of construction works	• Review of sediment management programme • Review of detailed design to check alignment with ESIA • Environmental supervision of construction works • Management of third-party labour risks	-
Community health and safety	• Construction health and safety: community health awareness, STDs, noise, dust, traffic, reservoir clearing, reservoir triggered seismicity • Community health and safety around and downstream of the reservoir: waterborne diseases, support for local health care centres, public awareness, warning systems, access restrictions, operational procedures, hydro-meteorological monitoring systems • Draft Emergency preparedness plan	• Community health and safety plan • Emergency preparedness plan • Community waterborne disease strategy • Public safety plan • Emergency preparedness plan
Influx management	• Planning and monitoring: influx management strategy, stakeholder engagement, monitoring framework and response plan • Anticipating and managing project-induced in-migration: measures for minimising influx, and social conflicts, planning for infrastructure services and utilities, • Addressing potential negative impacts: benefit sharing	• Final influx management strategy
Historically marginalised people	• Background • Structure and contents of the historically marginalised people development plan • Identification and assessment of specific vulnerabilities • Avoidance, minimisation and mitigation of any specific Project impacts • Engagement in a culturally appropriate way • Access to benefits and positive opportunities	• Historically marginalised people development plan
Reservoir zoning	• Requirements for the zoning plan	• Reservoir zoning plan
Alien invasive species management	• Requirements for the management plan • Measures for prevention of aquatic weeds, management of the development of aquatic weeds and measures for the removal and disposal of aquatic weeds	• Alien invasive species management plan
Biodiversity action plan	• Quantify residual habitat losses for detailed design plan • Stakeholder engagement (communities, relevant institutions, NGOs) • Expand biodiversity action plan to detail strategies for biodiversity offsetting for no net loss and net gain • Implementation plan for agreed biodiversity protection and enhancement measures, Roadmap for preparing a full biodiversity action plan	• Biodiversity Action Plan • Detailed monitoring plan

ESMP Component	Key ESMP sub-components	Key sub-plans and strategies to be prepared by REL
	•	
Environmental flow management	• Operative procedures and adaptive management • Minimum flow requirements in the dewatered reach • Flow regime variation management in the hydropeaking reach • Sediment management • Engagement with key local stakeholders (other HEPPs, river basin management authorities (e.g. ABAKIR)	• Reservoir and powerhouse operating procedures
Management of accumulation of domestic waste in the reservoir	• Background • Roadmap for preparation and implementation of the plan for the management of accumulation of domestic waste in the reservoir	• Plan for management of accumulation of domestic waste in the reservoir
Reservoir fisheries management programme	• Background • Fisheries management plan • Alien fish management • Delivering fisheries management plan initiatives • Roadmap for preparation and implementation of the plan	• Reservoir fisheries management programme
Institutional capacity building	• Engagement of institutional stakeholders • Assessment of capacity and needs of institutional stakeholders • Development of a capacity strengthening plan • Implementation of the Capacity Strengthening Plan • Monitoring and Evaluation of the Capacity Strengthening	• Capacity strengthening plan

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11.3 Environmental and Social Monitoring Programme

A summary of the key elements of the monitoring programme are as follows:

Parameter	Description	Phase*	Responsibility
Environmental performance of the EPC Contractor	Project standards and non-conformities will be managed through a non-conformity management process	C	REL
Physical environment			
Ruzizi River flow rate	Upstream and downstream of proposed Ruzizi III reservoir	O	REL
Water quality	Ruzizi III reservoir and downstream	F, O	REL
Suspended sediment concentration	Ruzizi River waters upstream of the coffer dam, continuous monitoring	C	REL
Noise levels	To demonstrate compliance with WHO and DRC/Rwanda noise guidelines	C	EPC Contractor
Effluent quality	Discharged wastewater from construction worksites to check conformity with DRC/Rwanda and IFC General EHS Guideline discharge limit values	C	EPC Contractor
Groundwater quality	At construction worksite	C	EPC Contractor
Soil erosion	At construction worksites to check effectiveness of control measures. Weekly	C	EPC Contractor
Sediment	Sediment deposition in the river channel downstream of the dam. before and after venting/sluicing events	O	REL
	Volumes and particle size, and suspended sediment particle size of sediment deposited in the Ruzizi III reservoir	O	REL
	Physical dimensions and sediment characteristics of the river channel downstream of the dam	O	REL
Ecology			
Aquatic biomonitoring	Downstream and upstream of the Ruzizi III dam, starting at least one year prior to start of construction	C, F, O	REL
Fish	Ruzizi River upstream and downstream of the Ruzizi III dam, including representative reaches in Burundi. Starting one year prior to start of construction and continuing until fish community stabilises or results confirm extent of impact.	C, F, O	REL
Invasive alien species	Terrestrial alien invasive species along the TL wayleave and in project footprints and restoration areas, until alien species encroachment under control	O	REL
	Aquatic alien invasive species in the Ruzizi III reservoir and downstream.	F, O	REL
Fauna	Occurrence of dangerous wildlife (snakes, hippos, crocs) in the Project Area (which may pose a risk to local residents (and contractors)	C, O	EPC Contractor
Social			
RAP implementation	External monitoring of RAP implementation. Duration of 3 years following payment of compensation. Performed by an Independent RAP consultant	C	REL
Community Health	Implementation of Community Health Management by the EPC Contractor	C	REL
	Evolution of the prevalence of malaria and schistosomiasis by consulting the records at local health centres located in the communities near the reservoir	O	REL
	Monitor implementation of the Influx Management Strategy actions by the EPC Contractor	C	REL
* C=Construction, F=Reservoir Filling, O=Operation			

