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# **The Project for Construction of the Karuma Bridge**

## **Environmental and Social Impact Assessment**



(August 2024)

**Uganda National Roads Authority  
(UNRA)**

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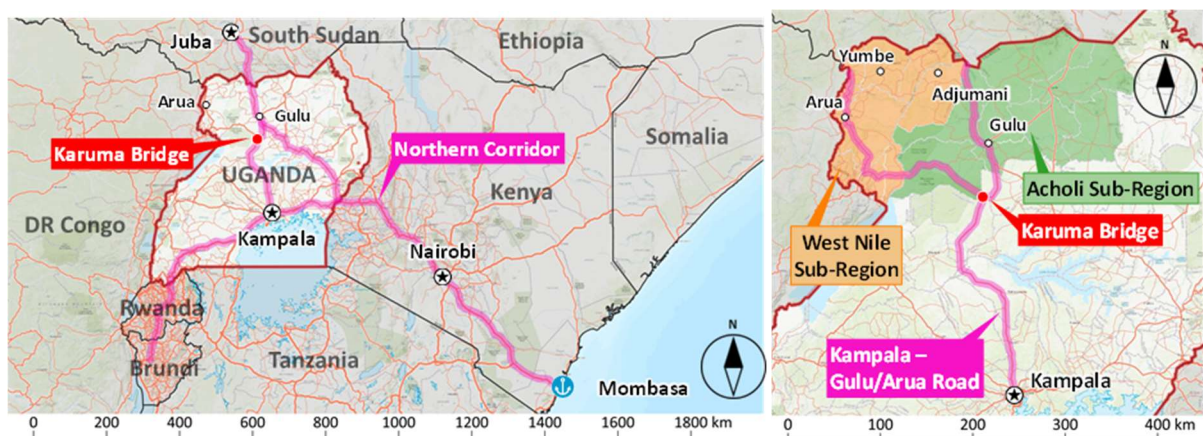
# The Project for Construction of the Karuma Bridge

## Environmental and Social Impact Assessment

### EXECUTIVE SUMMARY

#### 1. Background

The current Karuma Bridge spans the Victoria Nile near Karuma Falls at GPS coordinates (WGS 84). UTM 36N 415416mE 247918mN as shown in Figure-1. It lies on the Kampala-Gulu/Arua Highway, which is part of the Northern Corridor, an important interior transit route for goods and services, as well as connecting East and Central African countries to the Port of Mombasa and South Sudan. The new Karuma Bridge is being proposed at a time when the current Karuma Bridge was built in 1964 and has since deteriorated due to cracks, sections with exposed reinforcing bars in concrete members, and corrosion of steel bridge elements. Furthermore, the old bridge's approach roads pose considerable safety concerns due to bad road geometry, notably due to the steep gradients and sharp curve alignments. As a result, the bridge's traffic capacity is greatly reduced, with traffic accidents such as trucks falling off the bridge into the river.



Source: JICA Survey Team

**Figure-1 Project Location Map**

Against this backdrop, the Government of Uganda requested financial assistance from the Government of Japan for the construction of a new bridge at Karuma. In response to this request, JICA commissioned a survey to formulate the scope of work and make the necessary arrangements for the new Karuma Bridge's construction under Japan's Grant Aid.

However, the nature of the construction of the New Karuma Bridge project falls under the Fifth Schedule of the National Environment Act 2019 section 1 (a) (i), and Schedule 10 section (1) (a...p) for the projects where environment and social impact assessment (ESIA) is mandatory. In addition, the project is also classified as Category A under the JICA Guidelines for Environmental and Social Considerations 2010, for the "projects located in or near sensitive areas" and require the preparation of an environmental impact assessment.

Therefore, this Environmental and Social Impact Assessment has been prepared to meet both the Japanese and Ugandan government requirements for environmental and social impact assessment.

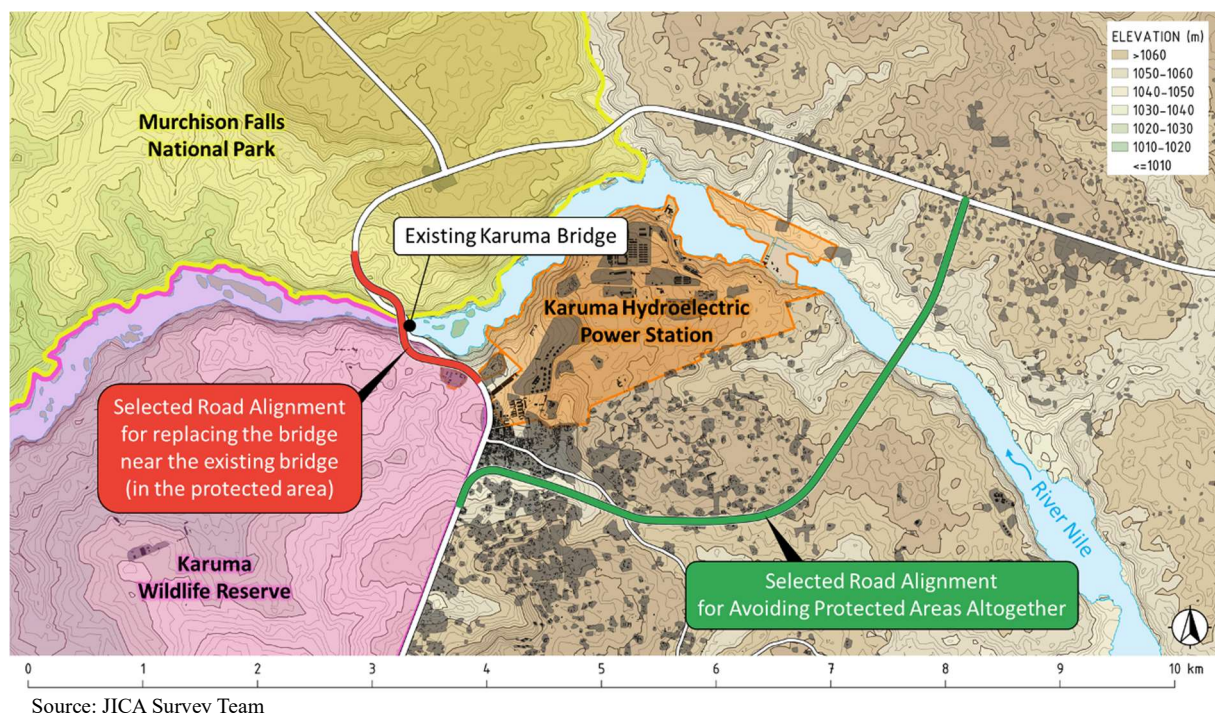
The ESIA (2024) for the New Karuma Bridge has been prepared in line with Ugandan relevant laws and the “JICA Guidelines for Environmental and Social Considerations (April 2010)” (hereinafter referred to as “JICA GL”). In addition, mitigation measures and monitoring plans of the ESIA (2016/2018) have also been taken into account in the ESIA 2024.

In terms of the major gaps, it is noted that all analysed items in ESIA (2024) covered items of ESIA (2016/2018), however, the major differences were conducting two seasons of on-site surveys on water quality and ecosystem which were requested by the external advisory committee of Japan International Cooperation Agency (hereinafter referred to as “JICA”) in accordance with JICA GL. In addition, the JICA GL prescripts that quantitative forecasts on air quality, water quality, and noise & vibration should be done.

## 2. Alternative Analysis on Bridge Location and Approach Road Route

The current Karuma Bridge is located in the edge of protected areas such as Murchison Falls National Park (MFNP) and Karuma Wildlife Reserve (KWR), thus alternative analysis on the bridge location and approach roads has been conducted which is required by JICA GL. This alternative study was analysed not only in terms of cost, construction time and runnability, but also in terms of the natural and social environment, as well as the opinions of the local population through local stakeholder meetings.

Table-1 shows the results of the comparative evaluation of i) not implementing the project, ii) avoiding the protected area altogether and iii) replacing the bridge near the existing bridge (in the protected area). For the following reasons, it was concluded that there are no feasible alternatives for project implementation outside the protected area and that replacing the bridge in the vicinity of the existing bridge (in the protected area) is appropriate.



**Figure-2 Comparison of Bridge Locations Outside and within Protected Areas (alternative Analysis)**



**Table-1 Comparison of Bridge Locations Outside and within Protected Areas**

		Without Project Case	Route Avoiding Protected Area (Alternative 1 outside protected area)	Route near the existing bridge (Alternative 1 within protected area)	
Project Size (Road with Bridge Length)	-		Total Length: 6,100m Bridge Length: 620m Road Length: 5,480m	Total Length: 1,700m Bridge Length: 240m Road Length: 1,460m	
Driveability	-		The road accessibility for nearby residents will be reduced due to the increased travel distance of approximately 7 km from Karuma Town to Kamdini Sub-County on the opposite bank of the river. There are many issues in terms of traffic flow and operation at the intersection.	By constructing a new bridge near the current bridge, the travel distance from Karuma Town to Kamdini Sub-County will be almost the same as the current distance. The accident-prone road alignment of the current road will be improved by the construction of the new bridge, which will improve driving safety and comfort. In terms of traffic operation, there are no issues with the replacement of the new bridge and traffic switching.	○
Impact of Natural Environment	Cutting tree/Wastes	-	App. 2ha (Mainly Secondly Forest and Fruits Trees)	App. 2.9h (Natural Forest)	▲
	Ecosystem of the Protected Area	-	There will be no alteration within the protected area, but approximately 16 hectares will be altered. In the River Nile, hippopotamuses and Nile crocodiles are also likely to be affected due to the installation of piers in the river. However, in other terrestrial areas, wildlife from the protected area will be controlled with the installation of anti-encroachment trenches at the boundary of the protected area, and it is assumed that there will be little impact on wildlife such as African elephants, hippopotamuses, and African crocodiles.	About 2.9 ha of alteration within the protected area will occur. The proposed project will not significantly affect hippopotamuses and Nile crocodiles because no piers will be installed in the River Nile and the bridge location is difficult for hippopotamuses and Nile crocodiles to use due to the narrow width of the river and the high velocity of the current in the river. On the other hand, the terrestrial area is part of the activity zone of hippopotamuses, African elephants, and African water buffalo, and may affect some of the feeding areas of these species.	▲
	Green House Gases (CO2)	Restriction of traffic on the current bridge will increase the travelling distance by approximately 210 km and increase GHGs.	▲	The volume of greenhouse gases such as CO2 increases as the length of the road increases.	△
Impact of Social Environment	Land Acquisition and resettlement	-	Private Land Acquisition: 30 ha (Agriculture land, residential land) Resettlement: 60 structures *Large scale resettlement is expected	Land Acquisition: Non expected. Resettlement: Not expected.	△
	Loss of livelihood	Loss of livelihood and decrease of income for bender and commercial shops due to restriction of current bridge is expected.	▲	Loss of livelihood and decrease of income due to loss of agricultural land is expected.	△
				Loss of livelihood is not expected.	◎



		Without Project Case		Route Avoiding Protected Area (Alternative 1 outside protected area)		Route near the existing bridge (Alternative 1 within protected area)	
	Community Separation	The traffic restrictions on the current bridge will make it difficult to travel between the south and north banks, resulting in regional separation. Most of the residents of Karuma Town are from the Gulu area and regularly visit the Gulu area where their relatives live.	▲	Since the route passes through the towns of Karuma and Kamdini by road, community separation due to road maintenance is anticipated.	△	Since the new bridge and approach road will be constructed at the same location, community separation is not expected.	◎
	Traffic Accident post construction	Continued occurrence of traffic accidents, including personal injury, with possible negative impacts such as loss of life and cargo.	▲	The number of traffic accidents is expected to increase as the main road passes through a residential area.	△	Traffic accidents will be reduced compared to the current situation by improving the approach road alignment.	○
Construction Period	Land Acquisition and Resettlement	-		5 years Project delays due to land compensation process are expected.	▲	0 year (Land acquisition nor Resettlement is not necessary)	◎
	Construction	-		7.0 years Bridges over dam lakes require special foundation work and construction of large bridges such as cable-stayed bridges.	▲	2.7 years Materials and equipment can be brought in from the vicinity of the current Karuma Bridge to construct the bridge. Construction of a bridge of general scale.	○
Cost	Construction Cost	-		14.7 billion JPY (Construction Cost: 12.3 billion JPY) 96 million USD (Construction Cost: 80 million USD)	▲	4.5 billion JPY (Construction Cost: 3.8 billion JPY) 29.4 million USD (Construction Cost: 24.8 million USD)	○
	Maintenance Cost	-		2 billion JPY 13 million USD	△	0.8 billion JPY 5.2 million USD	○
	Economic Analysis (EIRR/2050)	-		EIRR:2.7%(<12%) unprofitable Commencement: 2035~	×	EIRR:20.6%(>12%) profitable Commencement: 2029~	◎
Reasons for Evaluation and Selection		Cannot be an option If the current Karuma Bridge is closed to traffic, it would have a tremendous impact on the flow of people and logistics from Kampala to northern Uganda and South Sudan and would not solve the road safety problem.		Not feasible for implementation Due to the significant negative impacts on agricultural land acquisition and resettlement, the project implementation will take time and cannot address the urgency of the current Karuma Bridge replacement, and the EIRR that will make the project feasible is not expected.		<b>Selected</b> It will pass through a protected area, will require tree cutting, and will have certain natural environmental impacts. However, the road alignment will pass through the vicinity of the current Karuma Bridge, thus the degree of impact can be expected based on current environmental issue on the current road. On the other hand, in the socio-environmental area, no impacts on land acquisition and resettlement are anticipated. In terms of business and economic feasibility, the route is significantly superior to the route outside the protected area, and the route inside the protected area was evaluated and selected as the superior route overall.	

Note: The impact was evaluated on a relative scale of ◎, ○, △, ▲, and ×.

Source: JICA Survey Team

### 3. Project Outline

#### (1) Project Outline

The infrastructures to be constructed is approximately 240m bridge and approximately 1460m approach road as shown below.

**Table-2 Project Outline**

Component	Structure Specification	Location
1. Approach Road	Kiryandongo side: 800 m Nwoya side: 660 m Total: 1,460 m	South (Left) Bank: Kiryandongo District North (Right) Bank: Nwoya District
2. Bridge	Bridge Length = 240 m Span arrangement: 40 m + 120 m + 80 m Structure type; Single Tower 3 span Extradosed PC Box Girder Bridge	

Source: JICA Survey Team



Source: JICA Survey Team

**Figure-3 Image of Karuma Bridge**

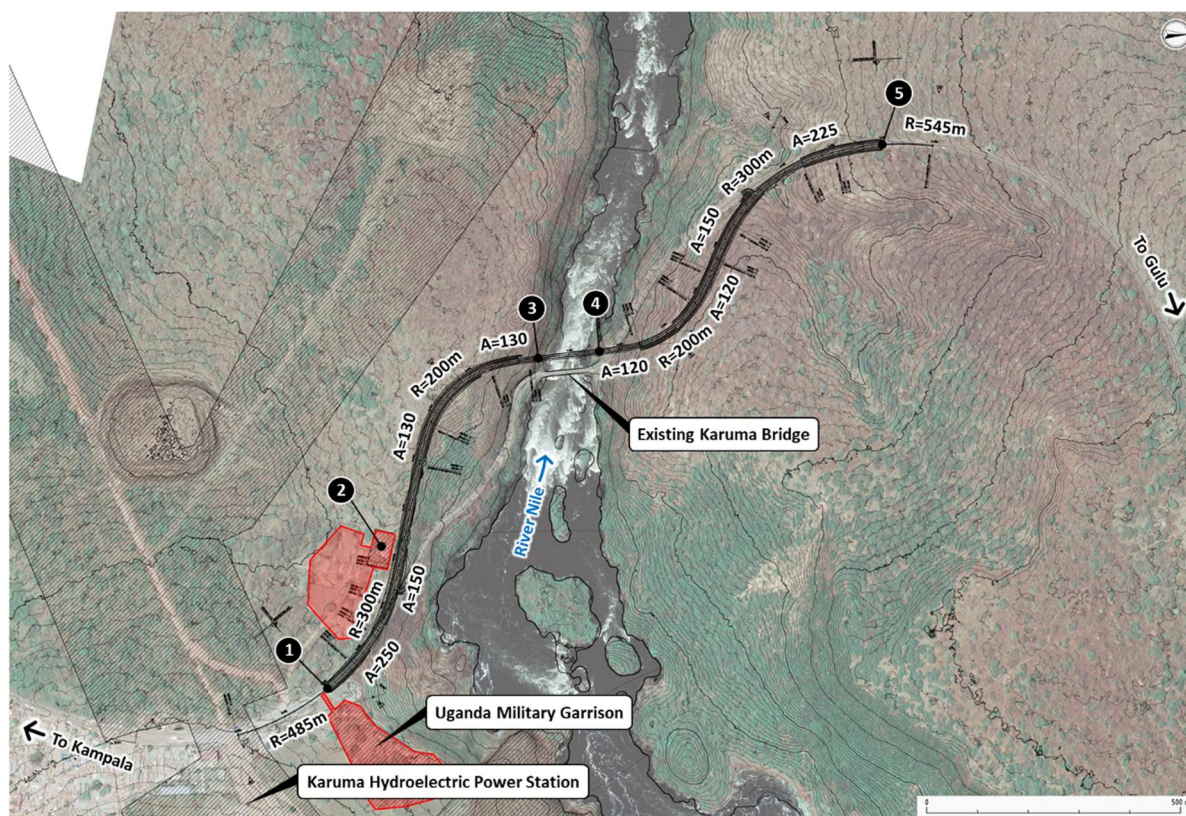
## (2) Road Design

The horizontal alignment of the approach roads to the Karuma Bridge was set considering the control points shown in Table-3.

**Table-3 Control Points for Horizontal Alignment Setting**

No.	Station	Control Point	Design Policy
①	0+000	Horizontal alignment of the starting point	Align with the centreline of the existing road.
②	0+550	KWR management office site	Ensure a separation of more than 20 m from the fence to the centreline of the road.
③	1+140	Location of Pier P1	Secure yard space necessary for the construction of the pier foundation.
④	1+260	Location of Pier P2	Secure yard space necessary for the construction of the pier foundation.
⑤	2+000	Horizontal alignment of the endpoint	Align with the centreline of the existing road.

Source: JICA Survey Team



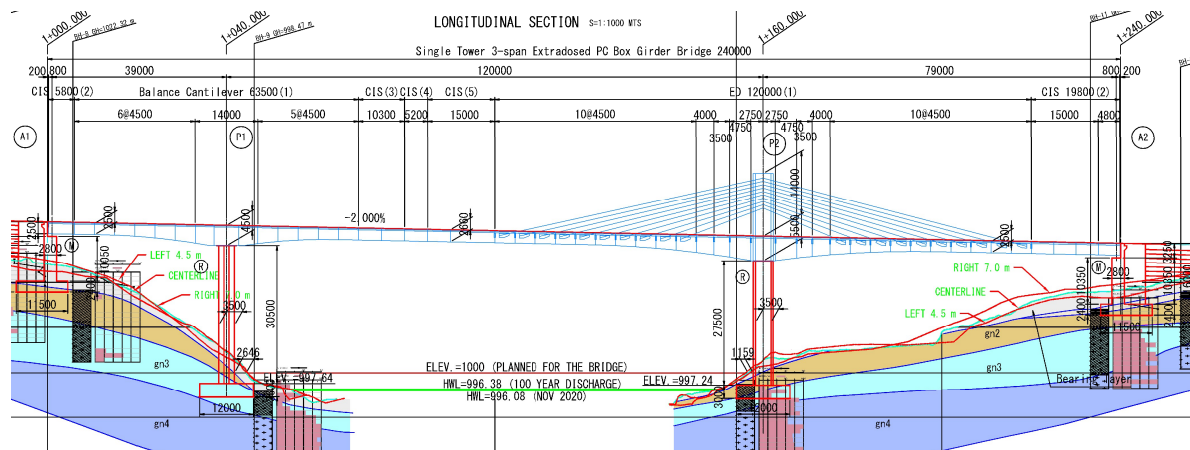
Source: JICA Survey Team

**Figure-4 Control Points for Horizontal Alignment Setting**



### (3) Bridge Design

As a result of the study on the appropriate bridge type for the road alignment selected above, the “**PC 3-span continuous box girder with extra-dosed bridge (40+120+80=240 m)**” was selected as the most suitable bridge type as shown **Figure-5**.



Source: JICA Survey Team

**Figure-5 Selected Bridge Type**

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#### **4. Legislative, Policy and Administrative Framework**

The ESIA was conducted following the relevant legislation, policy, plans and regulations.

- The National Environment Act 2019
- The National Environment (Environmental and Social Assessment) Regulations (2020)
- Uganda Wildlife Policy (2014)
- Wildlife Act (2019)

In addition, the ESIA has also been prepared following the JICA Guideline (2010)

#### **5. ESIA Process and Methodology**

##### **(1) Necessity of Preparation of ESIA (screening)**

The screening of the impacts was based on the Ugandan laws, and JICA Guideline (2010). Screening of potential project impacts was undertaken early in the development of the project, primarily through route option analyses, and

According to the National Environment Act (NEA) (2019) following conditions for the implementation of ESIA are described;

- i. Schedule 5 : 1(a) Construction of public roads not being community access roads, including (ii) Construction of flyovers
- ii. Schedule 10 : 1. Projects not listed in Schedule 6 and planned to be located in or near environmentally sensitive areas such as (b) areas declared by national law as protected areas

Thus, regardless of whether the alignment passes through protected areas, it is necessary to prepare ESIAS (Environmental and Social Impact Assessment Statement) following conditions in the Schedule 5.

Screening following JICA Guidelines for Environmental and Social Considerations 2010.

The project is classified as Category A because it falls under "projects located in or near sensitive areas" and requires the preparation of an environmental impact assessment following JICA Guidelines for Environmental and Social Considerations 2010.

##### **(2) Scoping**

The impacted items, factors, and degree of impact were done using the "Leopold Scoping Matrix" as summarised in (Table 5.2.1, and Table 5.2.2.) in the main ESIA report.

##### **(3) Baseline Survey and Forecast Methodology**

The survey was conducted according to impacted Items analysed in the scoping process in accordance with Ugandan relevant laws, JICA GL and other international environmental guidelines.

**Table-4 Survey Items and Methodologies on Baseline Survey and Forecast**

Category	No.	Impacted Item on JICA Guidelines and Uganda	Survey Item and Methodology	Forecast Methodology
Pollution	1	Air pollution	(1) Site measurement : 4 points (2) Item: 1)TSP, 2)PM10, 3)PM2.5, 4)Carbon dioxide (CO <sub>2</sub> ), 5)Carbon monoxide (CO), 6)Hydrocarbons, 7)Nitrogen oxides (NO <sub>x</sub> ), 8)Nitrogen dioxide (NO <sub>2</sub> ), 9)Sulphur dioxide (SO <sub>2</sub> ), 10)Sulphur trioxide (SO <sub>3</sub> ), 11)Smoke, 12)Soot (3) Methodology: follow relevant regulations in Uganda, if any (4) Frequency: One time (in dry season) Note: Collection of Secondary data, if any	Quantitative forecast Puff Model Or refer to other examples
	2	Water pollution	(1) Site measurement (3 points at proposed bridge point and each bridge (up/down stream) x <b>2 seasons (rainy and dry season)</b> = 6 measurements) WQ-1: Upstream of Karuma bridge, WQ-2: At current Karuma Bridge (2) Item: 1)BOD, 2)temperature, 3)E-coli form, 4)Total dissolved solids, 5)Total hardness(as CaCO <sub>3</sub> ), 6)Aluminium (Al), 7)Chloride (Cl), 8)Total Iron (Fe), 9)Sodium (Na), 10)Sulphate (SO <sub>4</sub> ), 11)Zinc (Zn), 12)Magnesium (Mg), 13)Calcium (as Ca), 14)Potassium (K), 15)Colour (TCUa), 16)Turbidity (NTU), 17)pH, 18)Conductivity (µS/cm), 19) Dissolved Oxygen (3) Methodology: follow relevant regulations in Uganda, if any (4) Frequency: Twice (rainy and dry season) Note: Secondary data collection, if any	Qualitative / Quantitative forecast
	3	Waste	(1) Site survey: Inquire of location of the registered/designated land fill site near project site. (2) Item: Summary of the site (3) Methodology: Interview and visual observation (4) Frequency: Once Note: Secondary data collection, if any	Qualitative forecast
	4 and 8	Soil contamination Sedimentation quality	(1) Site Survey: Excavation point 2 points SQ-1: South side on the alignment, SQ-2: North side on the alignment (2) Item: 1) Cadmium, 2) Hexavalent chromium, 3) Mercury, 4) Lead, 5) Arsenic, 6) Cyanide, 7) Selenium, 8) Fluorine, 9) Boron (3) Methodology: follow relevant regulations in Uganda, if any (4) Frequency: Once Note: Secondary data collection, if any	Qualitative forecast
	5	Noise and Vibration	(1) Site measurement: 7 points for Noise, 2 points for vibration (2) Item Ambient Noise: L <sub>Aeq</sub> , Continuous 24hr/weekday, traffic volume and speed Ambient Vibration: 24hr/weekday (3) Methodology: follow relevant regulations in Uganda, if any (4) Frequency: Once (in dry season, if possible) Note: Secondary data collection, if any	Quantitative forecast
	6	Ground subsidence	Not required.	-
	7	Odor	(1) Site survey: location of the base camp and Karuma TC. (2) Item: Condition of odour (3) Methodology: On-site survey (4) Frequency: Once (in dry season, if possible)	Qualitative forecast
Natural environment	9	Protected area	(1) Site survey: 500m each alongside of the bridge and approach road. Bird survey area is surveyed within 1km by using a telescope by point census. *Geographic map, River distribution map, vegetation map are surveyed for 5km range each from the bridge and approach road	Qualitative forecast
	10	Ecosystem	(2) Item: Fauna and flora, ecosystem, valuable species such as listed species on IUCN list Fauna: mammals, birds, reptiles, amphibians, aquatic life, insects Flora: Land plants and aquatic plant Especially following valuable species listed up from IUCN Red list shall be surveyed on their habitats such as feeding area, roosting area, breeding area and migration routes for 1)African Elephant, 2)Hippopotamus, 3)Buffalo and 4)Nile Crocodile (3) Methodology a) Fauna: On site survey (Transect Survey and other necessary method such as geometry survey, drone survey and fixed-point camera observation for mammals if necessary, Trace survey, interview survey, Point Census for Birds) b) Flora: On site survey (Transect Survey and other methodology) The observed coordinates for all observed IUCN species shall be recorded. c) Home range survey for valuable species (methodology as shown in a) d) Preparation of maps regarding with habitat category	



Category	No.	Impacted Item on JICA Guidelines and Uganda	Survey Item and Methodology	Forecast Methodology
			1) Geographic map: On site survey, literature survey (geographic map, satellite photo/ aerial photo etc.) 2) River distribution map (basin area): On site survey, literature survey (geographic map, satellite photo/ aerial photo etc.) 3) Vegetation map *1: On site survey, literature survey (geographic map, satellite photo/ aerial photo etc.) Remarks: Legends are classified by tropical high forest, woodland, bushland, grassland, seasonally wet grasslands, permanent wetlands (papyrus (including other sedges, reeds, and floating plants)), farmland, built up areas. *1 vegetation map are surveyed for 5km range each from the bridge and approach road. When creating a vegetation map within a 500m range, prepare a cross-sectional vegetation map by setting a quadrat for each classification of vegetation. (4) Frequency: One time (In dry and rainy seasons (Twice) but it must cover migration season of birds) Note: Secondary data collection, if any. Interview with wildlife specialists such as Makerere Univ., and/or UWA	
	11	Hydrology	Refer to hydrology survey results by JICA Survey Team(JST) (Flooding record survey, Hydrologic analysis)	← Ditto
	12	Topography and geology	Refer to Topography and geology survey by JST (topographic and geological survey)	← Ditto
Social environment	13	Involuntary resettlement	Not required. (But if land acquisition and resettlement for the development of new quarry and/or borrow pit sites are required, the additional surveys is necessary.)	Not required. (Qualitative forecast)
	14	Poverty group	Refer to the result of survey on No. 17 Local economy such as employment and livelihood	Qualitative forecast
	15	Indigenous and ethnic group	(1) Site Survey: Karuma Town Council, Diima Subcounty, and Kamdini Subcounty (2) Item: Census, tribe, and religion (3) Method: Social condition survey through interviews (250 samples) (4) Frequency: Once Note: Secondary data collection, if any	Qualitative forecast
	16	Local economy such as employment and livelihood	(1) Site Survey: Karuma Town Council, Diima Subcounty, and Kamdini Subcounty (2) Item: Census, income, expenditure, education, occupation, literacy, etc. (3) Method: Social condition survey through interviews (250 samples) and collection of statistical data (4) Frequency: Once Note: Secondary data collection, if any	Qualitative forecast
	17	Land use and utilization of local resources	(1) Site Survey: in/around MFNP and KWR (2) Item: Agricultural land use, fishing point, etc. (3) Method: Visual observation, interviews and collection and/or updating of the land use map (4) Frequency: Once Note: Secondary data collection, if any	Qualitative forecast
	18	Water usage	(1) Site survey: 500m range along the alignment and bridge (2) Item: - Clarification of river water utilization and well points - Water quality of underground water (pH, BOD, Total Coliform, Conductivity, Temperature and water level of well) (3) Methodology: Visual Survey and water quality analysis (4) Frequency: twice ( <b>Rainy and Dry Season, if there are any well in the 500 m range from project area</b> ) Note: Secondary data collection, if any	Qualitative forecast
	19	Existing social infrastructures and services	(1) Site survey: 500m range along the alignment and bridge (2) Item: Distribution of hospital, school, religious place, community centre, bus stop (bus terminal), etc. (3) Methodology: Visual observation, interviews and confirmation on map (4) Frequency: Once Note: Secondary data collection, if any	Qualitative forecast
	20	Social institutions such as social infrastructure and local decision-making institutions	(1) Site survey: 500m range along the alignment and bridge (2) Item: Distribution of houses, hospital, school, religious place, community centre, etc. (3) Methodology: Visual observation, interviews and confirmation on map (4) Frequency: Once Note: Secondary data collection, if any	Qualitative forecast

Category	No.	Impacted Item on JICA Guidelines and Uganda	Survey Item and Methodology	Forecast Methodology
	21	Unequal distribution of positive and negative impacts of the Project	(1) Site survey: Karuma Town Council, Diima Subcounty, and Kamdini Subcounty (2) Item: Inhabitants preference during public project (3) Methodology: Interview by local representatives and/or collection of opinion in stakeholder meetings (4) Frequency: Once	Qualitative forecast
	22	Local conflict of interests	Refer to the result of survey on No. 21 Unequal distribution of positive and negative impacts of the Project	Qualitative forecast
	23	Cultural heritage	(1) Site survey: 500m range along the alignment (2) Item: Distribution of cultural sites (including spiritual places and objects) and historical/ archaeological sites (3) Methodology: Interview and confirmation on site (including test pit excavation) (4) Frequency: Once Note: Secondary data collection, if any	Qualitative forecast
	24	Landscape	(1) Site survey: Inquire major site seeing points (2) Item: View and factor(s) of landscape (3) Methodology: Taking photograph with geotag (4) Frequency: Once (in Dry Season, if possible)	Photomontage
	25	Gender	(1) Site survey: Karuma Town Council, Diima Subcounty, and Kamdini Subcounty (2) Item: Current issues observed regarding gender gaps (3) Methodology: Interview with relevant organizations and collection of opinions in stakeholder meetings (4) Frequency: once Note: Secondary data collection, if any	Qualitative forecast
	26	Right of children	(1) Site survey: Karuma Town Council, Diima Subcounty, and Kamdini Subcounty (2) Item: Problems regarding children's right (3) Methodology: Interviews with relevant organizations and collection of opinions in stakeholder meetings (4) Frequency: once Note: Secondary data collection, if any	Qualitative forecast
	27	Infectious diseases	(1) Site survey: Karuma Town Council, Diima Subcounty, and Kamdini Subcounty (2) Item: Number of patients and mortal case of infection diseases (3) Methodology: Interview with relevant organizations and/or refer to social condition surveys (4) Frequency: Once Note: Secondary data collection, if any	Qualitative forecast
	28	Labor environment	(1) Site survey: Surrounding area of the existing Karuma bridge (2) Item: accident during construction (3) Methodology: Interview with relevant organizations and/or observation at construction area (4) Frequency: once Note: Confirmation of laws, regulations in Uganda and IFC standards regarding labors	Qualitative forecast
Others	29	Accident	(1) Site survey: Surrounding area of the existing Karuma bridge (2) Item: number and reasons of traffic accidents (3) Methodology: Interviews with police office and local authorities (4) Frequency: once Note: Secondary data collection, if any	Qualitative forecast
	30	Cross boundary impacts and climate change	Refer to Traffic forecast survey result by the JST (Number of construction machines, Traffic forecast survey result, emissions Intensity etc.)	Quantitative forecast (based on the length of approach road and bridge)

Source: JICA Survey Team

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## **6. Summary of Impact Forecast and Impact Evaluation with Mitigation Measures**

The results of the baseline survey, the forecasted impacts and the evaluation of impacts with implementation of mitigation measures for the items selected through scoping and predicted to be impacted by the project are presented in the table below.

Although there are expected to be some negative impacts on nature and society during construction as a result of project implementation due to negative impacts on ecosystems, dust and water quality from construction activities and the influx of small-scale external workers, these negative impacts are expected to be negligible. Furthermore, the implementation of mitigation measures will minimise those negative impacts. On the other hand, during construction, local residents are likely to be employed as construction workers, resulting in positive impacts on the local economy.

After construction, traffic accidents are expected to decrease as the approach road will be constructed to design standards with blackspots eliminated.



**Table-5 Summary of Baseline Data, Forecast and Impact Evaluations**

Area	No.	Impacted Item (Item in Ugandan Law: National Environment Regulations 2020)	Survey Item At Scoping (After Analysis)		Summary of Results		
			During Const	After Const	Baseline Survey Data based on the On-Site and/or Literature Survey	Impact Forecast and Evaluation (Quantitative/ Qualitative)	Impact Evaluation with Implementation of Mitigation Measures
Pollution	1	Air Pollution (Air Quality)	✓ (B-)	✓ (B-)	<p>1. Survey Point Air-1 : Along Kampala-Gulu Highway Air-2 : Within Karuma Wildlife reserve Air-3 : Within Karuma Wildlife reserve close to the Sino Hydro Power outflow Air-4 : Awooo cell, Central ward, Karuma Town Council, Kiryandongo district</p> <p>2. Survey Date : February 3rd to 6th, 2024</p> <p>3. Result of Measurement All data satisfied with Ugandan standards</p> <p>[Air-1] PM10 : 26 µg/m<sup>3</sup> (60) PM2.5 : 21 µg/m<sup>3</sup> (35) CO : 1.10 ppm (6) NO<sub>2</sub> : 0.0025 ppm (0.026) SO<sub>2</sub> : &lt;0.001 ppm (0.008)</p> <p>[Air-2] PM10 : 23 µg/m<sup>3</sup> (60) PM2.5 : 19 µg/m<sup>3</sup> (35) CO : 1.08 ppm (6) NO<sub>2</sub> : &lt;0.01 ppm (0.026) SO<sub>2</sub> : &lt;0.001 ppm (0.008)</p> <p>[Air-3] PM10 : 25 µg/m<sup>3</sup> (60) PM2.5 : 20 µg/m<sup>3</sup> (35) CO : 1.04 ppm (6) NO<sub>2</sub> : &lt;0.01 ppm (0.026) SO<sub>2</sub> : &lt;0.001 ppm (0.008)</p> <p>[Air-4] PM10 : 25 µg/m<sup>3</sup> (60) PM2.5 : 22 µg/m<sup>3</sup> (35) CO : 1.06 ppm (6) NO<sub>2</sub> : &lt;0.01 ppm (0.026) SO<sub>2</sub> : &lt;0.001 ppm (0.008)</p> <p>*Ugandan Standard: The National Environment (Air Quality Standards) Regulations (2024)</p>	<p>[During Construction] Exhaust gases, including CO, NO<sub>2</sub>, SO<sub>2</sub> and PM, are discharged from construction machines. However, this adverse impact is not serious because of the following reasons:</p> <ul style="list-style-type: none"> <li>Construction activities (sources) are limited to daytime.</li> <li>Dust generation is limited to periods of high winds and extreme dryness.</li> <li>The number of earthworks sections and construction machinery will be limited, so the contribution to air quality will be very small.</li> <li>There are no residential areas around the construction zone.</li> </ul> <p>[After Construction] 1. Location of Forecast Point Along Kampala-Gulu Highway, the boundary of ROW</p> <p>2. Forecast conditions (Traffic Volume) Small : 2,508 units/day Large : 1,728 units/day Total : 4,236 units/day Design Speed : 40km/h</p> <p>3. Forecasting method The Puff model</p> <p>4. Result of Forecast All forecasted values satisfied with Ugandan standards PM10 : 26.0322 µg/m<sup>3</sup> (60) CO : 1.1038 ppm (6) NO<sub>2</sub> : 0.0031 ppm (0.026) SO<sub>2</sub> : ≤0.00102 ppm (0.008)</p>	<p>[During Construction] Exhaust gases and dusts are generated during construction. However, the adverse impact is not serious because the residential area is away from the major earthwork area. Furthermore, mitigation measures such as sprinkling water and surface treatment is implemented when there is impaction of dust on the nearest residential and commercial areas. Thus, it is evaluated that the project does not give serious impacts on air quality.</p> <p>[After Construction] Air quality density will increase after construction due to the natural increase in traffic number in the future. However, air quality values on PM10, CO, NO<sub>2</sub> and SO<sub>2</sub> will increase slightly, and these forecasted values satisfy the relevant standards values. Thus, it is evaluated that the project does not give serious impacts on air quality.</p>
	2	Water Pollution (Water Quality)	✓ (B-)	✓ (D)	<p>1. Survey Point River Water-1 : River Nile at Upstream of Karuma HPP Dam Site</p>	<p>[During Construction] Impact of turbid water generated by earthworks during the construction (Standard value Uganda/Japan)</p>	<p>[During Construction] During construction, turbid water is caused by construction in the area. However, forecasted impact by</p>

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			During Const	After Const	Baseline Survey Data based on the On-Site and/or Literature Survey	Impact Forecast and Evaluation (Quantitative/ Qualitative)	Impact Evaluation with Implementation of Mitigation Measures
					<p>River Water-2 : River Nile at Karuma Bridge River Water-3 : River Nile at Outlet of the Karuma HPP</p> <p>2. Survey Date: Nov. 22nd, 2023 (Rainy season) and Feb. 5th, 2024 (Dry season)</p> <p>3. Result of Measurement Only Dissolved Oxygen at Survey Point-2 during rainy season survey is below Japanese standards. All other items satisfy the Uganda and Japanese standards. Rainy season/Dry season (Standard value Uganda/Japan)</p> <p>[River Water-1] pH : 6.5/7.4 (5.5-9.5/6.5-8.5) Turbidity : 4.2/3.1 NTU (25/-) TDS : 75/86 mg/l (1,500/-) SS : 13/17 mg/l (-/100) BOD : 3.0/2.0 mg/l (-/8) Conductivity : 107/123 µS/cm (2,500/-) DO : 5.5/7.0 mg/l (-/≥2) E-coli form : 210/310 CFU/100ml (-/-)</p> <p>[River Water-2] pH : 6.9/7.5 (5.5-9.5/6.5-8.5) Turbidity : 5.1/4.3 NTU (25/-) TDS : 72/85 mg/l (1,500/-) SS : 9/10 mg/l (-/100) BOD : 3.8/3.0 mg/l (-/8) Conductivity : 103/122 µS/cm (2,500/-) DO : 1.8/4.8 mg/l (-/≥2) <b>*Exceeding</b> E-coli form : 340/133 CFU/100ml (-/-)</p> <p>[River Water-3] pH : 6.7/7.0 (5.5-9.5/6.5-8.5) Turbidity : 4.8/4.7 NTU (25/-) TDS : 73/86 mg/l (1,500/-) SS : 12/15 mg/l (-/100) BOD : 5.0/3.0 mg/l (-/8) Conductivity : 104/123 µS/cm (2,500/-) DO : 2.8/4.0 mg/l (-/≥2) E-coli form : 45/21 CFU/100ml (-/-) *Uganda Standard value : Draft Portable waters standards as per the Uganda draft standard for portable water (2014)</p>	<p>Current SS : 10 mg/l (-/100) Forecasted SS : 10.10 mg/l (-/100, *1.01% increase) With regards to the impacts on organic polluted water from the base camp, such impact will be avoided and /or mitigated by appropriate management.</p> <p>[After Construction] As no offices or parking areas are planned for the project, no impacts from facilities related to the road are envisaged, as no polluted water will be discharged after the project is in service. On the other hand, if the Karuma Bridge becomes a new tourist attraction and more tourists stop in Karuma town, there is concern about an increase in general waste at viewpoints and commercial areas, and deterioration of water quality due to illegal dumping around the bridge.</p>	<p>the project is only 1%. In addition, there is no construction work in the river. Thus, it is assumed that such negligible impacts will not cause significant impacts in the downstream. Additionally, organic polluted water from labour camp site will be managed by contractor under observation of supervision consultant and the proponent. Thus, the impacts are prevented appropriately. Therefore, it is unlikely to give significant impacts on water quality during and after construction.</p> <p>[After Construction] As no offices or parking areas are planned for the project, no impacts from facilities related to the road are envisaged, as no polluted water will be discharged after the project is in service. On the other hand, if the Karuma Bridge becomes a new tourist attraction and more tourists stop in Karuma town, there is concern about an increase in general waste at viewpoints and commercial areas, and deterioration of water quality due to illegal dumping around the bridge.</p>

Area	No.	Impacted Item (Item in Ugandan Law: National Environment Regulations 2020)	Survey Item At Scoping (After Analysis)		Summary of Results		
			During Const	After Const	Baseline Survey Data based on the On-Site and/or Literature Survey	Impact Forecast and Evaluation (Quantitative/ Qualitative)	Impact Evaluation with Implementation of Mitigation Measures
	3	Waste	✓ (B-)	✓ (D)	<p>According to interviews with villagers, in the project area such as in Karuma Town Council and Kamdini Town Council, domestic waste management is either waste disposal into a compost pit, burned, or buried. The wastes are collected by designated tuku tuku operators and transported and disposed to the designated dumping site. However, the currently some wastes are illegally left along the road or illegally burned or dumped in the backyard of household randomly.</p> <p>Sewage and night soil is treated through septic tank and pit latrines. With regard to construction waste, such as waste soil, it is generally disposed of in the designated site such as borrow pit. For the concrete and cut trees, these can be used as construction materials in general. However, the cut trees inside of the MNFP and KWR are managed by UWA and mainly used as manure.</p>	<p>[During Construction] Waste generated in the Project Area Waste soil from earthwork : 913 m<sup>3</sup>/ 3 years (Cutting Section 25,781 m<sup>3</sup>/ 3 years— (Embankment) Reuse Volume 24,868 m<sup>3</sup>/ 3 years) Cut trees : 12,202 m<sup>3</sup>/ 3 years Domestic Solid Waste : 260.6 ton/3 years Waste Water : 21,900kl/3 years Night Soil : 547.5ton/3 years</p> <p>[After Construction] Since no offices and parking areas are planned for this project, in general, no waste is generated after construction. Thus, it is not likely to give adverse impacts on waste.</p>	<p>[During Construction and After Construction] All construction waste and domestic waste generated are reused and/or disposed of following the implementation of mitigation measures. Thus, it is not likely to cause significant impacts on waste management.</p>
Pollution	4.8	Soil Contamination and Bottom Sedimentation Quality	✓ (B-)	✓ (D)	<p>1. Survey Point SQ-1 : Around the earthwork area of the south bank SQ-2 : Around the earthwork area of the north bank</p> <p>2. Survey Date: November.12th, 2023</p> <p>3. Result of Measurement (Results of Analysis) All results of analysis satisfy the Japanese standards. (standards : Compared with Japanese soil contamination standards due to absence of Uganda standards) [SQ-1] Arsenic : &lt;0.001 ppm (150) Selenium : &lt;0.001ppm (150) Cyanide : 0 ppm (50) Hexavalent Chromium : 3.66 ppm (250) Mercury : &lt;0.001 ppm (15) Fluorine : 1.2 ppm (4000) Boron : 0.23 ppm (4000) Lead : 0 ppm (150) Cadmium : 0 ppm (150) [SQ-2] Arsenic : &lt;0.001 ppm (150)</p>	<p>[During Construction] The total estimated volume of waste soil from the project area is 913m<sup>3</sup>. It is expected that excavated soil is not polluted since the current surface soil is not polluted. However, if soil is necessary to be brought to the project site from outside area, it may have a risk the soil is polluted and cause soil contamination. In addition, risk such as leaking oil from construction machines may occur in the base camp site.</p> <p>[After Construction] No impacts are expected as there is no plan regarding soil contamination. On the other hand, if the Karuma Bridge becomes a new tourist attraction and more tourists stop in Karuma town, there is concern about an increase in general waste at viewpoints and commercial areas and soil contamination due to illegal dumping around the bridge.</p>	<p>[During Construction] It is expected that the soil generated in the project area is not polluted based on soil analysis, thus soil contamination is not caused due to construction soil. However, construction soil generated in the project area after excavation and brought from outside is tested and confirmed during construction. Leaking oil from construction machines and waste oil storage in the base camp may give negative impacts on the surrounding soil. However, appropriate management and implementation of mitigation measures minimize such risks. Therefore, it is unlikely to give significant impacts on Soil Contamination and Sedimentation Quality during and after construction. Hence, it is concluded that construction activities do not give any adverse impacts to the soil contamination nor bottom sedimentation quality.</p> <p>[After Construction] As a mitigation measure for possible soil contamination through waste, general waste management in commercial</p>



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			During Const	After Const	Baseline Survey Data based on the On-Site and/or Literature Survey	Impact Forecast and Evaluation (Quantitative/ Qualitative)	Impact Evaluation with Implementation of Mitigation Measures
					Selenium : <0.001ppm (150) Cyanide : 0 ppm (50) Hexavalent Chromium : 5.12 ppm (250) Mercury : <0.001 ppm (15) Fluorine : 2.2 ppm (4000) Boron : 1.66 ppm (4000) Lead : 0 ppm (150) Cadmium : 0 ppm (150)		areas and viewpoints in Karuma town will be implemented by the local government. In addition, regular patrols by UNRA and others will be carried out to ensure that illegal dumping does not take place in the vicinity of the bridge, and the impact is assessed as not significant as the anticipated impact will be minimized.
Pollution	5	Noise and Vibration	✓ (B-)	✓ (B-)	1. Survey Point Noise-1、 Vibration-1 : Along Kampala-Gulu Highway, on the Kiryandongo side of the Bridge Noise-2、 Vibration-2 : Within Karuma wildlife reserve Noise-3 : Close to the upstream side of River Nile, within Karuma Wildlife Reserve in Nwoya District. Noise-4 : Along Kampala-Gulu Highway, on the Oyam-Nwoya side of Bridge Noise-5 : Within Karuma Wildlife reserve close to the outflow area (Sino Hydro control station) Noise-6 : Point lies within the Awoo community Noise-7 : The point lies within the main Karuma trading centre approximately 5 meters from the Kampala-Gulu High way  2. Survey Date : February 3rd - 15th, 2024  3. Result of Measurement (standard value) [Noise] Only Noise-7 exceeds the environmental standards in Uganda for both daytime and nighttime. The monitored values at 6 points in the project area satisfy the environmental standards in Uganda. *Uganda environmental standards : The National Environment (Noise and Vibrations Standards and Control) Regulations(2003) Residential + Industrial + Commercial Area : Daytime 60dB(A), Nighttime 50dB(A)  Daytime 6AM~10PM/Nighttime10PM~6AM Noise-1 : 57/50 dB(A) Noise-2 : 33/- dB(A) *Only Daytime surveys were conducted.	[During Construction] 1.Location of Forecast Point Along Kampala-Gulu Highway, Boundary of ROW  2.Forecast conditions Construction Activities and Related Equipment : earthwork (dump truck, backhoe, and bulldozers)  3.Forecast Methodology Noise : Decay Formula Equation Vibration : Decay Formula Equation  4.Result of Forecast Although the forecasted noise results exceed the Uganda standard, the increase due to this project is less than 0.1 dB. The forecasted values do not exceed the Japanese standards value for construction noise. *BG exceeds Uganda's standards for construction noise(Commercial: Daytime75dB(A), Nighttime50dB(A)) so Japanese standards (7AM ~7PM : 85dB(A)) are applied. Sound Level at the Forecast Point from the Noise Source dB(A) : 63 dB(A) BG : 76 dB(A) Total : 76 dB(A) (+0 dB)  The forecasted values satisfy the Japanese Construction Vibration Standard. *Standard value : Uganda does not have any standard for construction vibration. Thus, Japanese standard has been applied. (7AM~7PM : 75dB) Sound Level at the Forecast Point from the Noise Source : 51 dB BG : 43 dB	[During Construction] Although the forecasted construction noise results exceed Uganda's standards, there will be no significant impact from the Project. The forecasted construction noise and vibration are within Japanese standard limits, thus any mitigation measures are not necessary. Additionally, the implementation of mitigation measures minimizes the impacts, and the degree of impacts will be within the acceptable level for inhabitants because of the limited period and time during construction.  [After Construction] As the result of the quantitative analysis on the project case, all forecasted values are not exceeding the noise and vibration standard levels. Thus, it is unlikely to cause serious impacts on the project area.