11.4 Budget

A summary of the Components of the ESMP to be implemented by REL are presented in the following table.

Plan	Component	Construction	Operation per year	
		52 months	First 3 years	>3 years
Environmental and Social Management System	ESMS 1.- System Development	-	-	-
	ESMS 2.- System implementation	$100,000	$50,000	$78,000
	ESMS 3.- Environmental and Social Technical Assistance	$500,000	$75,000	-
Management of Change Procedure	MCP 1.- Screening	$150,000	-	-
	MCP 2.- Assessment and approvals	$300,000	-	-
	MCP 3.- Public disclosure	$25,000	-	-
Detailed Design and Environmental and Social Surveillance of Construction Works	SURV 1.- River Engineering Feasibility studies & Sediment Management Programme	$300,000	-	-
	SURV 2.- Review of detailed design in line with E&S considerations	-	-	-
	SURV 3.- Environmental supervision of construction methods	-	-	-
Community Health and Safety	CHS 1.- Construction Health & Safety	$150,000	-	-
	CHS 2.- Community health and safety around and downstream of the reservoir	$ 500,000	$400,000	$50,000
	CHS 3.- Emergency Response Plan	$250,000	$50,000	$25,000
Influx Management	INF1.- Planning and Monitoring	$75,000	$25,000	-
	INF2.- Anticipating and managing Project-induced In-migration	-	-	-
	INF3.- Addressing potential negative impacts	$500,000	$ 50,000	$25,000
Historically Marginalised People Development Plan	HMPDP 1. – Targeted Social Impact Assessment	Included in the LADP budget*		
	HMPDP 2. – Historically Marginalised People Development Plan			
Reservoir Zoning	RZF 1.- Reservoir zoning	$50,000	$25,000	
Alien Invasive Species	AIS 1.- Aquatic weed management	$350,000	$50,000	$50,000
	AIS 2.- Alien fish management	$25,000	$50,000	$ 5,000
Biodiversity Action Plan	BAP1. - Bird deflectors and anti-electrocution devices	$50,000	$5,000	$5,000
	BAP2. - Sub-catchment protection & habitat restoration	$750,000	$250,000	$150,000
	BAP3. – Fish monitoring and protection	$360,000	$250,000	$250,000
Environmental Flow Management	EFMP 1.- Operating Procedures and Adaptative Management	$50,000	$170,000	$25,000
	EFMP 2.- Minimum flow during Reservoir filling or Maintenance	-	-	-
	EFMP 3.- Flow Regime Variation Management in the Hydropeaking Reach	$500,000	$50,000	$25,000
	EFMP 4.- Sediment Management	$100,000	$50,000	$25,000
	EFMP 5.- Engagement with Key Stakeholders (other HEPPs/ABAKIR)	$25,000	$25,000	$25,000
Management of Reservoir Trash	MRT 1. Management of Reservoir Trash	$100,000	$500,000	$250,000

Plan	Component	Construction	Operation per year	
		52 months	First 3 years	>3 years
Fisheries Management Programme	FMP1 – FMP preparation and update		$30,000	$30,000
	FMP2 – Alien fish species management	$25,000	$50,000	$25,000
	FMP3 – Delivering FPM initiatives		$80,000	$80,000
Monitoring	MON 1.- Hydrology, Environmental Flow and Water Quality	$200,000	$50,000	$25,000
	MON 2.- Reservoir and River Geomorphology and Sediment	$200,000	$150,000	$50,000
	MON 3.- Fish & Aquatic invertebrates	$160,000	$60,000	$60,000
	MON 4.- Bird Monitoring for Transmission Line Operation	-	$25,000	$25,000
	MON 5.- Land use and Revegetation Progress	$100,000	$50,000	$25,000
	MON 6.- Fishery Activity	$100,000	$25,000	$25,000
	MON 7.- Socioeconomic Monitoring	$100,000	$50,000	-
	MON 8.- Project-induced in-migration and local inflation	$75,000	$25,000	-
	MON 9.- Reporting and public disclosure	$75,000	$15,000	-
Monitoring Contracting States	Monitoring of E&S Conditions in the Environmental Permit	To be defined by REL		
TOTAL		$6,220,000	$2,635,000	$1,228,000

The budget for the implementation of the RAP is estimated to be US$21,192,600

*A provision of US$30,000,000 is included for a Local Area Development Plan (LADP) (US$10,000,000 for each Contracting State).