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			During Const	After Const	Baseline Survey Data based on the On-Site and/or Literature Survey	Impact Forecast and Evaluation (Quantitative/ Qualitative)	Impact Evaluation with Implementation of Mitigation Measures
					<p>Noise-3 : 50/- dB(A) *Only Daytime surveys were conducted.</p> <p>Noise-4 : 56/47 dB(A)</p> <p>Noise-5 : 48/- dB(A) *Only Daytime surveys were conducted.</p> <p>Noise-6 : 56/42 dB(A)</p> <p>Noise-7 : <b>76/69</b> dB(A) <b>*Exceeding</b></p> <p>*Noise-7 Daytime also exceeds IFC standards (70 dB(A) in commercial area)</p> <p>[Vibration]</p> <p>All monitored vibration levels have met the Japanese standard values.</p> <p>*standard value : There are no vibration standard prescripts in Uganda, thus the Japanese vibration standards along the trunk road have been applied on this ESIA.</p> <p>Commercial and Industrial Area : Daytime 70dB 、 Nighttime65dB</p> <p>Daytime 7AM~8PM/Nighttime 8PM~7AM</p> <p>Vibration-1 : 43/36 dB</p> <p>Vibration-2 : 30/- dB</p> <p>*Only Daytime surveys were conducted.</p>	<p>Total : 52 dB (+9 dB)</p> <p>[After Construction]</p> <p>1.Location of Forecast Point Same as the prediction point of air pollution.</p> <p>2.Forecast conditions (Traffic Volume) Same as the conditions of air pollution.</p> <p>3.Forecast Methodology Noise : The ASJ-2013 model Vibration : The formulation, which has been developed by the Ministry of Land, Infrastructure, Transport and Tourism in Japan</p> <p>4.Forecasted Value All forecasted values satisfy IFC standards. *BG is exceeding Uganda standard value (Commercial: Daytime60dB(A) 、 Nighttime50dB(A)). Thus, IFC standard (Commercial : Daytime and Nighttime 70dB(A)) has been applied. Daytime background levels exceeding IFC Standard, BG, the within increase of 3dB from the background levels has been applied (Uganda standard values : The National Environment (Noise and Vibrations Standards and Control) Regulations (2003))</p> <p>Daytime : 6AM~10PM Forecasted Value : 60 dB(A) BG : 76 dB(A) Total : 76 dB(A) Nighttime : 10PM~6AM Forecasted Value : 60 dB(A) BG : 69 dB(A) Total : 70 dB(A)</p> <p>All forecasted values satisfy Japanese standards. *Standard Value : Uganda does not have any standard for construction vibration. Thus, Japanese standard (Commercial / Industrial : Daytime70dB、 Nighttime65dB) has been applied. Daytime : 7AM~8PM Forecasted value : 40 dB BG : 43 dB Total : 45 dB</p>	

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			During Const	After Const	Baseline Survey Data based on the On-Site and/or Literature Survey	Impact Forecast and Evaluation (Quantitative/ Qualitative)	Impact Evaluation with Implementation of Mitigation Measures
						Nighttime : 8PM~7AM Forecasted value : 40 dB BG : 36 dB Total : 41 dB	
	7	Odor	✓ (B-)	✓ (B-)	According to interviews with villagers, in the project area, domestic waste management is either waste disposal into a compost pit, burned, or buried. The wastes are collected by designated tuku tuku operators and transported and disposed to the designated dumping site. However, the currently some wastes are illegally left along the road or illegally burned or dumped in the apart from the designated dumping site.	[During Construction] Putrid odor may be caused by domestic waste and night soil in the construction base camp. In addition, surrounding area of illegal dumping site will have bad odor if waste are not appropriately managed or dumped in the designated site. Additionally, the smell of oil and chemicals may be generated from workshop and storage if such materials are leaking or not managed appropriately.  [After Construction] Since no offices and parking areas are planned for this project, in general, no odor is generated after construction. Thus, it is not likely to give adverse impacts on odor. However, the illegal dumping may increase and cause bad odor in conjunction with increase in influx.	[During Construction and After Construction] All construction waste and domestic waste generated are managed and disposed of following the implementation of mitigation measures, thus they are not likely to cause significant impacts regarding bad odor.
Natural Env.	9, 10	Protected area Ecosystem (Ecological Considerations)	✓ (B-)	✓ (B-)	1.Survey area the survey area was basically 500m on both sides from the center line of the road and the bridge. However, for valuable species of large mammals that would be representative of the study area, their area of activity were surveyed beyond these areas to contribute to forecasts and evaluations.  2.Survey Date Nov 6 <sup>th</sup> - 15 <sup>th</sup> 2023 Feb 4 <sup>th</sup> - 5 <sup>th</sup> 2024 3.Result of Measurement In and around the project area, sixteen species of mammals, 117 species of birds, Seven species of amphibians and Six species of reptiles, 112 species of insects, 20 species of fishes, Twenty species of phytoplankton, Ten species of zooplankton, Seven species of benthos, 548 species of flora were identified.  Identified species include African Savanna Elephant, Bateleur, Martial Eagle, Elephant Snout, categorized Endangered (EN), Hippopotamus, African Mahogany categorized Vulnerable (VU), African buffalo, Patas	[During Construction] The implementation of the works will result in the felling and alteration of part of the habitat and growing environment of important species. Approximately 29,000 m2 of trees will be felled, but the impact on the habitat and growing environment of valuable species is not expected to be significant due to the implementation of tree replanting within the road right of way and on the site of related facilities, as well as the fact that a similar environment will remain in the surrounding area. Iroko (Kimoto) also plans to consider transplanting one individual within the proposed road site, if necessary, with expert guidance and advice.  The impacts of the construction on the savanna and open water ecosystems are expected to be minor. This is because the contribution to each ecosystem by the Key Stone Species, (i.e., hippopotamus and African elephant) will remain almost unchanged, and some of the main habitats of the higher and typical species in each ecosystem will be modified, but similar environments will remain in the surrounding areas.  Other Human Impacts shall be avoided or reduced by considering the mitigation measures.	[During Construction • After Construction] As a result of the construction work, part of the tropical forest and grassland areas along the Nile River, which are habitat and growth environments for threatened species, will be cut down or altered. Approximately 29,000m <sup>2</sup> of trees will be cut down, but the impacts on the habitat and growth environment of important species is not expected to be significant because the fact that a similar environment will remain in the surrounding area. In addition, mitigation measures such as tree replanting, transplantation of the valuable species and prohibition of blasting and adoption of lower noise and vibration construction methods are implemented during construction. Furthermore, mitigation measures described in previous section such as setting up sign board of speed limit and no-horn as well as humps for prevention of roadkill and installation of animal corridor under embankment of approach road shall be implemented. Therefore, the impacts on the important species are expected to be minor during and after construction.  The impacts on the ecosystems of savanna and open water

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			During Const	After Const	Baseline Survey Data based on the On-Site and/or Literature Survey	Impact Forecast and Evaluation (Quantitative/ Qualitative)	Impact Evaluation with Implementation of Mitigation Measures
					<p>monkey, African Crowned Eagle, Central Africa Rock Python, and Iroko categorized Near Threatened (NT) on the IUCN Red List.</p> <p>The vegetation affected by the road and bridge construction are Savanna Bushed Wooded Grassland, Riverine Bushed Woodland, Grassland on the south bank of the Nile River, Riverine Bushed Woodland, Open Savanna Wooded Bushland with thicket on the north bank.</p>	<p>[After Construction]</p> <p>The presence of the road will alter part of the tropical forest and grassland areas along the Nile River, which are habitats and growth environments for threatened species, but similar environments will remain in the surrounding areas. Therefore, the impacts on the habitats and habitats of important species are expected to be minor.</p> <p>The impact of the Project on the savanna and open water ecosystems is not expected to be significant, the same as the impacts shown during construction.</p> <p>Other Human Impacts are also the same as the impacts shown during construction.</p>	<p>during and after construction is not significant. It is because the contribution to each ecosystem by the Key Stone Species, hippopotamuses and African savanna elephants, will remain almost unchanged, and some of the main habitats of species that are higher and typical of each ecosystem will be modified, but similar environments will remain in the surrounding areas after construction as well.</p> <p>Thus, at the moment, they are not likely to give serious impacts on ecosystem both during construction and after construction.</p>
	11	Hydrology (Water)	✓ (D)	✓ (D)	<p>The River Nile, which Karuma Bridge crosses, is an international river that originates in Lake Victoria and flows into the Mediterranean Sea via Uganda, South Sudan, Sudan and Egypt, with a basin area of 2.9 million km<sup>2</sup> and a total length of 6,695 km. The river is the longest river in Africa.</p> <p>Karuma Bridge is located approximately 128 km downstream of Lake Kyoga, and there are five hydropower dams between Lake Victoria and the bridge. There are four Hydrological stations along The River Nile and Ministry of Water and Environment (MWE) manage the hydrological data.</p> <p>The historical maximum discharge recorded in October 1964, but in recent years, 2,117 m<sup>3</sup>/s (November 2020) and 2,008 m<sup>3</sup>/s (December 2021) were recorded, respectively, renewing the maximum discharge in observation history.</p> <p>100-year probability peak discharge calculated at Kamdini station was 2,718 m<sup>3</sup>/s. The maximum discharge, 2,540 m<sup>3</sup>/s in November 2020, at Karuma Bridge is equivalent to 57-year probable discharge, and the results of the survey of flood water marks show the maximum water level was estimated to be 996.08m. In addition, HWL for 100-year probable discharge was</p>	<p>[During Construction • After Construction]</p> <p>According to the bridge design as well as the, the bridge piers and any other relevant facilities are not constructed in the river. Therefore, this project does not change hydrological situation of Nile River and it does not give any impact.</p>	<p>[During Construction • After Construction]</p> <p>According to hydrological analysis and the design of the project, construction of the bridge and approach road does not give any impacts on hydrological situation of the current Nile River since the project does not touch in the Nile River as any physical structures are not planned.</p>

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			During Const	After Const	Baseline Survey Data based on the On-Site and/or Literature Survey	Impact Forecast and Evaluation (Quantitative/ Qualitative)	Impact Evaluation with Implementation of Mitigation Measures
					calculated as 996.38m.		
	12	Topography and geology	✓ (B-)	✓ (B-)	<p>(1) Topography The project area is located in northern Uganda at around 1,000m elevation. Lake Albert lies in the lower reaches of the Nile River, which flows to the west of the project area, and lowlands with approximately 600m to 700m spread out. The cross section of the current bridge route indicates the elevation 1,050m to 1,010m for the approach road, and the bridge section is approximately 1,000m as shown following elevation maps.</p> <p>(2) Geology The project area is also shield-shaped, and Gulu banded TTG Gneiss (2,652±8 Ma) of late Eocene age is distributed.</p> <p>The exposed rock at the southern part of the existing Karuma Bridge, where hard bedrock is outcropping. The geological survey conducted during the construction of the Karuma Dam, along the river in the area where the same bedrock is distributed also showed that the base rock with sufficient bearing capacity is distributed after passing through the topsoil and weathered bedrock in about 2m.</p> <p>Any valuable geological sites is not located in the project area.</p>	<p>[During Construction/ After Construction] These earthwork sections have risks of soil erosion, slope failure and landslide.</p>	<p>[During Construction • After Construction] Implementation of appropriate design and mitigation measures such as slope protection and periodical monitoring and maintenance will minimize the expected impacts. Thus, it is not likely to give significant impacts on the stability of earthwork section.</p>
Social Environment	13	Involuntary resettlement	✓ (D)	— (—)	The project area belongs to the government land in the protected area such as MFNP and KWR. There are not any living people in the project area.	<p>[Before and During Construction] The affected area of the project does not include private land or housing, and no land acquisition and resettlement will occur. In addition, as the project plans to use borrow pits and quarry sites, no land acquisition or resettlement is expected for these new developments.</p>	<p>[Before and During Construction] There are not any adverse impacts on this item.</p>
	14	Poverty group (vulnerable groups)	✓ (B+)	— (—)	According to the Uganda National Household Survey (2019/20), the national poverty line is 1.77 USD/day, equivalent to 2,377,926 UGX/year. However, it also states that the national level of the average consumption expenditure per adult equivalent (CPAE) is 96,774 UGX/month, equivalent to 1,161,228 UGX/year. In addition, 20.3% of the national population lives in poverty. In the case of Bunyoro Sub-region where Kiryandongo District is located, the CPAE is 98,232 UGX (1,178,784 UGX/year) and slightly higher than the	<p>[During Construction] As the project does not require land acquisition and resettlement, there are no poverty group who will be directly adversely affected. Although a poverty group live in the vicinity of the project area, their main source of income is from agriculture and fishing, and they will be able to continue their economic activities during the construction period. It is also forecasted that the local residents, including the poverty group, will be positively affected by the employment opportunities provided as workers related to the project.</p>	<p>[During Construction] It is evaluated that no negative impacts on the poverty group are expected as a result of project implementation. Rather, there will be positive impacts for the poverty group as employment opportunities will be provided to local residents, including the poverty group, during the construction period and mitigation measures will be taken to provide equal opportunities.</p>

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			During Const	After Const	Baseline Survey Data based on the On-Site and/or Literature Survey	Impact Forecast and Evaluation (Quantitative/ Qualitative)	Impact Evaluation with Implementation of Mitigation Measures
					above national level. For Lango Sub-region where Oyam District is located, it is 76,526 UGX (918,312 UGX/year).		
	15	Ethnic group (vulnerable groups)	✓ (B-)	— (—)	In Kiryandongo district (including Karuma and Diima), the Acholi tribe is the largest group at 32%, and in Oyam district (including Kamdini SC), the Lango tribe is the largest group at 90%. No ethnic group requiring special consideration have been identified in the project area.	[During Construction] No specific ethnic groups are directly affected by the implementation of the project and the impact of the influx of construction workers is not significant. However, discrimination on the basis of ethnicity in employment related to the project would have adverse impacts.	[During Construction] The implementation of mitigation measures during the construction period will avoid inequalities in employment opportunities due to ethnic differences and no significant impacts are envisaged as the population influx of construction workers will be negligible.
	16	Local economy such as employment and livelihood  (Impacts on economic activities)	✓ (B-)	— (—)	Looking at the characteristics of household income on average for Kiryandongo and Oyam district, it is clearly observed that agriculture is dominates in the monetary basis, as its percentage is about 77%. There are several shops and restaurants and approximately 500 people are economically active in an area of about 600 m from the project site along the Bobi-Masindi Road on the Kiryandongo district side. Of these, about 110 are vendors.	[During Construction] The project will not impose any traffic restrictions that would completely close the current Karuma Bridge or stop traffic on the existing road for construction activities. Therefore, the economic activities currently taking place along the road can continue. However, there will be temporary disruption when traffic restrictions are imposed, for example when construction vehicles enter and exit the construction yard.  [After Construction] No negative impact is expected because no activities which may give adverse impacts on this item is planned. If the new Karuma Bridge becomes a new tourist attraction, it could increase the frequency of tourist visits and have a positive impact on the local economy.	[During Construction/ After Construction] Disruption is expected due to traffic restrictions around the construction site, but the impact will be temporary and minimized by mitigation measures. In addition, no significant impacts are assessed to be expected due to increased employment and business opportunities.
	17	Land use and utilization of local resources (Land use)	✓ (B-)	— (—)	1)Agricultural Activity As the Project area is designated as protected areas, no agricultural activity is observed. 2)Fishing Activity Local residents have fishing activities more than upstream of the Karuma Bridge more than 0.4 km outside the protected areas. In addition, 121 registered members of the Karuma Fishery Association (KFA) with permission from UWA are fishing downstream more than 2km inside of the protected areas.	[During Construction] No piers will be constructed in the Nile River and no blasting will be used for the Project, and water flow and fish habitats will not be affected. In addition, the main fishing areas of the local people both upstream and downstream sides have a certain distance from the construction area, they can continue fishing. According to the local people, they have several routes to access their fishing area. Therefore, it is not expected that they will completely lose access to their fishing area, even if the project's control area is established and temporary disturbance occurs. However, the construction of detour will be considered if the local people request it. As described above, the Project will hire about 60 construction workers from Japan and other cities in Uganda. In this regard, the potential risk that they will take local resources such as fish without following the rules of the local community will be increased,	[During Construction] Where access roads to fishing areas are affected, detours will be provided where necessary. Contractors will also provide adequate guidance to construction workers to maintain good relations with the surrounding communities. It is evaluated that the implementation of these mitigation measures will minimize the impact.

Area	No.	Impacted Item (Item in Ugandan Law; National Environment Regulations 2020)	Survey Item At Scoping (After Analysis)		Summary of Results		
			During Const	After Const	Baseline Survey Data based on the On-Site and/or Literature Survey	Impact Forecast and Evaluation (Quantitative/ Qualitative)	Impact Evaluation with Implementation of Mitigation Measures
						resulting in conflict between the local community and outsiders.	
	18	Water usage (Water source)	✓ (-)	- (-)	No residential houses, irrigation canals and boreholes are observed within 500 m range of the affected area. In addition, the supplementary information as shown in was given by the local people during the FGDs	[During Construction] No adverse impact is expected because no activities which may give adverse impacts on this item is planned. However, measures to secure water resources can help to the local community, thus addressing the concerns of some FGD participants.	[During Construction] No significant adverse impacts on water use are expected, but impacts are assessed to be mitigated by employing local people where possible to address the concerns of some residents, avoiding large population influxes and taking measures to ensure water resources are available.
	19	Existing social infrastructures and services (social services and amenities)	✓ (B-)	- (-)	In the case of Oyam and Nwoya Districts, there is no social infrastructure within 3 km from the center point of the new bridge. On the other hand, there are several social infrastructures in Kiryandongo District side. Within 3 km from the center point of the new bridge, there are 22 structures were recorded, and the nearest infrastructure is the UWA Karuma Office, which is just 20 m away from the centerline of the alignment.	[During Construction] Temporary traffic restrictions for construction vehicles passing through the vicinity project area will affect access to social infrastructure.	[During Construction] Traffic restrictions may temporarily impede access to social infrastructure in the vicinity of the construction area, but the impact is evaluated to be mitigated by the implementation of mitigation measures.
	20	Social institutions such as social infrastructure and local decision-making institutions (social interactions, cohesion or disruption)	✓ (D)	- (-)	In Karuma TC of Kiryandong District and Diima SC of Oyam District, the council members were elected by the residents as their representatives. Due to the differences in size, structure, characteristics, etc. of the local population, the number of council members varies in Karuma TC, Diima SC, and Kamdini SC, with 13 to 15 council members in each.	[During Construction] For the Project, most of the construction workers will be hired from the local communities as much as possible, and the population influx will not be significant. In addition, the local council members are elected by the residents in accordance with the national law. Therefore, the impact on the existing social institution such as decision-making institution is negligible.	[During Construction] Since adverse impacts are not expected, mitigation measures are not necessary.
	21	Unequal distribution of positive and negative impacts of the Project (opportunities for employment)	✓ (B-)	- (-)	The local communities have experienced the conflicts with the previous project (Karuma HPP) in their community, since local people were not initially hired as construction workers and could not get benefit from the project.	[During Construction] As no land acquisition or resettlement will occur under the project, no specific people are expected to be directly affected. Given the demands on local people's job opportunities, the potential risk of conflict among local people would be high if the opportunities were misallocated. In addition, construction workers hired from other areas may have impacts on security situation and relationship with current residents.	[During Construction] It is evaluated that the risk of conflict between residents or between the project and local communities is minimized through the implementation of mitigation measures, such as the provision of equal employment opportunities and guidance to employed construction workers.
	22	Local conflict of interests	✓ (B-)	- (-)	See No. 21 Misdistribution of benefit and damage	See No. 21 Misdistribution of benefit and damage	See No. 21 Misdistribution of benefit and damage



Area	No.	Impacted Item (Item in Ugandan Law; National Environment Regulations 2020)	Survey Item At Scoping (After Analysis)		Summary of Results		
			During Const	After Const	Baseline Survey Data based on the On-Site and/or Literature Survey	Impact Forecast and Evaluation (Quantitative/ Qualitative)	Impact Evaluation with Implementation of Mitigation Measures
	23	Cultural Heritage (culture and heritage)	✓ (B-)	— (—)	Cultural sites: several sites are located more than 2km upstream of the present Karuma Bridge, all outside the project affected area. Historical and archaeological resources: signage about the Sir Samuel and Lady Florence Baker Historic Trail, as well as pottery fragments and iron slag produced during the Late Iron Age, were found within the affected area.	[During Construction] Although no direct impact on the cultural aspects of the local community is expected, the construction may cause confusion and/or nourish concern to the local community. The signboard about the historical trail (KHS-1) may be damaged. In addition, other objects similar to KPS-1 to 4 will be found on the surface and/or underground due to the earthwork.	[During Construction] The following mitigation measures need to be implemented to avoid disruption and concerns to local communities • Continuing consultation with cultural leaders should be carried out. • Undertaking works that do not impact on signage related to the historic trail. • Continuous monitoring under the guidance of an archaeologist. It is evaluated that implementation of these mitigation measures would minimize the impact.
	24	Landscape (Landscape)	✓ (B-)	✓ (B-)	There are no law-based designated landscape in the project area and its surrounding area. However, the project area is passing through MFNP and KWR where the tourists enjoy natural landscape, but this area is not the main tourism area of MFNP and KWR and tourist are not observed in this area. The landscape elements from the bridge crossing point are the river, existing bridge, approach road, the bank of the river and woodland and bushed grassland.	[During Construction • After Construction] The landscape elements are structure of the bridge and carriageway for both existing and new bridges and the bank of the river and woodland and bushed grassland. According to the CGs, the sky landscape and woodland is reduced by the construction of the new bridge. However, the changed elements are limited thus the impacts is negligible on this photomontage. Although the alignment is passing through Tourism Zones of MFNP and KWR, this area is not the main tourism area of MFNP and KWR and tourist are not observed in this area, thus adverse impact is not expected. The installation of a modern design structure of the bridge may create a sophisticated symbolic landscape in the project area.	[During Construction • After Construction] The changes before and after the construction of bridge and related structures are unavoidable. Although the sky factor and woodland has decreased due to the existence of bridge, a sophisticated and symbolic landscape is created. Furthermore, the color of the structure harmonizes with the sky and woodland landscape. Thus, it is evaluated that the project does not give serious impacts on this item.
	25	Gender (Gender)	✓ (B-)	— (—)	Through LSHMs, FGDs and other interviews, gender-related challenges (e.g. pregnancy due to inappropriate relationships between construction workers and women and girls from local communities, early pregnancy, abandonment of children, GBV) were identified in previous projects.	[During Construction] The population influx of construction workers will not be significant. However, based on the experience and concerns of the local community, gender issues should be carefully taken into considered and avoided.	[During Construction] As there is no need to employ a large number of construction workers from other regions, no significant gender-related impacts are anticipated, but it is assessed that implementation of mitigation measures could minimize potential risks.
	26	Right of children (vulnerable groups)	✓ (B-)	— (—)	According to the National Household Survey 2019/2020, 17.5% of children between the ages of 5 and 17 are involved in child labor in Uganda. In the case of Bunyoro Sub-region (including Kiryandongo District), the percentage is 13.2%, which is lower than the national level. However, the Lango Sub-region (including Oyam District) has 18.2% which is slightly higher than the national level.	[During Construction] The local people have experienced the disturbance of children's rights in the past, through previous projects, etc. in the local community. For the Project, therefore, the mitigation measures should be taken during construction, including those that can help minimize the indirect impacts on children, in accordance with the comments from schoolteachers, etc.	[During Construction] The impact on children's rights can be minimized by implementing mitigation measures, such as those to avoid child labor and inappropriate relationships between construction workers and girls.

Area	No.	Impacted Item (Item in Ugandan Law; National Environment Regulations 2020)	Survey Item At Scoping (After Analysis)		Summary of Results		
			During Const	After Const	Baseline Survey Data based on the On-Site and/or Literature Survey	Impact Forecast and Evaluation (Quantitative/ Qualitative)	Impact Evaluation with Implementation of Mitigation Measures
	27	Infectious diseases	✓ (B-)	✓ (B-)	According to WHO statistical data, the most common cause of death in Uganda is due to neonatal conditions, followed by HIV/ AIDS; although the number of people infected with HIV/ AIDS has been declining over the years, 1.4 million people are infected. Malaria is also a major infectious disease in Uganda, with an estimated 13 million people infected (as of 2021). In the social situation survey (interviews) conducted during the period of this cooperative preparatory survey, the highest number of households (240/256) indicated that malaria was a common infectious disease.	[During and After Construction]. Puddles and inadequate drainage at construction sites can provide a habitat for mosquitoes, which can cause malaria and dengue fever. In addition, construction workers employed from other areas may come into contact with local residents, which can spread sexually transmitted diseases and other diseases. [After Construction] Inadequate drainage maintenance along approach roads can provide a habitat for mosquitoes, causing malaria, dengue fever, etc.	[During and After construction] Impacts will be mitigated by improving drainage channels and sanitation facilities, conducting awareness-raising activities for construction workers and local residents, and distributing free condoms.
	28	Labor environment (occupational health and safety)	✓ (B-)	— (—)	There are some laws on labor environment are promulgated such as “The Occupational Safety Health Act No. 9 2006”, “The Workers Compensation Act Cap 225 (Formerly known as The Workers Compensation Act No. 8 2000)” and “Employment Act, Cap 219”	[During Construction] Inappropriate working conditions without safety measures in accordance with national legal and other frameworks can lead to accidents. For example, working without helmets and work shoes increases the risk of head and foot injuries.	[During Construction] Accidents associated with construction are minimized when the working environment and safety are taken into account with reference to national legal frameworks and international standards.
Other	29	Accident	✓ (B-)	— (—)	According to the interview at the Karuma Police Office, most accidents that occur on the existing Karuma Bridge are single vehicle accidents. From the records between March to October 2023 in 8 months show a total of 8 accidents reported.	[During Construction] Accidents related to the construction of access road and bridge, and the operation of quarry site and/or borrow pits, as well as traffic accidents related to the construction vehicles may increase. In traffic-controlled area, ordinary vehicles can cause traffic accidents.  [After Construction] Risk of traffic accidents on the new access road and bridge will be reduced due to the improvement of the alignment. However, safety measure to prevent accidents can be helpful in further improving safety.	[During Construction] Traffic accidents will reduce due to the implementation of mitigation measures such as assignment of traffic guides, installation of safety signboards such as speed limit around the construction site during construction, setting up signboard of speed limit 40km/h, humps and LED light after construction.

Area	No.	Impacted Item (Item in Ugandan Law; National Environment Regulations 2020)	Survey Item At Scoping (After Analysis)		Summary of Results		
			During Const	After Const	Baseline Survey Data based on the On-Site and/or Literature Survey	Impact Forecast and Evaluation (Quantitative/ Qualitative)	Impact Evaluation with Implementation of Mitigation Measures
	30	Cross boundary impacts and climate change (climate change)	✓ (B-)	✓ (B+)	No field survey conducted.	<p>[During Construction/ After Construction]</p> <p>During construction, a total of approximately 1,762 tons of CO2 is generated from construction activity for 3 years for with project case. In addition, 308,063 tons of CO2 is generated from the traffic during construction period for both with/without project case.</p> <p>After construction, large traffic needs to be diverted through the east side of Lake Choga and all the traffic are required to diverted through the east side of Lake Choga in without project case. Therefore, generated CO2 from traffic after construction of bridge for without project case will be larger for the longer travelling distance.</p> <p>Total accumulated CO2 volume in the case of “Without Project” beyond “With Project” case from the operation year 2030. This means that the project gives positive impacts on CO2 during the operation phase.</p>	<p>[During Construction/ After Construction]</p> <p>Negative impacts are forecasted during construction due to construction activities such as operation of construction machines. However, total CO2 emission for with project case will be smaller than that of without project case from year 2030. Thus, the project gives positive impacts after 2030.</p>

Note) ✓: Some activities are factors of adverse impacts and it is necessary to conduct survey and analysis:

No mark: There are no activities which gives adverse impacts on the item, thus surveys and analysis is not necessary

A: Serious impact is expected. B: Some impacts are expected. C: Degree and area of impacts are unknown (further surveys and analysis shall be done) D: Few impacts are expected.

Source: JICA Survey Team

**Table-6 Environmental Impact Level**

Impact	Probability of Occurrence	Extent	Rating
1) Air pollution	Likely	Localised	Miner
2) Water pollution	Likely	Localised	Miner
3) Waste	Likely	Localised	Miner
4) Soil contamination and Sediment	Likely	Localised	Miner
5) Noise and vibration	Likely	Localised	Medium
6) Ground subsidence	Likely	Localised	Miner
7) Odor	Likely	Localised	Miner
8) Protected area and ecosystem	Likely	Localised	Miner
9) Green House Gases (CO2))	Likely	Regional	Miner
10) Hydrology	Likely	Localised	Miner
11) Topography and geology	Likely	Localised	Miner
12) Involuntary Resettlement	Unlikely	Localised	
13) Poverty Group	Likely	Regional	Medium
14) Indigenous and ethnic group	Likely	Regional	Medium
15) Local economy such as employment and livelihood	Likely	Regional	Medium
16) Land use and utilization of local resources	Likely	Localised	Miner
17) Water usage	Likely	Localised	Medium
18) Existing social infrastructures and services	Likely	Localised	Miner
19) Social institutions such as local decision-making institutions	Likely	Localised	Miner
20) Unequal distribution of positive and negative impacts of the Project	Likely	Localised	Miner
21) Local conflict of interests	Likely	Regional	Medium
22) Cultural heritage	Likely	Regional	Medium
23) Landscape	Likely	Localised	Miner
24) Gender	Likely	Localised	Miner
25) Rights of children	Likely	Localised	Miner
26) Infectious diseases	Likely	International	Medium
27) Labor Environment and Safety	Likely	Localised	Miner
28) Accident	Likely	Regional	Miner

Source: JICA Survey Team

## 7. Environmental Management Plan including Environmental Monitoring Plan

### (1) Mitigation Measures and Cost

The Environmental Management Plan (hereinafter referred to as “EMP”) consists of mitigation measures and environmental monitoring plan in general.

Mitigation measures are prepared for minimizing the adverse negative impacts during and after construction. Necessary mitigation measures based on the result of impact forecasts during construction and after construction. In addition, the project will also take into account and implement the mitigation measures prepared in the approved 2016 ESIA by NEMA and 2018 ESIA prepared by UNRA.

The mitigation measures of 2016 ESIA approved by NEMA and 2018 ESIA prepared by UNRA are also integrated into Table 8.1.1 and Table 8.1.3.in the main text of ESIA. During construction, more than 200 mitigation measures are prepared.

The effectiveness of the mitigation measures will be continuously monitored during construction and compared to the quantitative prediction results to verify the effectiveness of the measures. It is also expected that the accumulation of such monitoring data will lead to the implementation of appropriate mitigation measures in the future.

In general, the cost of mitigation measures during construction are included as a part of the construction cost except major / special mitigation measures such as 1) Tree replantation, 2) deployment of UWA

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officers for protection workers from wild animals, 3) Archaeological monitoring, 4) Improvement of the signboard about the Sir Samuel and Lady Florence historical trail, 5) Sensitization on Gender, 6) Sensitization on the Children Rights, 7) Sensitization on Infection Diseases. Such major/special mitigation total cost is 510,200 USD as shown in Table 8.1.4 in the ESIA main text. These mitigation measures and cost will be discussed and detailed in the detailed design stage again.

## **(2) Environmental Monitoring Plan (EMoP) and Cost**

The environmental monitoring plan has established based on the impacted items and the degree of impacts. These monitoring results and implementation of mitigation measures shall be observed and managed by the project proponent, contractor, supervision consultant, environmental authorized agency (NEMA), local governments, and relevant ministries.

The direct cost of monitoring during and after construction are 80,500 USD and 45,000 USD, respectively.

During construction, the Construction Contractor shall prepare the Environmental Management Plan for Construction (CEMP) and obtain permission from PMU and carry out the task under the supervision of the Consultant.

Environmental monitoring plan during the construction phase is shown in Table 8.2.2 and Table 8.2.3 and the monitoring plan at the end of construction completion is shown in Table 8.2.4. Environmental monitoring plan after construction phase is shown in Table 8.2.5 and Table 8.2.6. Monitoring period during construction phase is three (3) years of construction period and the monitoring period after construction is also three (3) years

The project will also consider the monitoring plan prepared in the 2016 ESIA approved by NEMA and 2018 ESIA prepared by UNRA.

## **(3) Monitoring Organization**

### **1) During Construction**

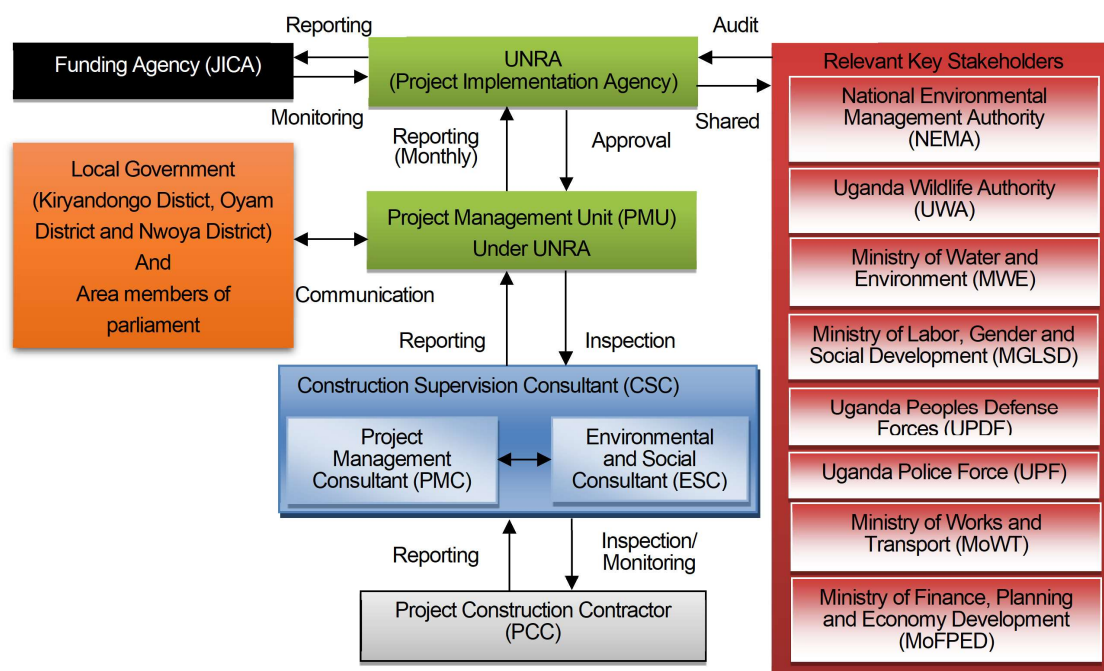
The objectives and design of the EMP and Environmental Monitoring Plan are described in the earlier sections of this chapter. There is a necessity to form a proper 'Institutional Framework' for the effective implementation of the formulated environmental management and monitoring plan. The elements of this 'Institutional Framework' will coordinate and work with each other throughout the project, i.e. during pre-construction, construction and operation stages.

The suggested elements of 'Institutional Framework' for implementing EMP during construction will be as follows:

**Table-7 Environmental Management Organization during Construction**

Name of Organization	Roles and Responsibilities
a) Project Management Unit under UNRA (PMU)	<ul style="list-style-type: none"> <li>Initiate the coordination process among the concerned organizations (Elements of Institutional Framework) for EMP implementation.</li> <li>Oversee the implementation of the EMP by PMU and CSC</li> <li>Review and approve monthly Environmental Report from CSC and sending the report to NEMA and other relevant key stakeholders</li> </ul>
b) Construction Supervision Consultant (CSC)	<ul style="list-style-type: none"> <li>CSC works in association with Project Construction Contractor (PCC) &amp; the Environmental and Social Consultant (ESC) on a full-time basis at the project site office.</li> <li>PMC mainly looks after managing engineering and construction-related activities.</li> </ul>
Environmental and Social Consultant (ESC)	<ul style="list-style-type: none"> <li>ESC inspects implementation of mitigation measures and environmental monitoring conducted by PCC</li> <li>ESC reviews and corrects Environmental Monitoring Report (EMR) submitted by PCC and then submit it to PMU after inspection.</li> <li>SESC monitors the activities of Service Provider hired by the UNRA.</li> </ul>
c) Project Construction Company (PCC)	<ul style="list-style-type: none"> <li>PCC implements approved EMP (mitigation measures) under observation of PMC &amp; ESC.</li> <li>PCC submits EMR for all conducted mitigation measures on site to the ESC on weekly and/or monthly basis.</li> </ul>
d) Authorized Environmental Agency (NEMA) and Other Relevant Key Stakeholders	<ul style="list-style-type: none"> <li>Inspect and audit periodical environmental monitoring report</li> <li>Inspect the implementation of mitigation measures on site, as required</li> <li>Request for necessary action and additional surveys and implementation of mitigation measures, if required</li> </ul>
e) Service Provider	<p>The service provider will implement the mitigation measures under a direct contract with UNRA. In addition, the Service Provider should carry out the following tasks with the advice and support of the CSC.</p> <ul style="list-style-type: none"> <li>Design and conduct a baseline assessment on Gender, Right of Children, and Infectious Disease and Occupational Health, and map the hotspot</li> <li>Disseminate the findings of the baseline assessment to stakeholders and indicate the scope of interventions under the assignment</li> <li>Provide training to the construction workers and local communities, etc.</li> </ul>
f) Local Government (Kiryandongo District, Oyam District and Nwoya District and Area members of parliament)	<ul style="list-style-type: none"> <li>Monitor construction activities</li> <li>Request for necessary action and additional surveys and implementation of mitigation measures, if required</li> </ul>
g) Funding Agency (JICA)	<ul style="list-style-type: none"> <li>Review periodical environmental monitoring report</li> <li>Request for necessary action and additional surveys and implementation of mitigation measures, if required</li> </ul>

Source: JICA Survey Team



Source: JICA Survey Team

**Figure-6 Environmental Management Implementation Organizations During Construction**

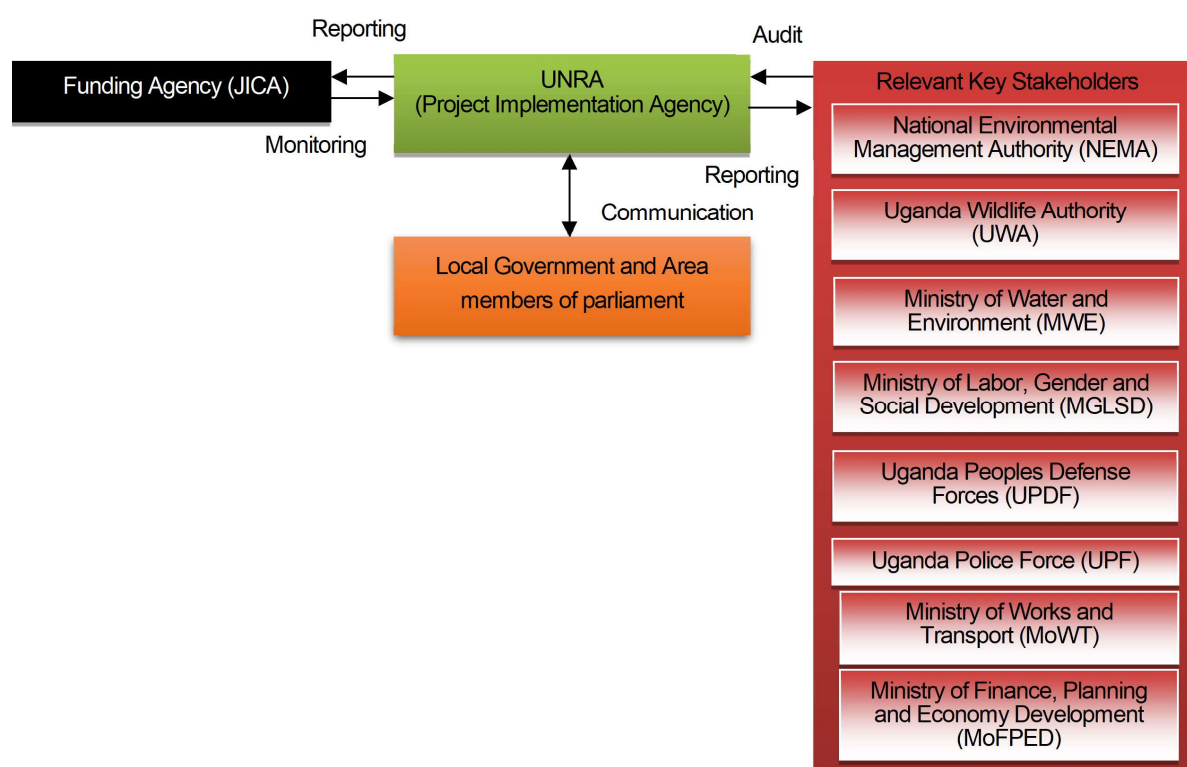
## 2) After Construction

The major authorities for implementing the EMP after construction are as follows:

**Table-8 Environmental Management Organization after Construction**

Name of Organization	Roles and Responsibilities
a) UNRA	<ul style="list-style-type: none"> <li>Initiate the coordination process among the concerned organizations (Elements of Institutional Framework) for EMP implementation.</li> <li>Oversee the implementation of the EMP</li> <li>Preparation of Environmental Report and sending the report to NEMA and other relevant key stakeholders</li> </ul>
b) Local Government (Kiryandongo District, Oyam District and Nwoya District and Area members of parliament)	<ul style="list-style-type: none"> <li>Monitor on site situation during project operation</li> <li>Request for necessary action and additional surveys and implementation of mitigation measures, if required</li> </ul>
c) Authorized Environmental Agency (NEMA) Other Relevant Key Stakeholders	<ul style="list-style-type: none"> <li>Inspect and audit the periodical environmental monitoring report</li> <li>Inspect the implementation of mitigation measures on site, as required</li> <li>Request for necessary action and additional surveys and implementation of mitigation measures, if required</li> </ul>
d) Funding Agency (JICA)	<ul style="list-style-type: none"> <li>Review the periodical environmental monitoring report</li> <li>Request for necessary action and additional surveys and implementation of mitigation measures, if required</li> </ul>

Source: JICA Survey Team



Source: JICA Survey Team

**Figure-7 Environmental Management Implementation Organizations after Construction**

## (4) Grievance Redress Mechanism

Complaints and conflicts on construction activities and construction workers may arise during construction. These complaints and conflicts can be of many kinds. It could be:

- Unexpected natural and social adverse impacts by the project construction activities



- 
- ii) Conflicts between construction workers and local community group & individuals
  - iii) Process of hiring construction workers from local community, etc.

The aim of the Grievance Redress Mechanisms (GRM) is to ensure that grievances and concerns raised by the other people within the communities can be effectively dealt with in a timely and satisfactory manner. Given the potential for quick and effective resolution on the ground, utilizing local dispute mechanisms as a first step in line with current traditional practices makes the mechanism more effective. Normally, a grievance redress mechanism is developed to ensure that:

- i) All complaints related to natural and social impacts by the project are appropriately dealt with;
- ii) It can be easily access by those who have complaints; and
- iii) Adequate measures are taken to resolve the issues raised.

UNRA promotes the concept of Grievances Management Committees in accordance with UNRA-GRM Harmonized Guidelines (2019). This is a community-based arrangement that seeks to resolve grievances at the lowest level possible using existing or established structures. GMCs are composed of a minimum of 6 persons with the following members;

- i) An observer who is a CBO (Community Based Organization / CSO (Civil Society Organization) representative if available–
- ii) Chairperson LC1 (but not to be elected as chairman of the GMC)–
- iii) 3 Representatives of Residents (at least 1 woman must be elected)–
- iv) An opinion leader (e.g. elder, religious or clan leader) if available.

From the GMC members, an executive is elected composed of chairperson, secretary and mobiliser.

GMCs will be set up with the help of District and sub-county CDOs (Community Development Officer) and LC1 leaders through community meetings before starting construction activities. GMCs will remain active throughout the project life up to the defects liability period.

Besides the GMCs, UNRA will establish contact points for logging grievances for community members. The UNRA contact channels to be established are the followings.

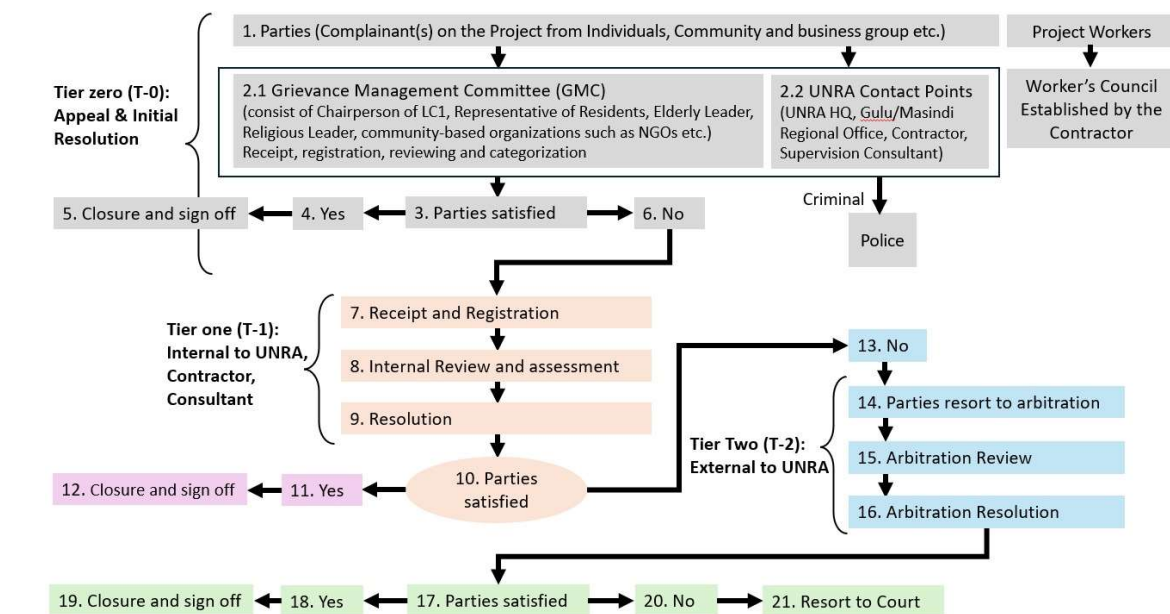
- i) UNRA headquarters,
- ii) UNRA stations at Gulu and Masindi,
- iii) Project contractor,
- iv) Consultants office

The contacts of the GMCs and UNRA established channels will be disclosed to the local communities through the local stakeholder meetings when the GMCs are established.

A grievance can be submitted by any stakeholder either in writing or verbally through Community GMCs and UNRA established channels. The procedure should respect anonymity for sensitive issues such as sexual harassment.

However, any grievances related to project workers issues such as welfare, working environment etc. shall be raised to the workers council. The workers council should be established after workers are mobilised at the beginning of construction stage.

A possible scheme for grievance redress mechanism adapted from the existing UNRA-GRM Harmonized Guidelines, 2019 is illustrated in Figure-8. The detailed Grievance Process Flow is shown in Table 8.4.1.



Source: JICA Survey Team

**Figure-8 Scheme for Grievance Redress Procedure during Construction**

## 8. Public Stakeholders and consultation/ Engagements

### (1) Stakeholders Analysis

The purpose of conducting a stakeholder analysis is to know who has a relationship with the program/project, to know the characteristics of that relationship, and to control that relationship to make the program/project successful. Various stakeholders were engaged as indicated in the matrix table below. The results of the stakeholder meetings and focus group discussion are indicated in Chapter in the main text of ESIA.

**Table -9 Result of Stakeholder Analysis**

Stakeholder	Importance	Relevance to the Project
National Environment management Authority (NEMA)	High	<b>[High]</b> NEMA is the authority to proceed ESIA process and issue the approval of ESIA
Uganda Wildlife Authority (UWA) Including site office	High	<b>[High]</b> The project area is in the Karuma Wildlife Reserve and Murchison Falls National Park. UWA has responsibility to manage such protected areas appropriately and issue approval on the development inside of such protected areas in accordance with the Wildlife Act 2019
Uganda National Road Authority (UNRA)	High	<b>[High]</b> UNRA is the project proponent and recognizes necessity of the project
Uganda Wildlife Education Centre (UWEC)	Low	<b>[Low]</b> UWEC has been established for purpose of education on wildlife assisted by the Uganda Government and the Wildlife Conservation Society in New York and managed by a Wildlife Trust.
Ministry of Gender, Labour, and Social Development (MOGLSD)	Medium	<b>[Medium]</b> MOGLSD is mandated to handle gender, culture, occupational health and safety, labor issues, and community issues. MOGLSD shall be in a position to support these where necessary on these matters in the project.
Makerere University	Medium	<b>[Medium]</b> Some experts on wildlife may be interested in species in the project area
Karuma TC, Kamdini SC, and surrounding area	High	<b>[High]</b> Council members of Karuma TC, Kamdini SC have some lessons in terms of social and economic impacts from Karuma HPP project. Additionally, they think job opportunities increase during construction.
Citizen of Karuma TC, Kamdini SC, and surrounding area	High	<b>[High]</b> People in Karuma TC, Kamdini SC, and surrounding area have some lessons in terms of social and economic impacts from Karuma HPP project. Additionally, they think job opportunities increase during construction.
Fishery Association / Fishery Group	High	<b>[High]</b> Fishermen worry about adverse impacts on their fishing ground because they do not know what kind of impacts are caused by the project.
Women's group	Medium	<b>[Medium]</b> Karuma TC people including women have some lessons in terms of social and economic impacts from Karuma HPP project. Additionally, they think job opportunities increase during construction.
Youth Group	Medium	<b>[Medium]</b> This group have some concerns on the impacts of the project. At the same time, they are concerned with uplifting income status through increasing of job opportunities during construction.
NGOs	Medium	<b>[Medium]</b> Since the project is located inside of MNFP and KWR, some NGOs may be concerned with conserving wildlife and the Project impacts the conservation area.

Source: JICA Survey Team

## **(2) Local Stakeholder Meetings/ Public Consultations/ Engagements**

The local stakeholder meetings for ESIA have been held twice at scoping stage and draft ESIA stage, respectively. The overview such as date and venue for the meetings are shown below. The photos of the LSMs are shown below;

**Table-10 Summary of Held Local Stakeholder Meetings/ Engagements**

Objectives of the Meeting (Date and Venue)	Agenda	Major Attendee	Number of Opinions and questions	Methodology
1 <sup>st</sup> Public Consultation in Karuma Town Scoping Stage (Nov 6 <sup>th</sup> , 2023: 15:00~17:00 Karuma Town Council Office	1. Project Outline 2. Alternative Analysis 3. Questionnaire 4. Schedule of the Project 5. Expected Major Impacts and Mitigation measures 6. Information collection on animals 7. Exchange Opinions	Total: 17 (male: 11, female: 6) Local Government	✓ Number of people who raised opinions: 3 ✓ Number of opinions and questions raised: 4	1) Information Disclosure ✓ Posting advertisement (Since 1 month prior to the meetings) ✓ Radio broadcast (1 month before and 2-3 days before the meetings) ✓ Miking (1 month before, 2-3 days before and on the day of the meetings)  2) Language English and Paluo, and Luo
1 <sup>st</sup> Public Consultation in Oyam District Scoping Stage (Nov 7 <sup>th</sup> , 2023: 10:00~12:00 Oyam District Local Government	1. Project Outline 2. Alternative Analysis 3. Questionnaire 4. Schedule of the Project 5. Expected Major Impacts and Mitigation measures 6. Information collection on animals 7. Exchange Opinions	Total: 21 (male: 15, female: 6) Local Government:	✓ Number of people who raised opinions: 11 ✓ Number of opinions and questions raised: 10	
1 <sup>st</sup> Public Consultation in Kamdini Town Scoping Stage (Nov 7 <sup>th</sup> , 2023: 14:30 ~ 16:30 Kamdin Town Council Office	1. Project Outline 2. Alternative Analysis 3. Questionnaire 4. Schedule of the Project 5. Expected Major Impacts and Mitigation measures 6. Information collection on animals 7. Exchange Opinions	Total: 28 (male: 22, female: 6) Government: 1, PAPs: 18, NGOs and Community Specific Group: 6, Media: 1, JICA Survey Team: 3	✓ Number of people who raised opinions: 1 ✓ Number of opinions and questions raised: 7	
1 <sup>st</sup> Public Consultation in Karuma Town Scoping Stage (Nov 8 <sup>th</sup> , 2023: 10:30 ~ 14:00 Karuma Town Council Compound	1. Project Outline 2. Alternative Analysis 3. Questionnaire 4. Schedule of the Project 5. Expected Major Impacts and Mitigation measures 6. Information collection on animals 7. Exchange Opinions	Total: 141 (male: 99, female: 42) Government: 1, PAPs: 155, NGOs and Community Specific Group: 6, Media: 1, JICA Survey Team: 3	✓ Number of people who raised opinions: 8 ✓ Number of opinions and questions raised: 8	
1 <sup>st</sup> Public Consultation in Kamdini Town Scoping Stage (Nov 9 <sup>th</sup> , 2023: 10:00 ~ 12:30 at Nora Village, Juma Parish, Kamdini Town Council Township, Mon State)	1. Project Outline 2. Alternative Analysis 3. Questionnaire 4. Schedule of the Project 5. Expected Major Impacts and Mitigation measures 6. Information collection on animals 7. Exchange Opinions	Total: 65 (male: 50, female: 15) Government: 1, PAPs: 155, NGOs and Community Specific Group: 6, Media: 1, JICA Survey Team: 3	✓ Number of people who raised opinions: 9 ✓ Number of opinions and questions raised: 9	
2 <sup>nd</sup> Public Consultation in Karuma Town Draft ESIA Stage (Apr 3 <sup>rd</sup> , 2024: 10:30 ~ 13:30 at Karuma Town Council office	1. Project Outline 2. Result of the Preference on Alternative Analysis in the 1 <sup>st</sup> LSM Meetings 3. Summary of Survey and Forecast Result and Major Mitigation Measures 4. ESIA Implementation Structure 5. Grievance Redress Mechanism 6. Schedule of the Project 7. Exchange Opinions	Total: 238 (male: 173, female: 65) Karuma TC (Leaders of each level), Cultural Leader, Religion Leader, female group Leader, economic activity Leader, general inhabitants, etc	✓ Number of people who raised opinions: 8 ✓ Number of opinions and questions raised: 14	
2 <sup>nd</sup> Public Consultation in Kamdini Town Draft ESIA Stage (Apr 4 <sup>th</sup> , 2024: 10:30 ~ 13:30 at Nora village Kamdini Town Council	1. Project Outline 2. Result of the Preference on Alternative Analysis in the 1 <sup>st</sup> LSM Meetings 3. Summary of Survey and Forecast Result and Major Mitigation Measures 4. ESIA Implementation Structure 5. Grievance Redress Mechanism 6. Schedule of the Project 7. Exchange Opinions	Total: 147 (male: 111, female: 36) Kamdini SC (Leaders of each level), Cultural Leader, Religion Leader, female group Leader, economic activity Leader, , general inhabitants, etc.	✓ Number of people who raised opinions: 9 ✓ Number of opinions and questions raised: 18	

Source: JICA Survey Team

### (3) Focus Group Discussions

In addition to the local stakeholder meetings (LSHMs), Focus Group Discussions (FGDs) with several target groups in the vicinity of the Project area have been held as shown in below. The targeted groups were women, schoolteachers, cultural leaders, and religious leaders.