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11.5 Responsibility of Government Agencies

11.5.1 Land Acquisition, Involuntary Resettlement and Compensation

A Joint Implementation Unit (JIU) formed by the Contracting states, EGL and REL will acquire the private lands and land rights required for the Project, in accordance with the project's Resettlement Action Plan (RAP). Once the RAP budget is approved by the JIU, each contracting State will provide its share of the funds necessary for the implementation of the RAP by REL.

11.5.2 Monitoring of E&S Conditions in the Environmental Permit

The Environmental Permit issued by environmental authorities in DRC and Rwanda will include a number of conditions associated with Project Activities. The environmental authorities will supervise the effective compliance of the Project with these conditions during the construction and operation periods, including verification of the Project's progress and monitoring reports, review of project documentation and ensure compliance with condition listed in the permits, and regular monitoring site inspections.

11.5.3 Validation of Environmental Flow Management

The Lake Kivu Ruzizi River Basin Authority (ABAKIR) will review the proposed environmental flow management for the Project and approve or amend its content.

11.5.4 Development of the Ruzizi Hydropower Cascade Management Plan

EGL will prepare a Cascade Management Plan for the optimised operation of the hydropower schemes on the Ruzizi River, including Ruzizi-I, -II, -III and -IV. The plan will define modes of operation to ensure hydropower schemes operate in a coordinated manner to: optime power generation, optimise sediment management, ensure that environmental flows are released as per agreements with ABAKIR and environmental authorities, minimising health and safety risks for local communities. The plan will include monitoring and adaptive management measures, mechanism for coordination with ABAKIR and other institutional stakeholders, stakeholder engagement plan, and reporting (power generation, environmental and social performance, hydrological conditions).

11.5.5 Other Basin-Wide Studies and Initiatives

11.5.5.1 Development of a Comprehensive Basin-Wide Cumulative Impact Assessment

It is an expectation of the lenders supporting the Ruzizi III Project that a Comprehensive Basin-Wide CIA in alignment with the IFC's CIA Good Practice Guidebook (IFC, 2013) is undertaken. The ESIA recommends that EGL coordinate with the Contracting States and ABAKIR to identify funding for an International Consultant to undertake the comprehensive CIA.

11.5.5.2 Ongoing Basin-Wide Plans and Programmes

It is an expectation of the lenders supporting the Ruzizi III Project that several basin-wide studies are initiated. It is noteworthy that in the frame of an objective to develop a future Integrated Water Resources Management Plan, the River Basin Authority (ABAKIR) has prepared as Strategic Action Plan (SAP) for the basin including several subplans and components that address cross-cutting issues which are of interest for the Ruzizi-III Project, which include: (i) pollution prevention and waste management of Lake Kivu, Bukavu Basin and Ruzizi River, (ii) reduction of soil erosion at basin level, (iii) biodiversity preservation at basin level, (iv) institutional capacity building, (v) support for ABAKIR, (vi) enhancing regional and national cooperation, and (vii) improvement of water quality, environmental and economic services and practices of Lake Kivu through improved transboundary cooperation.

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12 Conclusion

The ESIA identifies and assesses the Project's key environmental and social challenges, which are principally related to physical and economic displacement, alterations to the Ruzizi River flow regime and the impact on fish, and loss of some natural habitat. The project AoI in the upper and middle Ruzizi River is assessed as severely modified over the past 50 years by the hydropeaking mode of operation of the Ruzizi-I and -II hydroelectric power schemes that are situated upstream. However, five fish species (3 migratory and 2 threatened fish) potentially qualify for critical habitat although abundance is low or not confirmed, and any project impacts on these and other fish species can be adequately mitigated to a non-significant level.

The ESIA includes a Resettlement Action Plan for the main project components, excluding quarries and borrow areas, and a Resettlement Policy Framework for the quarries and borrow areas. AN Environmental and Social Management Plan has been prepared that set out the plans for the management of environmental and social impacts and risks.

The ESIA has assessed the Project’s environmental and social risks and concludes that residual impacts can be reduced to an acceptable level if all mitigation and monitoring and adaptive management measures area applied.

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