**Table-11 Summary of Held Focus Group Discussion**

No.	Date	Venue	Target Group	Main Purpose of Meeting	Participants (excluding Project Side)			Means of Meeting
					Male	Female	Total	
1	8 <sup>th</sup> November 2023	Karuma TC	Women's Group	<ul style="list-style-type: none"> <li>To confirm the situation about gender, child labor, etc.</li> <li>To exchange opinions about proposed Project plan</li> </ul>	-	54	54	Face-to-face
2	9 <sup>th</sup> November 2023	Kamdini SC	Women's Group	<ul style="list-style-type: none"> <li>To confirm the situation about gender, child labor, etc.</li> <li>To exchange opinions about proposed Project plan</li> </ul>	-	66	66	Ditto
3	2 <sup>nd</sup> April 2024	Karuma TC	Teachers of Karuma Primary School	<ul style="list-style-type: none"> <li>To confirm challenges on child labor, gender, etc. related to public projects</li> <li>To exchange the opinions about proposed mitigation measures</li> </ul>	1	7	8	Ditto
4	2 <sup>nd</sup> April 2024	Karuma TC	Teachers of Mutunda Secondary School		2	4	6	Ditto
5	2 <sup>nd</sup> April 2024	Kamdini SC	Teachers of Nora Primary School		9	2	11	Ditto
6	2 <sup>nd</sup> April 2024	Kamdini SC	Teachers of Marriolate Secondary School		6	1	7	Ditto
7	3 <sup>rd</sup> April 2024	Karuma TC	Cultural leaders	<ul style="list-style-type: none"> <li>To confirm the location of cultural sites and resources</li> <li>To exchange the opinions about proposed mitigation measures</li> </ul>	15	-	15	Ditto
8	4 <sup>th</sup> April 2024	Kamdini SC			8	-	8	Ditto
9	5 <sup>th</sup> April 2024	Karuma TC	Religious leaders	<ul style="list-style-type: none"> <li>To exchange the opinions about proposed mitigation measures</li> </ul>	9	1	10	Ditto
10	5 <sup>th</sup> April 2024	Kamdini SC			14	-	14	Ditto

Source: JICA Survey Team

### (1) Results of the Response to the Opinions and Requests in the Local Stakeholder Meetings and Focus Group Discussions

At the meeting, questions and opinions were raised by local residents, but as no objections or problematic opinions were raised, it is understood that a basic agreement on the implementation of the project was reached. The opinions and requests raised during the local stakeholder consultations, which were reflected in the project, are listed below.

**Table-12 Opinions in the Local Stakeholder Meeting/Focus Group Discussions and Reflections to the Project**

No.	Date of Questions / Comments	Position	Summary of Questions / Comments	Results of the study and results reflected in the project
1.	6 <sup>th</sup> of Nov, 2023	Representative of the People with Disabled (PWD) Karuma Town Council (male)	Will special consideration be given to persons with disabilities in this project?	Reflected in mitigation measures [During Construction] 106) Providing equal job opportunities for the local people as construction workers. *Fair employment for the same work regardless of gender or disability.
2.	Same as above	Karuma Town Council Mayor (male)	How can local communities benefit in terms of employment?	Reflected in mitigation measures [During Construction] 108) Ensure people from local community are given priority where appropriate
3.	7 <sup>th</sup> of Nov, 2023	Physical planning in Oyam District (Female)	What CSR will Oyam County receive?	There are no laws or regulations regarding Corporate Social Responsibility (CSR) in Uganda and UNRA projects, and the contractors are free on their own initiative during construction. Therefore, since there are no promises that can be made at the survey stage, it was decided to share the requests with other relevant

No.	Date of Questions / Comments	Position	Summary of Questions / Comments	Results of the study and results reflected in the project
				ministries and agencies of the Ugandan government as the requests of the local government and residents.
4.	Same as above	Kamdini SC Town Council Member (male)	Please install signs or take other measures to improve safety.	Reflected in mitigation measures [After construction] 19) Install 40km/h speed limit signs and humps.
5.	Same as above	Kamdini SC Town Council Member (male)	During construction, we expect the project to give priority to hiring local residents under fair terms and conditions.	Reflected in mitigation measures [During Construction] 106) Providing equal job opportunities for the local people as construction workers. 108) Ensure people from local community are given priority where appropriate 132) Ensure fair wages of construction workers hired for the Project 144) Provision of equal job opportunities and fair salary regardless of gender (including positive segregation mechanism to ring fence some jobs for women)
6.	8th of Nov, 2023	Karuma Resident (male) TC	Will there be any mitigation measures during construction to mitigate the impact on business properties along the current road?	Reflected in mitigation measures [During Construction] 104) Information disclosure about the detailed construction plan, including schedule, construction area and related facilities, and traffic control areas. 107) Ensure access to the entrances of shops, restaurants, etc around the construction area and related facilities and traffic control areas.
7.	Same as above	Karuma Resident (male) TC	Is there any support planned for vulnerable social groups (women, disabled, etc.)?	Since there will be no direct negative impact on the vulnerable groups by the implementation of this project, no special support measures such as vocational training are being considered; however, the following mitigation measures are being prepared. [During Construction] For the People with Disabled : See No.1 Gender Related 143) Development of the Code of Conduct for Contractors in conformity with gender policy and Employment Act, Cap 219. 144) Provision of equal job opportunities and fair salary regardless of gender (including positive segregation mechanism to ring fence some jobs for women) 145) Installation of the sanitary facilities in considering gender at construction site and related facilities (including workers' camp). 146) Provision of the educational training to the construction workers about gender issues. 147) Sensitization to the local people about gender issues.
8.	Same as above	Karuma Resident (male) TC	I would like to request CSR hospital construction or hospital equipment upgrade.	Reflected in mitigation measures Same as No.3
9.	9th of Nov, 2023	Kamdini Resident (male) SC	The bridge preferably be the same type (lower road truss bridge) as the Pakwachi Bridge, which would prevent falls from the upper part of the bridge.	Reflected in the design The safety of a bridge is regulated not by the type of bridge, but by the specifications of the safety facilities, such as the height of the railings on the bridge. In this project, the safety facilities have been fully considered and designed.
10.	Same as above	Kamdini Resident (male) SC	It is important that local residents be given priority for employment. In addition, employment of not only unskilled workers but also skilled workers should be considered depending on the ability of the residents.	Reflected in mitigation measures Same as No.5
11.	3rd of Apr, 2024	Karuma Resident (female) TC	I would like to the CSR to construct a health center or provide job training.	Reflected in mitigation measures Same as No.3
12.	Same as above	Karuma Resident (female) TC	I would like to a transparent procedure in hiring workers.	Reflected in mitigation measures Same as No.5
13.	Same as above	Karuma Resident (male) TC	I would like bridges and roads to have no curves to avoid accidents.	Reflected in the design The alignment follows design standards (e.g., Uganda MoWT road design manual).



No.	Date of Questions / Comments	Position	Summary of Questions / Comments	Results of the study and results reflected in the project
14.	Same as above	Karuma Resident (male) TC	Will sidewalks be installed?	Reflected in the design Sufficient shoulder is available for sidewalks.
15.	4th of Apr, 2024	Kamdini Resident (male) SC	It is our request to UNRA to extend the area of installation of the humps to the center of Kamdini SC (outside the project area). (CSR)	Although outside the project implementation area, UNRA has decided to consider the installation of safety facilities from the viewpoint of ensuring future traffic safety.
16.	Same as above	Kamdini Resident (male) SC	Regarding the design of the bridge, it appears to have no or low guardrails. It would be preferable to have a structure that is more secure for passing vehicles, such as the Pakwach Bridge(lower-road truss bridge).	Reflected in mitigation measures Same as No.9
17.	Same as above	Kamdini Resident (male) SC	We would like to have fair and transparent disclosure of information regarding the employment of workers. We would also like to see information disclosed as early as possible, not just before the project is implemented.	Reflected in mitigation measures [During Construction] 133) Information on the Project will be disseminated transparently to the local community. 134) Continue to communicate with the local community from the survey period to ensure that all concerns are addressed.
18.	Same as above	Kamdini Resident (male) SC	In past projects, there was a gap between the employment rate explained in advance and the actual employment rate for local workers. Therefore, it would be desirable to sign an MOU between the appropriate organization and the local community this time.	Reflected in mitigation measures [During Construction] 107) Establishment of GRM for resolving issues including recording grievances delivered by the local people. 131) The contractor will encourage potential workers to get recommendation from local leaders (LC) to be eligible in the hiring of construction workers to ensure that those hired do not have criminal records.
19.	Same as above	Kamdini Resident (male) SC	Since there are many unemployed young people in this area, we would like you to consider measures to give them priority employment.	Reflected in mitigation measures Same as No.5
20.		Kamdini Resident (male) SC	In the past projects such as the Karuma hydroelectric project, the number of children born out of wedlock increased in the surrounding areas, and if such cases occurred in this project, we would like to provide livelihood restoration measures for the children and their families.	Reflected in mitigation measures [During Construction] 143) Development of the Code of Conduct for Contractors in conformity with gender policy and Employment Act, Cap 219. 146) Provide the educational training on gender issues to the construction workers. 147) Sensitize the local people on gender issues.
21.		Kamdini Resident (male) SC	We would like you to install wells, construct a community, center, youth centers to provide job training as part of the CSR.	Reflected in mitigation measures Same as No.3
22.		Kamdini Resident (male) SC	Regarding the employment of workers in this project, I would like to work as skilled workers, not unskilled workers, so I would like to request that the employment conditions for skilled workers be disclosed and available for application, not only in Kampala, but also in this vicinity.	Reflected in mitigation measures Same as No.5

Source: JICA Survey Team

## 9. Recommendations

The mitigation measures and environmental monitoring planned in this ESIA need to ensure that they are implemented during and after construction. The results of these monitoring should also be regularly reported to UWA, NEMA, local government and other relevant ministries and agencies, and made publicly available through the UNRA website to ensure transparency.

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## The Project for Construction of the Karuma Bridge

### Environmental and Social Impact Assessment

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## CHAPTER 1 INTRODUCTION

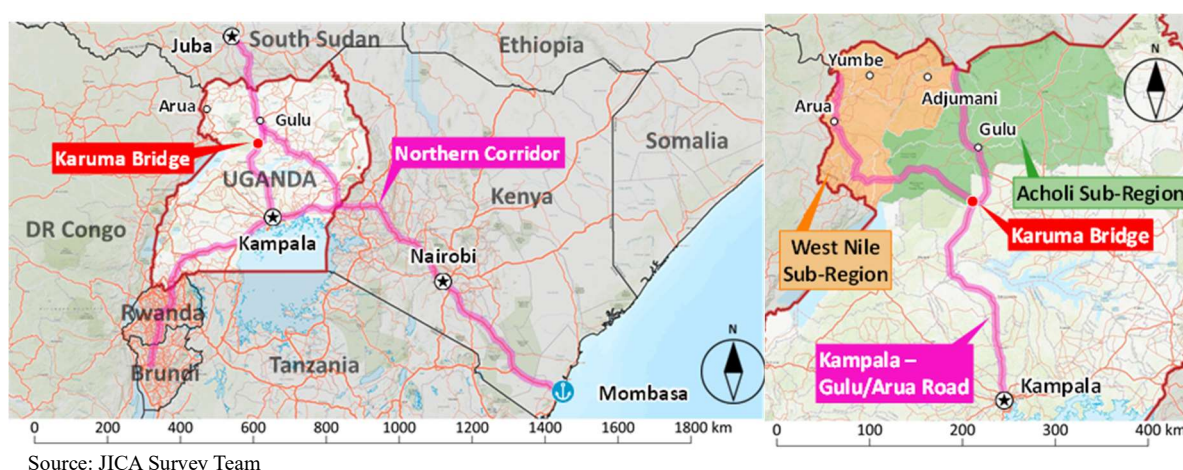
### [Summary of the Chapter 1]

This chapter presents the project's objectives and background, outline, history and current status of Karuma bridge, necessity of ESIA, past ESIAs, gap analysis between 2016/2018 and 2024 ESIAs, relevant organizations and the structure of the report.

This 2024 ESIA has been prepared in accordance with JICA guidelines as well as Ugandan legislation. Field surveys and interviews have been conducted to obtain up-to-date information on about 30 items. Compared to previous ESIAs, differences can be seen in that flora, fauna and water quality surveys have been carried out during the wet and dry seasons and quantitative impact estimates for air quality, noise, vibration and water quality have been made based on the latest survey results.

### 1.1. Objectives and Background of the Project

The Karuma Bridge crosses the Victoria Nile on the Kampala-Gulu/Arua Road, a trunk road that connects Kampala, the capital of the Republic of Uganda (hereinafter referred to as "Uganda"), with Gulu, a core city in the north and the center of the Acholi Sub-region, as well as the West Nile Sub-region in the northwest. The Kampala-Gulu/Arua Road is a crucial logistics and transportation link on the Northern Corridor of East Africa (hereinafter referred to as the "Northern Corridor"), which is an international trunk road network originating at the port of Mombasa, Kenya, and extending to the Republic of South Sudan. More than 800,000 refugees from South Sudan, the Democratic Republic of the Congo, and other countries have entered Northern Uganda (comprising the Acholi region and West Nile region), with many relief supplies being transported from Kampala and other areas. Since the Kampala-Gulu/Arua Road is the sole connection between Kampala and the northern region, the Karuma Bridge, located there, plays a significant role in refugee assistance, in addition to its political and economic importance. Figure 1.1.1 illustrates the location of the existing Karuma Bridge, the Northern Corridor starting from the port of Mombasa, and the administrative boundaries of the West Nile and Acholi Sub-regions, which host many refugees.



**Figure 1.1.1 Project Location Map (Wide Range)**

The existing Karuma Bridge was constructed in 1964, and after nearly 60 years of service, it is exhibiting signs of damage and aging, such as cracks in the concrete slab elements and exposed rebar. Additionally, the bridge section is not wide enough to accommodate the



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horizontal curve radius of the approach road, which forces large trucks to occupy the entire width of the bridge while traveling on it. The approach roads on both sides feature steep grades and sharp curves, leading to road safety issues. This insufficient road geometry has resulted in accidents on the bridge, including fatalities due to vehicles falling into the river or causing traffic blockages.

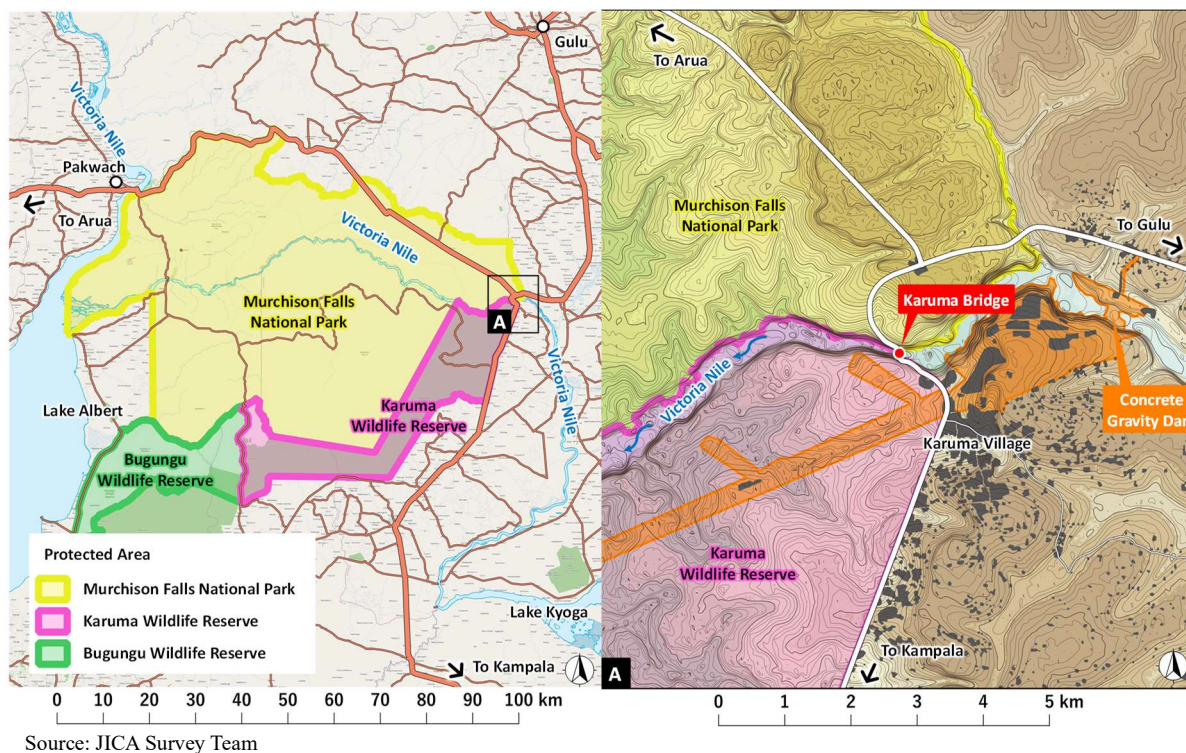
If the Karuma Bridge were to become impassable due to accidents or deterioration, traffic between Kampala and Gulu/Arua would need to be rerouted more than 200 km to the east of Lake Kyoga. Given these challenges, the construction of a new bridge for safe passage is a matter of great urgency and is positioned as a top priority for the Government of Uganda. The National Development Plan III (2020/21-2024/2025) features the "Integrated Transport Infrastructure Promotion Program" as one of its key initiatives. This is significant as the country heavily relies on roads for over 92% of its freight and passenger transport.

In 2014, the Government of Uganda, working through the Uganda National Roads Authority (UNRA), conducted a feasibility study and detailed design study for the construction of the new Karuma Bridge, with plans to construct it approximately 400 m downstream from the existing bridge. A report on the Environmental and Social Impact Assessment (ESIA) for the project was also submitted to the National Environmental Management Agency (NEMA) in 2015, and the certificate of ESIA approval was issued on August 9, 2016. However, this environmental permit has since expired due to a lack of funding and failure to initiate the project within the specified validity period. (Construction work must commence within two years of issuance, and the permit is valid for five years, including the construction period.)

Faced with these circumstances, the Government of Uganda sought grant assistance from Japan for the construction of the New Karuma Bridge. In response to this request, a survey has been undertaken to comprehensively understand the project's background, purpose, and content. This survey also examines its effectiveness, technical and economic appropriateness, and aims to develop a schematic design for the project, determining the optimal scale necessary to achieve the desired results of the cooperation. It also includes an estimate of the project cost, assuming the grant aid will be used for procuring facilities and equipment, among other items.

The primary purpose of this survey is to estimate the project's cost and propose the content of the recipient country's contribution to the project, an implementation plan, and considerations for operation and maintenance. These are all essential components needed to achieve the project's goals and desired results.

The 45 km section of the Kampala-Gulu/Arua Road, situated to the north of the Karuma Bridge, which includes the project area, is located in the Murchison Falls National Park (MFNP) and Karuma Wildlife Reserve (KWR). Therefore, the survey and proposal must give due consideration to the natural environment of these areas and the surrounding social environment. An environmental impact assessment will be conducted as part of this survey. Figure 1.1.2 depicts the survey area's location within Murchison Falls National Park and Karuma Wildlife Reserve, as well as the current land use status of the surrounding areas.



**Figure 1.1.2 Project Location Map (Close Range)**

## 1.2. Basic Concept of the Project

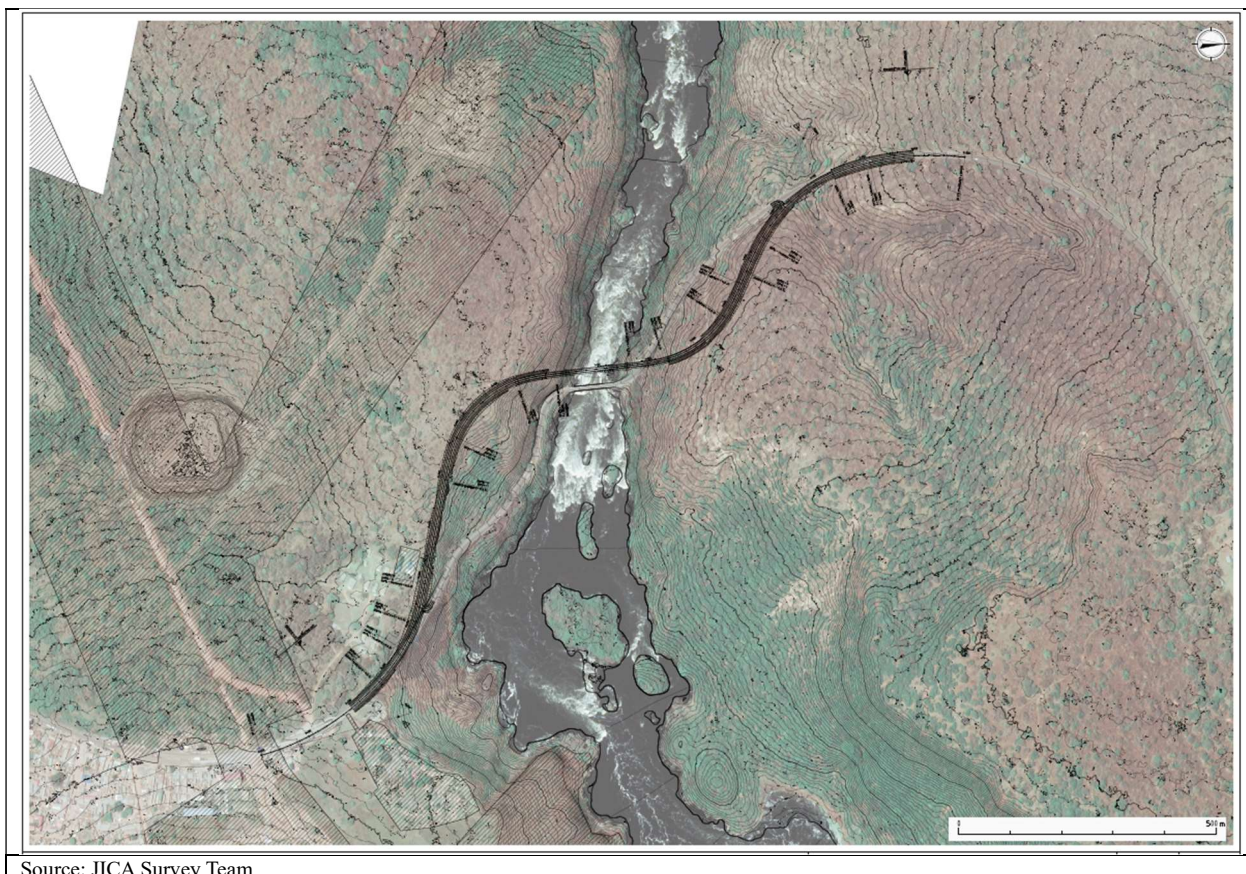
The project aims to replace the Karuma Bridge, located on the border between Kiryandongo and Nwoya districts, to facilitate traffic and ensure safety on the targeted section, thereby contributing to the facilitation of logistics and transport in the Northern Corridor and the Northern Region.

**Table 1.2.1 Outline of the Project**

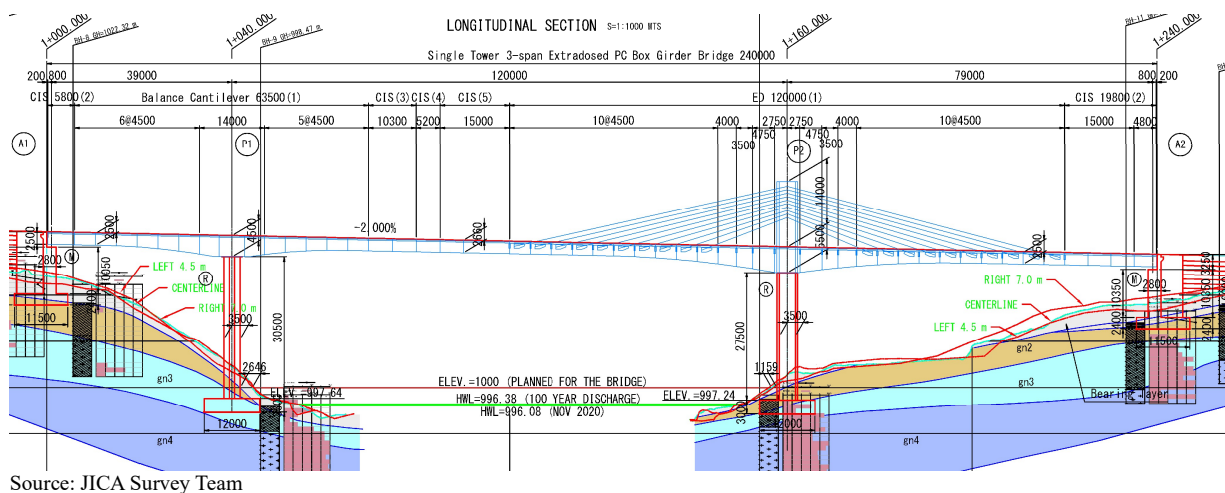
Project Name	The Project for Construction of Karuma Bridge
Objective of the Project	Facilitate traffic and ensure safety in the target section by constructing a Karuma Bridge on the border between Kiryandongo and Nwoya District, thereby contributing to the smoothness of transportation in the northern corridor and international trade improvement.
Project Site	Karuma Bridge on the border between Kiryandongo and Nwoya districts
Executing Agency	Uganda National Road Authority (UNRA)
Financial Scheme	Japan's Grant Aid
Bridge Location	Approximately 40 m downstream from and parallel to the existing Karuma Bridge.
Bridge Type	PC 3-span Continuous Box Girder with Extra-dosed Bridge (40m + 120 m + 80 m = 240 m)
Approach Road Length	Kiryandongo side: 800 m, Nwoya side: 660m (Total 1,460 m)

Source: UNRA / JICA Survey Team





**Figure 1.2.1 Bridge Location and Approach Road Alignment**



**Figure 1.2.2 Bridge Type**

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### 1.3. Understanding of the Project

#### 1.3.1. Role of Northern Corridor for Refugees living in the Area

The Northern Region of Uganda had been an agricultural hub, producing rice, beans, millet, corn, cotton, and other crops, and its population was self-sufficient, generating money by exporting surplus agricultural products to neighbouring Sudan. However, the region entered into a state of armed conflict occasioned by the Lord's Resistance Army (LRA) rebels for more than 20 years, during which time investment in social infrastructure stalled. The local government was unable to function throughout this time, resulting in 61 percent of the total population sliding into abject poverty.

During the conflict, more than 90% of the population of the Acholi Sub-region became Internally Displaced Persons (IDPs). Fortunately, soon after the end of peace talks with the LRA in 2006, donor agencies, notably JICA, began providing shelter and infrastructure to these IDPs in order to foster their return and resettlement. The following initiatives have been devoted to aiding the transportation industry in Northern Uganda:

- (1) Project for Rural Road Network Planning in Northern Uganda: Aug 2009 to May 2013
- (2) Project for Rural Road Network Development in Acholi Sub-region in Northern Uganda: Apr 2011 to Apr 2012
- (3) The Project for Improvement of Gulu Municipal Council Roads in Northern Uganda: Sep 2016
- (4) The Project for the Improvement of National Road in Refugee-hosting Areas of West Nile Sub-region: Feb 2021

In addition to the above, the northern region of Uganda is accommodating South Sudanese refugees who were displaced as a result of the deteriorating public security situation in the country's south following armed conflict in Juba, South Sudan's capital, in July 2016. The region has also taken in refugees from the Democratic Republic of the Congo (DR Congo). According to United Nations High Commission for Refugees (UNHCR), the total number of refugees in Uganda is 1.6 million as of February 2022. Many refugees have flowed into Yumbe District and Adjumani District (both within the West Nile Sub-region), and the number of refugees in these two districts alone account for more than 30%. 61% of the refugees are from South Sudan and 29% of them from DR Congo, and the two countries together account for 90% of the total number of refugees. The Kampala-Gulu/Arua Highway being the only trunk road connecting Kampala to the northern region, securing a stable logistics route by replacing the Karuma Bridge is of great significance for humanitarian assistance.

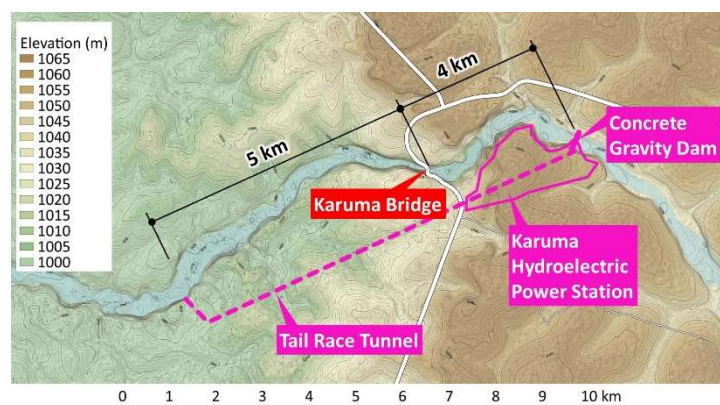
#### 1.3.2. Other Projects near the Project Area

About 4 km upstream of the Karuma Bridge, the “Karuma Hydropower Plant” is under construction with financial support from the Government of China. With a planned generation capacity of up to 600 megawatts, the power station will be the largest power generation facility in Uganda.

As of June 2024, all facilities have been completed and four of the six turbines are currently being commissioned, with all turbines expected to be operational by the end of 2024.

Once in operation, most of the river water will be used for the power generation and drained into the tail race tunnel shown in Figure 1.3.1. The length of the tail race tunnel is about 9 km and the tunnel merges the river 5 km downstream of the Karuma Bridge. As a result, it is assumed that the river water level within the tail race tunnel section will be significantly reduced, and that the impact of the dam on the river should be fully considered in the planning and designing of the new Karuma Bridge.

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Source: Data Collection Survey on Infrastructure Development for Northern Economic Corridor in Uganda (JICA / 2019)

**Figure 1.3.1 Karuma Hydropower Plant and Drainage Tunnel**

### 1.3.3. History and Current Status of Karuma Bridge

The Karuma Bridge is located about 260 km north of Kampala on the Kampala-Gulu/Arua Highway. The intersection between Kampala-Gulu Highway and Kampala-Arua Highway is located near the north bank of the Karuma Bridge. The Victoria Nile, where the Karuma Bridge crosses, is at the border between Nwoya and Kiryandongo Districts. About half the area of both districts is designated as a wildlife reserve known as The Murchison Falls National Park therefore, the Karuma Bridge is located within the national park.

The Karuma Bridge, constructed in 1964, is a continuous 3 spans steel-I girder bridge with reinforced concrete (RC) slab (effective width: 7.3 m, bridge length: 84.7 m, maximum span: 48.5 m). Repair work was conducted on the bridge around 2012, but some defects still exist, such as damage in the expansion joints, cracks in the slab and exposed steel bars. The approach roads on both sides of the bridge are sharp curves with a curve radius of about 80m and steep grades of between 5 to 7%. Furthermore, as illustrated in the lower right photo in Figure 1.3.2, the bridge width is too narrow for large vehicles to pass each other. The JICA Survey Team presumes that this is the likely cause of the numerous traffic accidents.

Given its current condition, continuing to use the old Karuma Bridge would be extremely unsafe, the bridge should therefore be replaced as soon as possible.





Corrosion of Steel Girder, Damage to Attachment



Deterioration of Slab, Corrosion of Steel Girder



Accident in which Vehicle failed to River



Lack of Shoulder Width in Curve Section

Source: Upper Left, Upper Right, Lower Right: JICA Survey Team, Lower Left: Uganda Broadcasting Corporation (Apr 2021)

**Figure 1.3.2 Condition of Existing Karuma Bridge**

#### 1.4. Necessity and Objective of ESIA Study for the Construction of Karuma Bridge

According to the National Environment Act (2019), mandatory of ESIA explains the Schedule 5 “Construction of public roads not being community access roads, including (ii) Construction of flyovers” and Schedule 10 “Projects not listed in schedule 6 and planned to be located in or near environmentally sensitive areas such as (b) areas declared by national law as protected areas”, thus the project for the construction of Karuma Bridge is required to conduct ESIA.

#### 1.5. Derivative, Secondary, and Cumulative Impacts

The approach road already existed when the current Karuma Bridge was built (1964) and the Karuma Bridge of the Project will be connected to the same road. Therefore, there is no indivisible project in relation with the Project as per following definition. In addition, the Atiak and Gulu section of the road between the Sudanese border (about 250km north to the Karuma Bridge) has already been constructed under the assistance of World Bank (August 2015). Further, the European Union is currently assisting the construction of the road between Larobi and Atiak section, however, this is not a prerequisite for the project and therefore there is no indivisible project in relation with the Project as per following definition.

- 1) which involve associated facilities that would not have been constructed or expanded if the Project did not exist, and
- 2) without which, the Project would not be viable.

There is no cumulative impact in the Project as any cumulative impact from the Karuma Hydroelectric Power Plant project is already incorporated into the ESIA as the Karuma

Hydroelectric Power Plant was already in operation (since August 2023) by the time of the baseline study began for the ESIA. Similarly, the access road and the existing Karuma Bridge existed prior to the ESIA therefore any cumulative impact from those infrastructures are reflected in the ESIA. Finally, no further development is expected as the project site is within a national protected area and therefore no additional cumulative impact is expected.

## 1.6. Past Major Activities on ESIA for the Project

### 1.6.1. Background of the ESIA reports on the Karuma Bridge Project

The history of the ESIA for this project is shown in the table below. The first approval of the ESIA report by NEMA had been obtained in 2016, but the construction had not been started within the 24 months set as a requirement for approval. Therefore, an updated ESIA was prepared in 2018, but the Certificate of Approval of ESIA was not renewed as the project was not expected to be implemented. Then, an application for the extension of the validity period of Certificate of ESIA Approval is currently being submitted to NEMA by UNRA in April 2024 and issued in August 2024.

**Table 1.6.1 Past Activities on ESIA for the Karuma Bridge**

Year/Month	Description
9 <sup>th</sup> of August, 2016	ESIA Approval by NEMA
2018	Preparation of update ESIA by UNRA
11 <sup>th</sup> of April, 2024	Submission of Application for the extension of the validity period of Certificate of ESIA Approval from UNRA to NEMA
2 <sup>nd</sup> of August, 2024	

Source: JICA Survey Team

#### 1) Gap Analysis between 2016/2018 and 2024 ESIA

The ESIA (2024) has been prepared based on the ESIA (2016/2018) and in accordance with Ugandan relevant laws and the “JICA Guidelines for Environmental and Social Considerations (April 2010)” (hereinafter referred to as “JICA GL”).

All analysed items in ESIA (2024) cover items of ESIA (2016/2018), however, major differences are conducting two seasons on-site surveys on water quality and ecosystem which were requested by the external advisory committee of JICA. In addition, the JICA GL prescripts that quantitative forecast on air quality, water quality, and noise & vibration should be done.

**Table 1.6.2 Major Gaps between 2016/2018 and 2024 ESIA**

Item	ESIA (2016/2018)	ESIA (2024)
Referred main Laws and Guidelines	Ugandan Law	Ugandan Laws and JICA GL
Alternative Analysis	Alternative analysis has been done on routes and bridge types including without project	Same as left
On site survey item	ESIA (2016): Air quality, and Ecosystem (fauna and flora) surveys, ESIA (2018): Ecosystem (fauna and flora) survey  Note: All baseline survey results of the ESIA (2016/2018) were referenced in the literature survey of the ESIA (2024).	Air quality, Water quality, Soil contamination, Noise & Vibration, Ecosystem (fauna and flora), Archaeological objects, and Social Condition Survey (interview survey).
Frequency of Site Survey	ESIA (2016) <b>One season:</b> Air quality and Ecosystem (fauna and flora) surveys ESIA (2018) <b>One season:</b> Ecosystem (fauna and flora) survey	<b>One season:</b> Air quality, Soil contamination, Noise & Vibration, Archaeological objects, and Social Condition Survey (interview survey) <b>Two Seasons (dry and rainy season):</b> Water quality and ecosystem (fauna and flora)
Forecasted Negative Impact Items and Methods	(1) Forecast Item ESIA (2016) <b>[During construction]:</b> Air quality, noise, vibration, physical cultural resources, water pollution, solid waste, soil contamination, soil	Basically, all forecasted items in the ESIA 2016/2018 are including in the ESIA 2024. (1) Forecast Item: <b>[During Construction]:</b> Air, Water, Waste, Soil contamination, Noise and vibration,

Item	ESIAs (2016/2018)	ESIA (2024)
	<p>erosion, soil compaction, ecosystem (fauna-flora), occupational health and safety of workers, construction materials, construction camps and worker sites</p> <p><b>[After construction]:</b> Ecosystem (fauna-flora), accident ESIA(2018)</p> <p><b>[During construction]:</b> Air, noise, vibration, water, waste, soil erosion, soil contamination, ecosystem (fauna-flora), transmitted diseases, employment opportunities, gender (prostitution), crime and drug, child abuse, accident. Safety and health, landscape, climate change</p> <p><b>[After construction]:</b> Noise, vibration, soil erosion, ecosystem (fauna-flora), transmitted diseases, safety and health, landscape, climate change</p> <p>(2) Methodology of forecast <b>Quantitative forecast:</b> None <b>Qualitative forecast:</b> for above all items</p>	<p>Odor, Protected area/Ecosystem, Hydrology, Topography and geology, Poverty Group, Indigenous and ethnic group, Local economy, Land use and utilization of local resources, Water usage, Existing social infrastructures and services, Social institutions, Unequal distribution of benefits and damage, Local conflict of interests, Cultural heritage, Landscape, Gender, Rights of children, Infectious diseases, Labor environment (including work safety), Accidents, Cross boundary impacts and climate change.</p> <p><b>[After Construction]:</b> Air, Water, Waste, Soil contamination, Noise and vibration, Odor, Protected area/Ecosystem, Hydrology, Topography and geology, water usage, landscape, Cultural heritage, Accidents, Cross boundary impacts and climate change.</p> <p>(2) Methodology <b>Quantitative analysis:</b> Air quality, Water quality, Noise &amp; Vibration, Wastes, Cross boundary impacts and climate change. (CO2) <b>Qualitative analysis:</b> Soil contamination, Odor, Protected area/Ecosystem, Hydrology, Topography and geology, Poor Group, Indigenous and ethnic group, Local economy, Land use and utilization of local resources, Water usage, Existing social infrastructures and services, Social institutions, Unequal distribution of benefits and damage, Local conflict of interests, Cultural heritage, Landscape, Gender, Rights of children, Infectious diseases, Labor environment (including work safety), Accidents</p>
Major Items of Mitigation Measures	<p>ESIA(2016) <b>[During construction]:</b> Air quality (dust), Solid waste, soil erosion, water pollution, ecosystem (fauna-flora), noise, accident, employment opportunities, local economy, cultural resources, worker's safety <b>[After construction]:</b> Water pollution, traffic accident ESIA(2018) <b>[During construction]:</b> Air (dust), noise, vibration, water use, sharp slope, ecosystem (fauna-flora), employment opportunity, base-camp location, infection diseases, waste including hazardous material, gender, physical cultural sites, influx people, right of children, gender, occupational health and safety, accident, discrimination and harassment, climate change. <b>[After construction]:</b> Noise, vibration, sharp slope, traffic accident, ecosystem (fauna-flora), climate change.</p>	<p>Basically, all mitigation measures in the ESIA 2016/2018 are including in the ESIA 2024. <b>[During Construction]:</b> Air, Water, Waste, Soil contamination, Noise and vibration, Odor, Protected area/Ecosystem, Hydrology, Topography and geology, Poverty Group, Indigenous and ethnic group, Local economy, Land use and utilization of local resources, Water usage, Existing social infrastructures and services, Social institutions, Unequal distribution of benefits and damage, Local conflict of interests, Cultural heritage, Landscape, Gender, Rights of children, Infectious diseases, Labor environment (including work safety), Accidents, Cross boundary impacts and climate change. <b>[After Construction]:</b> Air, Water, Waste, Soil contamination, Noise and vibration, Odor, Protected area/Ecosystem, Hydrology, Topography and geology, water usage, landscape, Cultural heritage, Accidents</p>
Major area of Environmental Monitoring Plan	<p>ESIA(2016) All mitigation measures shall be monitored in the EMoP On-site measurement and survey item are; <b>[During Construction]:</b> Water Quality, Noise, Ecosystem <b>[After Construction]:</b> Not specify. ESIA(2016) All mitigation measures shall be monitored in the EMoP On-site measurement and survey item are; <b>[During Construction]:</b> Noise, Water quality, Ecosystem <b>[After Construction]:</b> Not specify.</p>	<p>All mitigation measures shall be monitored in the EMoP. Basically, all mitigation measures in the ESIA 2016/2018 are including in the ESIA 2024. On-site measurement and survey items <b>[During Construction]:</b> Air quality, Water Quality, Soil Contamination, Noise, Ecosystem <b>[After Construction]:</b> Air quality, Water Quality, Noise, Ecosystem</p>
Public Consultation	<p>ESIA(2016): Conducted at the scoping stage in Kiryandongo and Nwoya District ESIA(2018): Conducted at the scoping stage in Kiryandongo and Nwoya District (August 2018)</p>	<p>Conducted at scoping stage in Nov. 2023 and draft ESIA stage in Apr. 2024 in Kiryandongo, Nwoya and Oyam districts.  Note: Local stakeholder meetings were held in two phases: scoping in Nov. 2023 and draft ESIA in Apr. 2024, respectively.</p>

Source: JICA Survey Team



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## 1.7. The Project Proponent

### 1.7.1. Responsibilities on the Project

The Uganda National Roads Authority (UNRA) is an agency of the Government, under the Ministry of Works and Transport (MoWT) established by law, the UNRA Act of 2006, with the responsibility of maintaining, managing, and developing the National Road network. In addition, the Authority is required to render advisory services to Government and for related matters concerning National Roads, among others, and also to collaborate with international organizations, intergovernmental organizations and agencies or other states and the private sector on issues relating to the development and maintenance of roads. Under such an arrangement, the ESIA is coordinated under the Network Planning Department.

### 1.7.2. Address of the Proponent

Uganda National Roads Authority (UNRA)  
Plot 3-5, Old Port Bell Road. Kampala  
UAP Nakawa Business Park  
First Floor, Block D,  
P. O Box 38487 Uganda  
Tel: +256 312 233 100

## 1.8. Environmental and Social Impact Assessment Team

This Environmental and Social Impact Assessment was conducted by qualified personnel from PROME CONSULTANTS LTD in cooperation with JICA Survey Team led by Oriental Consultants Global Co., Ltd., as commissioned by Japan International Cooperation Agency (JICA) an international funding agency from Japan Government. The member of the Environmental and Social Impact Assessment Team are shown in the Table 1.8.1.

**Table 1.8.1 Environmental and Social Impact Assessment Team**

Name	Roles	Signature
<b>Dr. Rose MUGIDDE</b>	<b>Team Leader</b> Environmental and Water Specialist NEMA Registered Lead Practitioner	
<b>Gloria SIBO</b>	<b>Natural Resource Specialist</b> and Project Coordinator NEMA Registered ESIA Practitioner	
<b>Stephen KIGOOLO</b>	<b>Fauna Specialist</b> NEMA Registered ESIA Practitioner	
<b>Samuel MUTEBI</b>	<b>Plant Ecologist/Entomologist</b> NEMA Registered ESIA Practitioner	
<b>Ibrahim KAKAIRE</b>	<b>Air and Noise Assessment Specialist</b> and Field Project Coordinator NEMA Registered ESIA Practitioner	
<b>Contributing Local Specialists from Prome</b>		
Edward MUTEESA	Social Gender Specialist	
James ENGARU	Field Sociologist and Stakeholder Engagement	
Dr. James NAGAYI	Aquatic Specialist	
Michael KIBUULE	Orithonologist (Birds) Specialist	
Jalia KIYEMBA	Entomologist Specialist	
Mukasa MUHAMMED	Field Sociologist and Social Economic Enumeration	
Maxwell MWESIGWA	GIS expert	
Godfrey KATUMBA	Hydrologist/ Water quality Specialist	
Christopher SSEBUYUNGO	Physical Cultural Resource Specialist	
Moses ARUHO	Environmental and Natural Resource Expert	
Martha RWABOONA	Field Sociologist	
Patricia MBABAZI	Assistant Field Environmentalist	

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Dougious SSEKACHWA	Assistant Field Environmentalist
Deborah NAMYALU	Field Environment and Social Assistant
<b>Contribution from JICA Survey Team</b>	
Hironori KUROKI	Environmental Consideration 1
Koichi MURATA	Environmental Consideration 2 (Wildlife)
Mizuki TAKAHASHI	Environmental Consideration 3 (Natural Environment)
Hideyuki YAMAMOTO	Environmental Consideration 4 (Ecosystem)
Ayumi SHIGA	Social Consideration
Godfrey TUMUHAIRWE	Environmental and Social Specialist
Renee NASASIRA	Environmental and Social Assistant

## 1.9. **Quality Control**

A number of Quality control measures were employed to ensure that the data collected and ESIA report prepared is of the required quality and therefore addresses the requirements of both JICA as well as NEMA. These included:-

Mobilization of required Experts:- The ESIA Consultants ensured that right from mobilization, the right experts or professionals in different fields are mobilized given the nature of the study area.

Review of Data collection Tools: All documents used for data collection were guided by a detailed checklist provided by JICA Survey Team. The tool used for collecting Social Economic data from the project area was reviewed and approved by JICA Survey Team and this was tested in the community to ensure adequacy of data collection.

Supervision during data collection: The team leader including the JICA Survey Team supervised the data collection process and all data was double checked to eliminate erroneous data before leaving the field.

Report Development: The ESIA report development was spear-headed by JICA Survey Team and any missing information was collected to ensure adequate capture of all required data needed to develop a good quality and applicable ESIA report.

## 1.10. **Structure of the Report**

The structure of the report is as follows:

CHAPTER 1 INTRODUCTION  
 CHAPTER 2 POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK ON  
    ENVIRONMENTAL AND SOCIAL CONSIDERATIONS IN UGANDA  
 CHAPTER 3 PROJECT DESCRIPTION AND ALTERNATIVE ANALYSIS  
 CHAPTER 4 FEATURES OF THE SURROUNDING ENVIRONMENT  
 CHAPTER 5 SCREENING AND SCOPING  
 CHAPTER 6 IMPACT AND RISK ASSESSMENT AND MITIGATION MEASURES  
 CHAPTER 7 CONSISTENCY WITH JICA GUIDELINES  
 CHAPTER 8 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN  
 CHAPTER 9 LOCAL STAKEHOLDER MEETINGS/ENGAGEMENTS

## CHAPTER 2 POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK ON ENVIRONMENTAL AND SOCIAL CONSIDERATIONS IN UGANDA

### [Summary of the Chapter 2]

This chapter presents the laws and regulations of Uganda, relevant international guidelines and international ordinances with which the project and environmental impact assessment must comply in terms of the natural and social environment. It also summarises the various licensing procedures required for the implementation of the project as well as the environmental assessment.

### 2.1. Laws and Regulations Regarding on Natural Environment

#### (1) Laws and Regulations on Environmental and Social Impact Assessment

##### 1) Major Laws and Regulations on Environmental and Social Impact Assessment

Major laws and regulations related to environmental and social impact assessment in Uganda are as follows. The National Environment Act (2019) stipulates general organizations related to the environmental and social impact assessment in Uganda and areas to be managed with and organizes the requirements for projects that require the preparation of environmental and social assessment reports (ESIAs). In addition, The National Environment (Environmental And Social Assessment) Regulations (2020) specifically describes the procedures for environmental assessments to be carried out and items.

Major laws and regulations are summarized in the following table.

**Table 2.1.1 Major Laws and Regulations on Environmental and Social Impact Assessment**

Name of Laws / Regulations	Contents of the Law / Regulation	Contents related the Project
The National Environment Act (NEA) (2019)	Responsible organizations on environmental and social impact assessment, management of chemicals, waste management, rules and regulations of environmental and social impact assessment	<ul style="list-style-type: none"> <li>Projects which May Require Environmental And Social Impact Assessments</li> <li>Schedule 5 : 1(a) Construction of public roads not being community access roads, including—</li> <li>(ii) Construction of flyovers</li> <li>Schedule 10 : 1. Projects not listed in schedule 6 and planned to be located in or near environmentally sensitive areas such as—</li> <li>(b) areas declared by national law as protected areas</li> </ul>
The National Environment (Environmental And Social Assessment) Regulations (2020)	Required documents on implementation of ESIA such as project brief report, scoping report, ESIA Statement and environmental risk assessment,	<ul style="list-style-type: none"> <li>Schedule 2: Issues to be Considered in Preparation of a Project Brief or an Environmental and Social Impact Statement</li> <li>Items and contents of the project brief and ESIAS</li> <li>Schedule 5: Format of Environmental and Social Impact Statement</li> </ul>

Source: JICA Survey Team based on the National Environment Act (NEA) (2019) and the National Environment (Environmental And Social Assessment) Regulations (2020)

The National Environment Act (NEA) (2019) stipulates that the project requires ESIA are the Schedule 5 “Construction of public roads not being community access roads, including (ii) Construction of flyovers” and Schedule 10 “Projects not listed in schedule 6 and planned to be located in or near environmentally sensitive areas such as (b) areas declared by national law as protected areas”. Thus, the project for the construction of Karuma Bridge is required to conduct ESIA regardless of the project falls inside of the protected areas under national law.

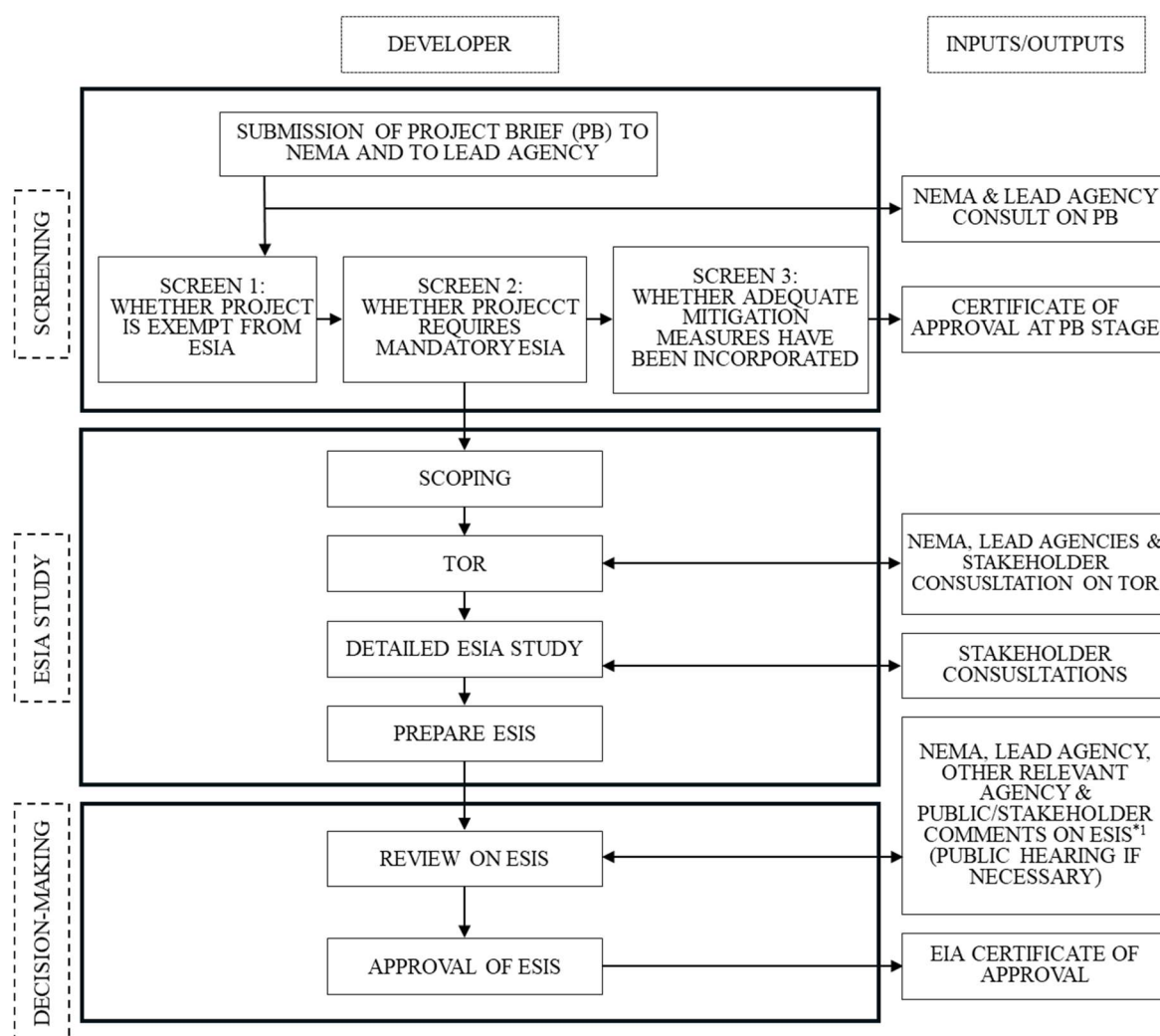
##### 2) Process of Environmental and Social Impact Assessment

The general process in accordance with the National Environment (Environmental And Social Assessment) Regulations (2020) is shown below;

**Table 2.1.2 General Process of ESIA**

Item	Contents	Prescript Duration
1. Preparation and Submission of Project Brief	The project proponent (UNRA) shall prepare a project brief for mandatory scheduled projects base on the National Environment (Environmental And Social Assessment) Regulations (2020) (NER) and submit it to NEMA.	Forward to relevant organizations by NEMA: 7 days Preparation comments by organizations: 14 days (the duration is extended, if information in the project brief is not sufficient)
2. Screening	Necessity of ESIA is judged by NEMA	Conclusion of Screening by NEMA: Within 30 days after submission of the Project Brief
3. Scoping, Preparation of TOR for ESIA and Approval	The Project Proponent shall prepare draft Scoping, and ToR for ESIA and submit them to NEMA and approved by NEMA	Reviewing by related government organizations and screening. Request implementation of ESIA to the proponent or resubmission of scoping and ToR, reject of project implementation: 7 days (after receiving draft scoping and ToR)
4. Implementation of ESIA and Preparation of ESIAS	The project proponent shall conduct a series of survey for ESIA and prepare ESIAS based on the approved ToR	* Duration of preparation is not prescript
5. ESIA Reviewing and Approval	The project proponent shall submit draft ESIAS to NEMA, and then the ESIA is reviewed by relevant government organizations and approved	Forward to relevant organizations by NEMA: 7 days Reviewing and Comment: 21 days
6. Public Hearing (if necessary)	Public Hearing is held when NEMA and ESIA technical committee requests	Announce to relevant organizations and stakeholders by NEMA: 5 days in prior to public hearing The report of public hearing shall be submitted to NEMA within 14 days
7. Approval of ESIA	Updating and submission of ESIAS is requested based on result of public hearing by NEMA, and then approval for ESIAS is given by NEMA	The approval of ESIAS by NEMA: within 60 days after receiving final ESIAS

Source: The National Environment (Environmental and Social Assessment) Regulations (2020)



Note: The project area of this project is located within the MFNP and KWR managed by UWA and is therefore part of the relevant agencies that UWA reviews for review and approval of development in accordance with the Wildlife Act 2019.

Source: The National Environment (Environmental and Social Assessment) Regulations (2020)

**Figure 2.1.1 Flow Chart of ESIA**

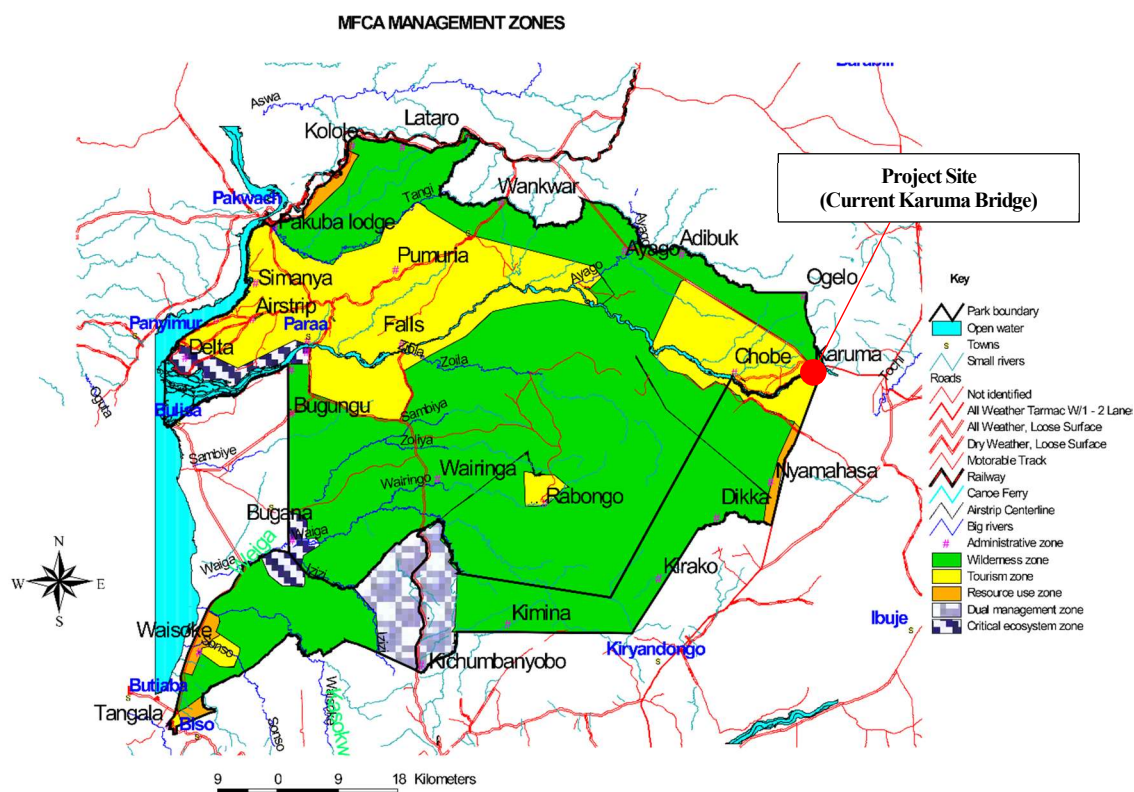
## (2) Laws, Regulations and Guidelines on Natural Environment

Major laws and regulations related to the natural environment are shown in the following Table. Uganda Wildlife Policy (2014) is a high-level policy and it prescribes the implementation and monitoring of environmental assessment for the purpose of sustainable management of wildlife in protected areas and the strategic concept of infrastructure development for tourism development. In addition, the Wildlife Act (2019) (Sec.26(5)(e) and (6)(f)) describes that it is possible to conduct economic activities by conducting appropriate environmental assessments within protected areas. Furthermore, Uganda Wildlife Authority (UWA) has responsibility for establishment of Management Plan, thus UWA has published the Murchison Fall National Park (Karuma Wildlife Reserve, Bugungu Wildlife Reserve) ((Murchison Falls Protected Area)) General Management Plan (2013-2023) in July 2014 and Operational Guidelines for Developments in Wildlife Protected Areas in 2021 respectively.

Summary of major policy, laws, regulations and guidelines related natural environment is shown below.

**Table 2.1.3 Major Policy, Law, Regulation and Guideline on Natural Environment**

Policy, Law, Regulation and Guideline	Objects/Contents	Project related contents
Uganda Wildlife Policy (2014)	Designed to provide comprehensive policy guidance on the protection and development of wildlife resources in Uganda.	Objective 1 (P16): d) Ensure that all new developments and interventions within protected areas are subjected to appropriate environmental impact assessments and regular environmental audits are conducted on existing ones. Objective 3 (P18): To promote sustainable and equitable utilization of wildlife as a viable economic form of land use Strategies for tourism development d) Develop and or improve infrastructure in wildlife protected areas.
Wildlife Act (2019)	Legislation that strengthens the protection and sustainable management of wildlife and defines the roles and responsibilities of the institutions involved.	Sec. 23: Environmental impact assessment. (1) A developer desiring to undertake a project which may have a significant effect on any wildlife species or community shall undertake an environmental impact assessment in accordance with the National Environment Act, 2019. Sec.26: Description of wildlife conservation area. (5) A national park declared under subsection (2)(a) shall be an area in which the following activities may be permitted— (e) any other compatible economic activity subject to this Act and after an environment impact assessment study has been conducted. (6) A wildlife reserve declared under subsection (2)(b) shall be an area in which the following activities are permitted— (f) any other compatible socio-economic activity subject to this Act and after an environment impact assessment study has been carried out.
Murchison Fall National Park (Karuma Wildlife Reserve, Bugungu Wildlife Reserve) ((Murchison Falls Protected Area)) General Management Plan (2013-2023) July 2014/UWA	To guide protected area management responsible body in making decisions the sustainability of protected areas.	The Karuma Bridge area is designated as Tourism Zones as shown in the figure below. The content of the Tourism Zone shown in 4.1 (page30) is described as “This Zone represents areas in Murchison of spectacular scenery and wild game for visitor enjoyment. ". It states that lodge construction, sport fishing, and events with tourists are permitted. In addition, according to UWA, infrastructure development necessary for tourism is permitted in this zone. Furthermore, the specific objectives of the park management program in Sec. 8 are as follows. “2. To ensure well developed and maintained protected area infrastructure and facilities by end of planned period.
Operational Guidelines for Developments in Wildlife Protected Areas/UWA	Directs, coordinates and regulates the activities of developers in the natural protected areas. Minimize negative long-term and short-term negative impacts of development on the integrity of protected areas and associated ecological processes. Minimize the negative impact of development activities on tourism. Raise conservation awareness among various developers.	3. The Guidelines (page10) 3.3 Infrastructure 3.3.1 Construction and Operation of Roads and Pipelines i. Main roads, access roads, pipelines, electricity transmission lines, and any other infrastructure shall be limited to only those that are approved. As much as possible, pipelines and electricity transmission shall be subsurface. In case of unforeseen access roads, the developer shall undertake Environmental and Social Impact Assessments in accordance with the National Environment Act 2019 and Wildlife Act 2019.



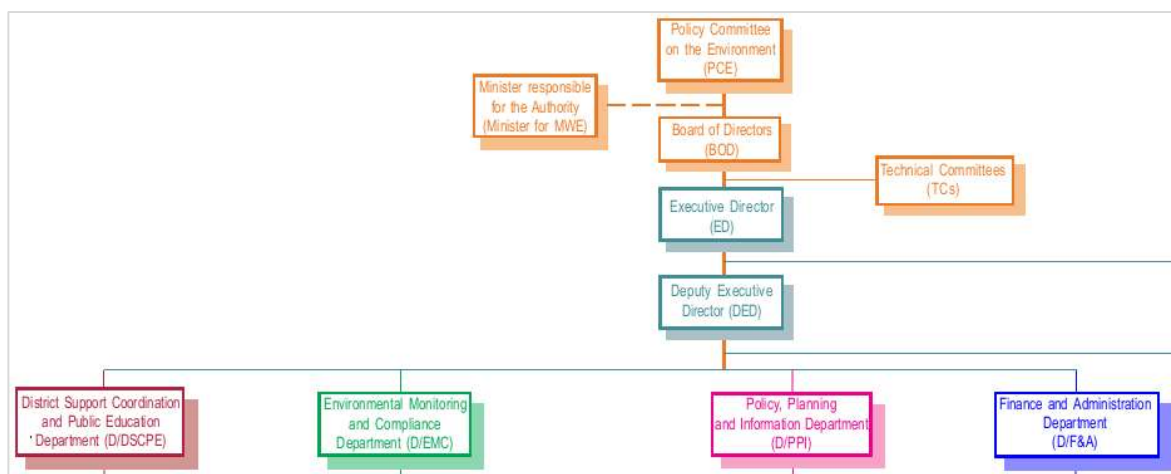
Source: Murchison Fall National Park (Karuma Wildlife Reserve, Bugungu Wildlife Reserve) ((Murchison Falls Protected Area)) General Management Plan (2013-2023) July 2014/UWA

**Figure 2.1.2 Zoning Map of the Murchison Fall National Park**

(3) Organizations related Environmental and Social Impact Assessment

1) Environmental Authorized Organization

The authority to approve ESIA in Uganda is the National Environmental Management Authority (NEMA) under the Ministry of Water and Environment. The Department of Environmental Monitoring Compliance (D/EMC) coordinates the process of Environmental and Social Impact Assessment (ESIA) and the issuance of the Environmental Compliance Certificate (ECC). The organization chart of NEMA is shown below.

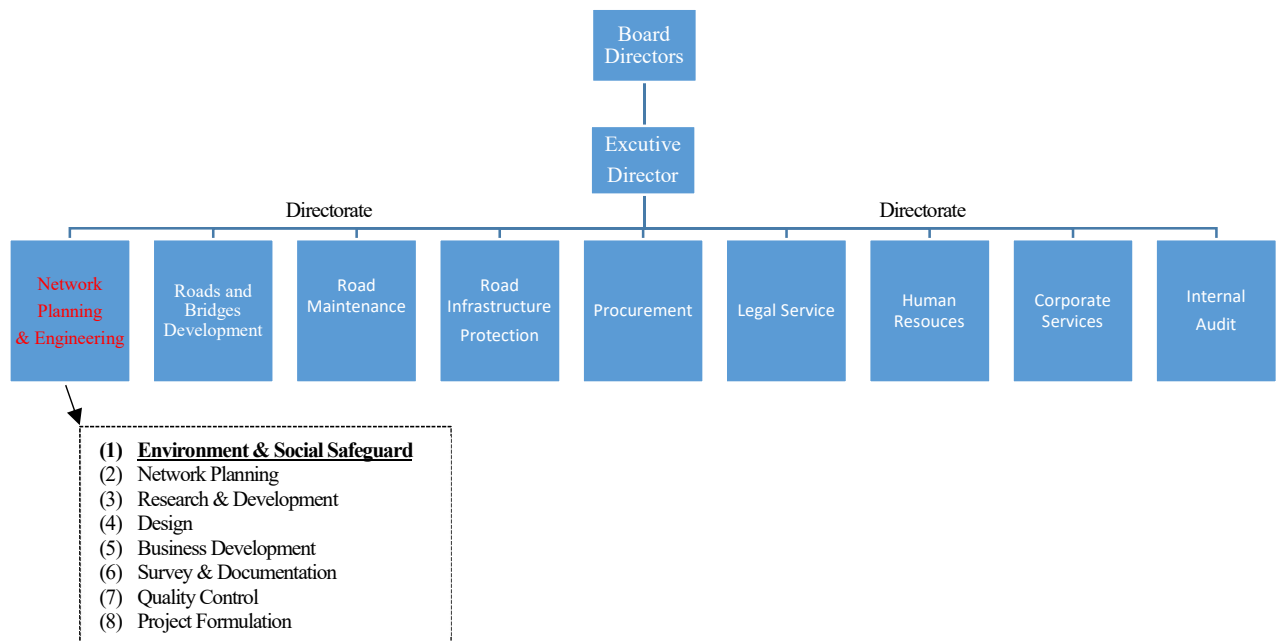


Source: National Environment Management Authority Strategic Plan 2009/2010-2013/2014

**Figure 2.1.3 Organization Chart of NEMA (National Environment Management Authority)**

## 2) UNRA (Uganda National Roads Authority)

The organizational chart of the Uganda National Roads Authority (UNRA) is shown below. The unit coordinates ESIA and land acquisition and resettlement plans (LARAP) is the Environment and Social Safeguard Unit under the Directorate of Network Planning & Engineering.



Source: UNRA

**Figure 2.1.4 Organization Chart of UNRA (Uganda National Roads Authority)**

## (4) Screening

### 1) Screening in Accordance with Uganda Law

According to the National Environment Act (NEA) (2019) following conditions for implementation of ESIA is described;

- iii. Schedule 5 : 1(a) Construction of public roads not being community access roads, including (ii) Construction of flyovers
- iv. Schedule 10 : 1. Projects not listed in schedule 6 and planned to be located in or near environmentally sensitive areas such as (b) areas declared by national law as protected areas

Thus, regardless of whether the alignment passes through protected areas, it is necessary to prepare ESIAS (Environmental and Social Impact Assessment Statement) in accordance with condition in the schedule 5.

### 2) Screening in Accordance with JICA Guidelines for Environmental and Social Considerations 2010

The project is classified as Category A because it falls under "projects located in or near sensitive areas" and requires the preparation of an environmental impact assessment in accordance with JICA Guidelines for Environmental and Social Considerations 2010.

## (5) Gaps between Relevant EIA Laws in Uganda and JICA Guidelines

The result of gap analysis shows that some gaps have been identified on disclosure of ESIAS (Environmental and Social Impact Assessment Statement (report)) and monitoring report during and after construction. Thus the project proponent (UNRA) follows the JICA



Guidelines basically.

**Table 2.1.4 Result of Gap Analysis between EIA Related Laws in Uganda and JICA Guidelines**

JICA Guideline (2010)* <sup>1</sup>	The National Environment Act (2019) (NEA) The National Environment (Environmental and Social Assessment) Regulations (2020) (NER) Wildlife Act (2019)	Gaps / Policy to fill up gaps in this Study
<b><u>[I. Underlying Principles]</u></b>  1. Environmental impacts that may be caused by projects must be assessed and examined in the earliest possible planning stage. Alternatives or mitigation measures to avoid or minimize adverse impacts must be examined and incorporated into the project plan. (Appendix 1.)	In the initial stage of ESIA, alternative analysis and expected mitigation measures shall be included in the project brief report. [NER] 6. Projects for which project briefs are required (5) The project brief shall contain the following information, in a concise manner— (c) an evaluation of project alternatives, including a zero or no-project alternative in terms of project location, project design or technologies to be used, and a justification for selecting the chosen option (n) an environmental management and monitoring plan developed in accordance with regulation 46, incorporating climate adaptation and mitigation plan;	No gaps
<b><u>[II. Information Disclosure]</u></b>  1. EIA reports (which may be referred to differently in different systems) must be written in the official language or in a language widely used in the country in which the project is to be implemented. When explaining projects to local residents, written materials must be provided in a language and form understandable to them. (Appendix 2.)	There is no description about language in the regulation and act.	No significant gaps (Public language in Uganda is English and used in the project area, thus there is no gaps between them)
2. EIA reports are required to be made available to the local residents of the country in which the project is to be implemented. The EIA reports are required to be available at all times for perusal by project stakeholders such as local residents and copying must be permitted. (Appendix 2.)	In the stakeholder consultation during the environmental and social impacts study, sufficient information shall be disclosed to the stakeholders as follows, however there is not any the description about disclose of EIA report. [NER] 16. Stakeholder consultation during the environmental and social impact study (1) The developer shall, in undertaking the environmental and social impact study, carry out consultations with relevant stakeholders, communities likely to be affected by the project and the public. (d) ensure that appropriate project information on environmental and social impacts or risks is disclosed to stakeholders in a timely, understandable, accessible and appropriate manner and format, well in advance of the proposed consultations.	Gap is clarified (Summary of Draft ESIA is informed to participants before stakeholder consultation and approved ESIA is disclosed on the web-site of JICA)
<b><u>[III. Local Stakeholder Meeting / Consultation]</u></b>  1. Projects must be adequately coordinated so that they are accepted in a manner that is socially appropriate to the country and locality in which they are planned. For projects with a potentially large environmental impact, sufficient consultations with local stakeholders, such as local residents, must be conducted via disclosure of information at an early stage, at which time alternatives for project plans may be examined. The outcome of such consultations must be incorporated into the contents of project plans. (Appendix 1.)	Stakeholder consultation is conducted [NER] 16. Stakeholder consultation during the environmental and social impact study (1) The developer shall, in undertaking the environmental and social impact study, carry out consultations with relevant stakeholders, communities likely to be affected by the project and the public.	No Gaps

JICA Guideline (2010)* <sup>1</sup>	The National Environment Act (2019) (NEA) The National Environment (Environmental and Social Assessment) Regulations (2020) (NER) Wildlife Act (2019)	Gaps / Policy to fill up gaps in this Study
2. In preparing EIA reports, consultations with stakeholders, such as local residents, must take place after sufficient information has been disclosed. Records of such consultations must be prepared. (Appendix 2)	Information related to EIA is disclosed in a timely manner based on NER, and local stakeholder meetings are held. [NER] 16. Stakeholder consultation during the environmental and social impact study (2) The developer shall, in undertaking consultations under this regulation, establish a systematic approach to stakeholder engagement to —  (d) ensure that appropriate project information on environmental and social impacts or risks is disclosed to stakeholders in a timely, understandable, accessible and appropriate manner and format, well in advance of the proposed consultations.	No Gaps
3. If necessary, consultations with relevant stakeholders, such as local residents, should take place throughout the preparation and implementation stages of a project. Holding consultations is highly desirable, especially when the items to be considered in the EIA are being selected and when the draft report is being prepared. (Appendix 2. )	It is mandatory to hold a local stakeholder consultation in III.1., However necessity of the Public Hearing at the draft ESIA stage is judged in the process of Sec.21(4) in the NER. [NER] 21. Consideration of environmental and social impact statement by the Authority (4) The Authority or the technical committee on environmental and social assessment in respect of a project by the Authority, shall, during consideration of the environmental and social impact statement under this regulation, determine whether a public hearing is necessary.	Gap is clarified (Since the public consultation at the draft ESIA stage is not mandatory in the NER, this consultation is held in accordance with JICA Guidelines 2010)
<b><u>IV. Scope of Impacts to Be Assessed</u></b>  1. The impacts to be assessed with regard to environmental and social considerations include impacts on human health and safety, as well as on the natural environment, that are transmitted through air, water, soil, waste, accidents, water usage, climate change, ecosystems, fauna and flora, including trans-boundary or global scale impacts. These also include social impacts, including migration of population and involuntary resettlement, local economy such as employment and livelihood, utilization of land and local resources, social institutions such as social capital and local decision-making institutions, existing social infrastructures and services, vulnerable social groups such as poor and indigenous peoples, equality of benefits and losses and equality in the development process, gender, children's rights, cultural heritage, local conflicts of interest, infectious diseases such as HIV/AIDS, and working conditions including occupational safety. (Appendix 1.)	Major items to be analyzed are included in the NER. [NER] Schedule 2 ISSUES TO BE CONSIDERED IN PREPARATION OF A PROJECT BRIEF OR AN ENVIRONMENTAL AND SOCIAL IMPACT STATEMENT A developer shall, in the preparation of a project brief or an environmental and social impact statement, take into account the following— (summarized from 1, 2 and 3) Biological diversity, Soil; livelihoods of local communities and indigenous peoples dependent on living natural resources, surface and ground water hydrology, landscape, water quality, air quality, chemical and waste management, local resources, climate change, land acquisition, land-use, economic activities, opportunities for employment and wealth, occupation health and safety, equal opportunities for workers, human health, gender, vulnerable group, social services	No Gaps
2. In addition to the direct and immediate impacts of projects, their derivative, secondary, and cumulative impacts as well as the impacts of projects that are indivisible from the project are also to be examined and assessed to a reasonable extent. It is also desirable that the impacts that can occur at any time throughout the project cycle should be considered throughout the life cycle of the project. (Appendix 1.)	Items to be surveyed and analyzed include direct/indirect, cumulative, short-term to long-term, and wide-area (cross-border) impacts from the scoping stage in accordance with the NER. However, there is no mention of indivisible project. [NER] 13. Conduct of scoping exercise (4) The terms of reference referred to in subregulation (3) shall include— (j) a description of the proposed method of evaluating identified potential direct, indirect, induced, cumulative and transboundary impacts and proposed mitigation measures; 15. Environmental and social impact study (1) Upon approval of the terms of reference, the developer shall undertake	No significant Gaps (Although description about “indivisible project” in the NER, the project is not under such situation)

JICA Guideline (2010)* <sup>1</sup>	The National Environment Act (2019) (NEA) The National Environment (Environmental and Social Assessment) Regulations (2020) (NER) Wildlife Act (2019)	Gaps / Policy to fill up gaps in this Study
	an environmental and social impact study to— (a) assess the anticipated positive and negative direct, indirect, induced, cumulative and transboundary environmental, health, socio-economic, cultural and climate change impacts of the proposed project, including expected carbon footprints of the project;	
<b><u>[V. Monitoring and Redress Grievance]</u></b> 1. Project proponents etc. should make efforts to make the results of the monitoring process available to local project stakeholders. (Appendix 1.)	There is no description to disclose the results of environmental monitoring during and after construction in the article “46. Environmental management and monitoring plan” in the NER.	Gap is clarified (Monitoring results are disclosed on the web-site of JICA)
2. When third parties point out, in concrete terms, that environmental and social considerations are not being fully undertaken, forums for discussion and examination of countermeasures are established based on sufficient information disclosure, including stakeholders’ participation in relevant projects. Project proponents etc. should make efforts to reach an agreement on procedures to be adopted with a view to resolving problems. (Appendix 1.)	In the project brief report and the ESIAS, description of a grievance mechanism is required, and any issues are resolved through this mechanism. [NER] 6. Projects for which project briefs are required (5) The project brief shall contain the following information, in a concise manner— (o) plan for stakeholder engagement throughout the proposed project or activity development, including details on how to address potential related grievances or requests for information, and evidence of stakeholder consultation;	No Gaps
<b><u>[VI. Ecosystem and Biota]</u></b> 1. Projects must not involve significant conversion or significant degradation of critical natural habitats and critical forests. (Appendix 1.)	Economic activities in national parks and wildlife reserves are allowed if EISA is implemented and approved (Wildlife Act). In addition, the NER requires conservation measures using the concept of mitigation hierarchy. [Wildlife Act] 26. Description of wildlife conservation area. (5) A national park declared under subsection (2)(a) shall be an area in which the following activities may be permitted— (e) any other compatible economic activity subject to this Act and after an environment impact assessment study has been conducted” (6) A wildlife reserve declared under subsection (2)(b) shall be an area in which the following activities are permitted— (f) any other compatible socio-economic activity subject to this Act and after an environment impact assessment study has been carried out. [NER] 43. Mitigation hierarchy (c) ensure achievement of measurable conservation outcomes that can reasonably be expected to result in no net loss and preferably a net gain of biodiversity or other benefits, provided that a net gain is mandatory for projects in critical habitats or projects with impacts on endemic species.	No significant Gaps
<b><u>[VII. Indigenous Peoples]</u></b> 1. Any adverse impacts that a project may have on indigenous peoples are to be avoided when feasible by exploring all viable alternatives. When, after such an examination, avoidance is proved unfeasible, effective measures must be taken to minimize impacts and to compensate indigenous peoples for their losses. (Appendix 1.)	As shown in IV-1, survey and analysis for “Indigenous People” is included in the ESIA items, and it is necessary to minimize and mitigate expected negative impacts.	No Gaps

Note) \*1 JICA Guidelines (Appendix 1: Environmental and Social Considerations Required for Intended Projects, Appendix 2: EIA Reports for Category A Projects)

Source: JICA Guidelines for Environmental and Social Considerations (2010)

## 2.2. Laws and Regulations Regarding on Social Environment

### (1) Key Legal Frameworks on Social Environment

Key laws and regulations related to the social environment are listed in Table 2.1.1, except those related to land acquisition and resettlement, which are discussed in the below (2).

**Table 2.2.1 Key Laws and Regulations on Social Environment in Uganda**

Name of Laws/ Regulations	Contents of the Law / Regulation	Contents related to the Project
<b>Vulnerable People</b>		
National Policy on Disability, 2006	It promotes a society in which persons with disabilities (PWDs) fully participate in all aspects of development.	The Project will be required to contribute to and ensure the participation of PWDs in all phases.
<b>Cultural Heritage</b>		
The Uganda National Culture Policy, 2019	It provides for overall guidance and strategies for enhancing the integration of culture into national development.	The Project will be required to consider all aspects related to cultural significance in the design and construction.
The Museums and Monuments Act, 2023	It ensures the protection of cultural and natural heritage resources and the environment, etc.	The Project will be required to collect and document of information on natural and cultural heritage if it is encouraged by the Project, and the cooperation with Ministry of Tourism, Wildlife, and Antiques.
<b>Children's right</b>		
Children Act, Cap 59 (2016)	It provides for the care, protection and maintenance of children, etc.	The Project should avoid child employment and protect children's right.
<b>Gender</b>		
Uganda Gender Policy, 2007	It reaffirms the Government of Uganda's unequivocal commitment to take action to achieve gender equality.	The Policy provides the framework and guidelines for mainstreaming gender in the public sector.
The National Policy Elimination of Gender based Violence, 2016	It provides a framework for the implementation of comprehensive GBV prevention measures and provision of multi-sectoral support services for survivors.	The Project will be required to prepare a gender action plan to support the workers and the local community during the implementation.
<b>Infectious Disease</b>		
National AIDS Policy, 2007	It focuses on the workplace and recognizes that the workplace is where the working population spends most of their active lives.	The Project will be required to play a role as one of the key stakeholders with local authorities, national agencies, people living with HIV/AIDS, etc.
Guidelines for Mainstreaming Gender into the Roads Sub-sector, 2008	It strengthens the roads sub-sector's contribution to poverty eradication through influencing methodologies, analyses, policies, institutional practices and planning from the gender perspective.	The Project will be required to enhance the gender considerations in accordance with the guidelines.
<b>Work Environment</b>		
National Occupational Health and Safety Policy, 2005	It provides and maintains a healthy working environment, institutionalises Occupational Health and Safety (OHS), programs and plans, and contributes towards safeguarding the physical environment.	The Project will be required to provide mitigation measures to protect the workers from health and safety impacts such as accidents, etc.
The Occupational Safety and Health Act No.9, 2006	It provides for the health and safety of persons at work and the handling of hazardous processes and chemicals during manufacture, storage, transportation, and sale to improve the working conditions of workers.	The Project will be required to ensure the health and safety of all the workers. This Act also takes gender considerations for the workers into account, so the Project must comply with it.
The Workers Compensation Act, Cap 225 (2000)	It provides a framework for dealing with the complaints of occupational injuries and disease from people and workers.	The Act is closely related to the "Occupational Safety and Health Act No.9, 2006" which provides for compensation to workers for injuries and diseases suffered in the course of their employment. The Project will be required to comply with this when the case arises.
Employment Act, Cap 219 (2006)	It seeks to harmonize relations between workers and employers of the contracted company in order to protect workers' interests and welfare and ensure their occupational health and safety.	The Project will be required to protect the interests and welfare of workers. In addition, this Act also prohibits the employment of children and advocates the payment of equal wage for both men and women, so the Project must comply with it.
The National Employment Policy for Uganda, 2011	It describes its purpose as to guide all stakeholders on creatin and enhancement of the quality and availability of gainful employment opportunities.	The Project will be required to promote the principle of non-discrimination and protection of the rights and dignity of persons affected and infected by HIV/ AIDS.
<b>Others</b>		
National Equal Opportunities Policy, 2006	It provides a framework for re-dressing imbalances, which exist against marginalized	The Project will be required secure the equal opportunities including service delivery, trainings and

Name of Laws/ Regulations	Contents of the Law / Regulation	Contents related to the Project
	groups while promoting equality and fairness for all, with a goal of providing avenues where individuals and groups' potentials are put to maximum use by availing equal opportunities and affirmative action.	employment.
Public Health Act, Cap 281 (1935)	It aims to avoid pollution of environmental resources that support health and livelihoods of communities.	The Project activities will take all possible mitigation measures to ensure that all impacts on people and the environment are avoided, or where this is not possible or in the event of an accident, compensated for.

Source: JICA Survey Team

## (2) Legal Frameworks on Land Acquisition and Resettlement

Table 2.2.2 shows laws and regulations on land acquisition and resettlement in Uganda. According to Article 26 (2) of the Constitution accredits to take possession or acquisition of property compulsory if the purposes are public use or in the interest of defence, public safety, public order, public morality, or public health. On the other hand, it also stipulates the necessity of prompt payment of fair and adequate compensation in advance and securing a right of access to a court of a law. In this regard, the Land Acquisition Act and the Land Act are developed, as well as the “Guidelines for Compensation Assessment under Land Acquisition (GCALA)” of which purpose is to harmonize and improve the overall practice of valuation assessment to achieve fair and adequate compensation to Project Affected Persons (PAPs).

**Table 2.2.2 Laws and Regulations on Land Acquisition and Resettlement in Uganda**

Name of Framework	Summary
The Constitution of the Republic of Uganda (1995)	<ul style="list-style-type: none"> <li>Article 237 stipulates that the land in Uganda belongs to Ugandan citizens based on the land tenure system. On the other hand, Article 26 allows the government and local governments to acquire land for public purposes with the premise of securing fair, appropriate, and prompt compensation and the right to claim with the court.</li> </ul>
The Constitution (Amendment) (NO. 2) Act (2005)	<ul style="list-style-type: none"> <li>It provides for the establishment of a Regional Land Board by each regional government.</li> </ul>
The Land Acquisition Act (1965)	<ul style="list-style-type: none"> <li>The method and procedure of permanent and temporary land acquisition in public projects are provided.</li> <li>It stipulates paying the appropriate compensation prior to land acquisition.</li> </ul>
The Land Act (1998)	<ul style="list-style-type: none"> <li>It specifies the ownership and management of the land, and conflict resolution. The categorizations of the land are mentioned as follows. 【Land tenure systems】</li> <li>Customary : It is a traditional land ownership system that allows for the ownership and use of the land by individuals or communities based on the traditional customs of the community.</li> <li>Freehold: A system that permanently owns land and grants the owner on the right to freely use and dispose of the land, including development, sale, and donation within the limits of the law.</li> <li>Mailo: It is a system introduced in the era under the governance of the British. The owner have a right to hold land permanently and freely use and dispose of the land within the limits of the law.</li> <li>Leasehold: A system in which ownership is granted for a set period of land use based on a contract with the landowner. This includes cases where the property is rented without rent.</li> </ul>
The National Land Policy (2013)	<ul style="list-style-type: none"> <li>It deals with the land issues and conflicts that today's Uganda faces.</li> <li>Regarding women's rights in land ownership and inheritance, the policy notes that women in Uganda generally do not own or inherit land due to restrictive practices such as traditional land ownership and economic difficulties in purchasing land rights in the market. In the policy statements, the following points are specified for the improvement of women's rights.               <ol style="list-style-type: none"> <li>1) Government shall by legislation, protect the right to inheritance and ownership of land for women and children; and</li> <li>2) Government shall ensure that both men and women enjoy equal rights to land before marriage, in marriage, after marriage and at succession without discrimination.</li> </ol> </li> </ul>
Guidelines for Compensation Assessment under Land Acquisition (2017) (GCALA)	<ul style="list-style-type: none"> <li>It provides the role of relevant authorities, a basic idea of compensation computation, and calculation methods of impacts on property and income sources.</li> </ul>

Source: JICA Survey Team

Table 2.2.3 shows institutions involved in land management in Uganda. Where the projects need the land acquisition and resettlement, these will be stakeholders, as well.

**Table 2.2.3 Organization and Authority on Land Management**

Organization and Authority	Key Role
Uganda Land Commission	<ul style="list-style-type: none"> <li>It consists of a chairperson and not less than four other members appointed by President with the approval of Parliament.</li> <li>It holds and manages any land in Uganda which is vested in or acquired by the Government in accordance with the Constitution, as well as other functions as may be prescribed by Parliament.</li> </ul>
Regional Land Board	<ul style="list-style-type: none"> <li>It consists of all the Land District Boards in the region.</li> <li>It coordinates and monitors land use in the region and plans land use in the region; except that if there is a conflict between regional land planning and central government land planning, the latter shall prevail.</li> </ul>
District Land Board	<ul style="list-style-type: none"> <li>It is determined the organization structure, procedure, and term by Parliament.</li> <li>It holds and allocates land in the district which is not owned by any person or authority, facilitates the registration and transfers of interests in land, and deals with all other matters connected with land in the district in accordance with laws made by Parliament.</li> </ul>
District Land Tribunal	<ul style="list-style-type: none"> <li>It consists of a Chairperson and two other members, and which shall sit from time to time to hear and determine disputes concerning land matters within the district.</li> </ul>
Chief Government Valuer (CGV)	<ul style="list-style-type: none"> <li>It heads the Valuation Division in Department of Land Administration in the Directorate of Land Management under the Ministry of Land, Housing, and Urban Development (MoLHUD).</li> <li>The Valuation Division is mandated to timely and reliable real property valuations to Government.</li> <li>The main roles of the CGV are heading and supervising the Valuation Division, Supervision of Government projects, advising government on the real property valuations, valuating property for rent by Government, Assessing Stamp Duty, Advising Government on Rating Properties, any other duties that may be assigned from time to time.</li> </ul>
Assessor	<ul style="list-style-type: none"> <li>The Land Acquisition Act provides that MoLHUD appoints a private assessor, and she/he assesses and compiles the valuation reports. In practice, the reports prepared by the Assessor are approved and endorsed by the CGV.</li> </ul>
Technical Expert	<ul style="list-style-type: none"> <li>It is assigned from the following ministries to support the CGV, Assessor, or district staff the determination of faire and adequate compensation for specific developments.               <ol style="list-style-type: none"> <li>1) Ministry of Agriculture, Animal Industry and Fisheries (MAAIF): annual and perennial crops, and fish farming infrastructure such as ponds</li> <li>2) National Forestry Authority (NFA): trees</li> <li>3) Ministry of Energy and Mineral Development (MEMD): minerals</li> <li>4) other relevant ministry or government agency</li> </ol> </li> </ul>

Source: JICA Survey Team

Table 2.2.4 summarizes the result of gap analysis between laws and regulations in Uganda and the JICA Guidelines on involuntary resettlement (April 2010). Since the JICA Guidelines also refer to the WB's Operational Manuals, they are included in the gap analysis here.

**Table 2.2.4 Result of Gap Analysis between Uganda Laws and JICA Guidelines**

No	JICA Guidelines	Laws and Guidelines in Uganda	Gaps / Policy to fill up gaps in this Study
1	Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives. (JICA GL)	The Constitution (1995) provides that no person shall be compulsorily deprived of property or any interest in or right over property of any description except where is necessary for public use or in the interest of defence, public safety, public order, public morality or public health. On the other hand, the Constitution and the Land Act (1998) allow the Government or local government to the compulsory taking of possession or acquisition of property, as well.	There is no clear and concrete stipulation for avoiding or minimizing involuntary resettlement. For the Project, the alternatives shall be considered to avoid or minimize the impact of resettlement.
2	When population displacement is unavoidable, effective measures to minimize impact and to compensate for losses should be taken. (JICA GL)	The Constitution (1995) stipulates "the prompt payment of fair and adequate compensation" prior to the resettlement.	There is no laws and regulations that mention about countermeasures for avoiding impacts, and it is unclear to construe "the fair and adequate compensation." In the Project, effective countermeasures that can make small impacts and indemnify the damages shall be considered.
3	People who must be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported, so that they can improve or at least restore their standard of living, income opportunities and production levels to pre-project levels. (JICA GL)	The Land Act (1998) and GCALA (2017) provide the assessment methods of land, structure, and crops based on market prices. In addition, the payment of disturbance allowance (*) based on the duration from announcement to resettlement is stipulated, as well. (*) Disturbance allowance: it is to be added 15% of the valued price if more than 6 months are given for the resettlement, and 30% for	There is no clear stipulation about the means of livelihood restoration. Through the RAP Survey in the Project, the necessary means of livelihood restoration shall be considered and provided if necessary.

No	JICA Guidelines	Laws and Guidelines in Uganda	Gaps / Policy to fill up gaps in this Study
		when the period is less than 6 months.	
4	Compensation must be based on the full replacement cost as much as possible. (JICA GL)	<p>The Land Act (1998) sets the compensation price as follows.</p> <ul style="list-style-type: none"> <li>For customary land, the value shall be the open market value of the unimproved land.</li> <li>For a structure in rural areas which is categorized as “Permanent,” the compensation valued by depreciated replacement costs, and the disturbance allowance shall be paid.</li> <li>If Semi-permanent or temporary structure, the compensation based on the compensation rate provided by DLB, and the disturbance allowance shall be paid.</li> <li>Tenants are compensated for unused rent and require six months' notice to vacate the structure.</li> </ul> <p>On the other hand, GCALA provides the following principles.</p> <ul style="list-style-type: none"> <li>The land should be compensated based on replacement value equated to the current market cost of the replacement land.</li> <li>Structures should be valued at replacement cost to ensure fair and adequate compensation.</li> </ul>	There is no gap. Where the land acquisition and resettlement are required for the Project, the compensation will be provided at the full replacement cost without any deduction or depreciation in accordance with the principles of GCALA.
5	Compensation and other kinds of assistance must be provided prior to displacement. (JICA GL)	The Constitution (1998) secures “the fair and adequate compensation” prior to the resettlement.	There is no clear stipulation about other kinds of assistance. If it is judged that other kinds of assistance is necessary through the RAP Survey, the Project provides them accordingly.
6	For projects that entail large-scale involuntary resettlement, resettlement action plans must be prepared and made available to the public. (JICA GL)	There is no clear stipulation.	The Project follows the JICA Guidelines.
7	In preparing a resettlement action plan, consultations must be held with the affected people and their communities based on sufficient information made available to them in advance. (JICA GL)	There is no clear stipulation.	The Project follows the JICA Guidelines.
8	When consultations are held, explanations must be given in a form, manner, and language that are understandable to the affected people. (JICA GL)	There is no clear stipulation.	The Project follows the JICA Guidelines.
9	Appropriate participation of affected people must be promoted in planning, implementation, and monitoring of resettlement action plans. (JICA GL)	The Land Acquisition Act (1965) stipulates that displaced persons may make a formal written request for an investigation, and the Assessor is obliged to hold a public hearing before finalizing an assessment.	There is no huge gap. In the Project, stakeholder meetings, etc. are to be organized during this survey period, and the participation of local stakeholders will be promoted from the early stage of the Project.
10	Appropriate and accessible grievance mechanisms must be established for the affected people and their communities. (JICA GL)	The Land Act (1998) provides both establishment of the District Land Tribunal and the dispute resolution and mediation by traditional authorities. However, the activity by the District Land Tribunal has been suspended since 2007, then and the High Court handles land-related lawsuits in accordance with the Land Acquisition Act (1965).	If the High Court deals with the disputes relevant to land issues, there can be a gap with the JICA Guidelines in terms of accessibility and the cost payments by PAPs. In the Project, the grievance redress mechanism that PAPs are easily accessible and include dispute resolution and mediation by existing traditional authorities.
Mo	Affected people are to be identified and recorded as early as possible in order to	The Land Acquisition Act (1965) stipulates the identification of displaced persons and the	There is no clear stipulation about census surveys and establishment of cut-off date.

No	JICA Guidelines	Laws and Guidelines in Uganda	Gaps / Policy to fill up gaps in this Study
	establish their eligibility through an initial baseline survey (including population census that serves as an eligibility cut-off date, asset inventory, and socioeconomic survey), preferably at the project identification stage, to prevent a subsequent influx of encroachers of others who wish to take advance of such benefits. (WB OP 4.12 Para. 6)	provision of the announcement for the resettlement.	For the Project, the cut-off date will be set as the day when the census survey begins.
.	Eligibility of benefits includes the PAPs who have formal legal rights to land (including customary and traditional land rights recognized under law), the PAPs who don't have formal legal rights to land at the time of census but have a claim to such land or assets and the PAPs who have no recognizable legal right to the land they are occupying. (WB OP 4.12 Para. 15)	The Land Act (1998) treats only lawful and bona fide residents as owners.	It does not stipulate that persons without formal legal rights are entitled to compensation. In the Project, assistances for people who does not have formal legal rights will be provided as much as possible.
13	Preference should be given to land-based resettlement strategies for displaced persons whose livelihoods are land-based. (WB OP 4.12 Para. 11)	There is no clear stipulation.	The Project follows the JICA Guidelines.
14	Provide support for the transition period (between displacement and livelihood restoration). (WB OP 4. 12, para.6)	There is no clear stipulation.	The Project follows the JICA Guidelines.
15	Particular attention must be paid to the needs of the vulnerable groups among those displaced, especially those below the poverty line, landless, elderly, women and children, ethnic minorities, etc. (WB OP 4.12 Para. 8)	There is no clear stipulation.	The Project follows the JICA Guidelines.
16	Abbreviated Resettlement Action Plan shall be prepared for resettlement and land acquisition with less than 200 resettlers (World Bank OP4.12 Para.25)	There is no clear stipulation.	The Project follows the JICA Guidelines.

Source: JICA Survey Team



## 2.3. Required Environmental and Social Permits

Table 2.3.1 shows the list of Environmental and Social Permits to be required for the project in the different stages. These permits shall be obtained from each relevant institutions by responsible organizations in a timely manner.

**Table 2.3.1 Required Environmental and Social Permits**

No.	Issue	Permit	Law/Regulation	Deadline	Approving Authority	Responsibility
<b>Before/ During Construction</b>						
1	Auxiliary facilities such as Camp Sites, Borrow Areas	Environmental Approval ESIA certificate	National Environment Act - 2019	Before setting up of Auxiliary facilities (Mobilization Stage of the Contractor)	NEMA	Contractor
2	Ground water and Surface water abstraction	Water abstraction permit	Water Act, Cap.152	Before usage of Ground water and Surface water (Before Commencement of Construction)	Directorate of Water resource Management (DWRM)	Contractor
3	Construction in Karuma Wildlife Reserve and boundary of MFNP	Permission to construct through wildlife conservation areas	Uganda Wildlife Act. 2019	Before Construction in Karuma Wildlife Reserve and MFNP (Before Commencement of Construction)	Uganda Wildlife Authority, UWA	Contractor
4	On-site storage of Hazardous waste such as used oil	Hazardous waste storage, transportation and disposal license	National Environment (Waste Management) Regulation 2020	Before storage of hazardous waste (During Construction)	NEMA	Contractor
5	Discharge water from construction area into the River is not contaminated or treated	Waste Water Discharge Permits	National Environment (Waste Management) Regulation 2020	Before discharging wastewater (Before Commencement of Construction)	NEMA	Contractor
6	Riverbank User Permit	Permit of the use a riverbanks or lake shore	The National Environment (Wetlands, Riverbanks And Lake Shores Management) Regulations, No. 3/2000	Before use/ alteration/ excavation of River Nile (Before Commencement of Construction)	NEMA	Contractor
<b>At the end of Construction</b>						
7	Project construction closure	Decommissioning and Restoration Permit	National Environment Act - 2019	After construction prior to Project Handover	NEMA and UNRA	Contractor

Source: JICA Survey Team

## CHAPTER 3 PROJECT DESCRIPTION AND ALTERNATIVE ANALYSIS

[Summary of the Chapter 3]

This chapter presents, project outline, adopted design standards for road design and bridge, design drawings, general drawings and typical cross section are indicated. Summary of construction methodology, procurement plan and tentative construction schedule are described. Additionally, the route alternative analysis has been carried out and concluded, and then how the concluded route complies with the five exceptional conditions for project implementation within protected areas in accordance with JICA Guidelines for Environmental and Social Considerations 2010.

### 3.1. Project Outline

Project locations, structure components and features are shown below.

**Table 3.1.1 Project Outline and Main Component**

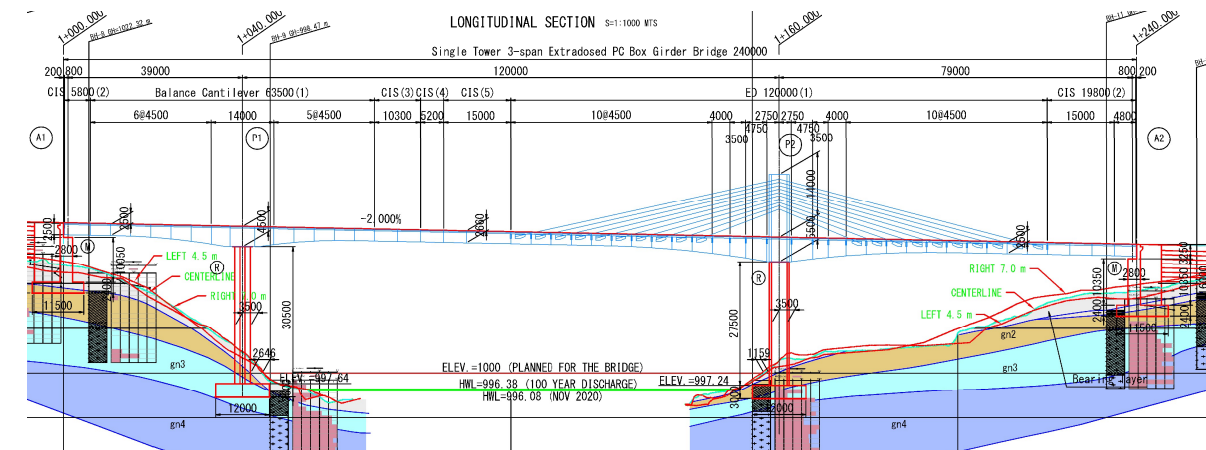
Component	Structure Specification	Location
1. Approach Road	Kiryandongo side: 800 m Nwoya side: 660 m Total: 1,460 m	South (Left) Bank: Kiryandongo District North (Right) Bank: Nwoya District
2. Bridge	Bridge Length = 240 m Span arrangement: 40 m + 120 m + 80 m Structure type; Single Tower 3 span Extradosed PC Box Girder Bridge	

Source: JICA Survey Team



Source : JICA Survey Team

**Figure 3.1.1 Bridge Location and Approach Road Alignment**



Source: JICA Survey Team

**Figure 3.1.2 Bridge Type**

### 3.2. Design Standards and Codes

Prior to the execution of the outline design of the New Karuma Bridge, each design criteria is established. However the complying code and fundamental criteria can be shown following

#### 3.2.1. Design Standards and Codes for Road Design

The principle design standards for the road design for the project is:

- Road Design Manual, Ministry of Works, Housing and Communications (July, 2005)

In addition, the following design standards are applied as complementary.

- Government Order on Road Design Standards in Japan
- AASHTO, A Policy on Geometric Design of Highway and Streets

#### 3.2.2. Design Standards and Codes for Bridge Design

The design criteria for the new Karuma Bridge shall comply with the UNRA's Requirements. Codes to be adopted are mainly Road Design Manual Volume 4: Bridge Design, Ministry of Works and Transport, 2010, together with the latest Eurocode, British Standard, AASHTO LRFD Bridge Design Specifications and Specifications for Highway Bridges from Japan Road Association.

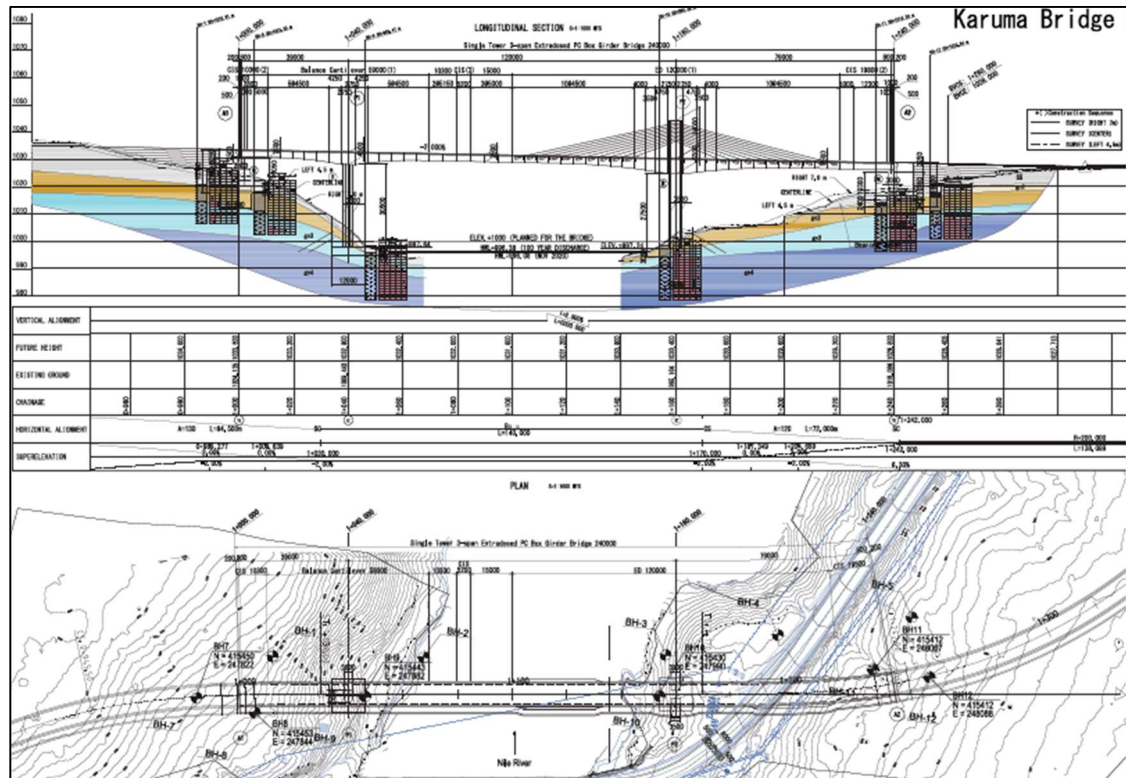
- Road Design Manual, 2010, Vol. 4: Bridge Design (Ministry of Works, Housing and Communications)
- UNI EN 1991: Eurocode 1 – Actions on structures
- UNI EN 1992: Eurocode 2 – Design of concrete structures
- UNI EN 1993: Eurocode 3 – Design of steel structures
- UNI EN 1994: Eurocode 4 – Design of composite steel and concrete structures
- UNI EN 1997: Eurocode 7 – Design of geotechnical design
- UNI EN 1998: Eurocode 8 – Design of structures for earthquake resistance
- British Standard 5400-2: 2006 Steel, concrete and composite bridges. Specification for loads

- AASHTO LRFD Bridge Design Specifications, 9th edition
- Specifications for Highway Bridges I to V, 2017 version (Japan Road Association)

### 3.3. Design Drawings

#### 3.3.1. General Drawing

General drawing of the New Karuma Bridge is shown in Figure 3.3.1.

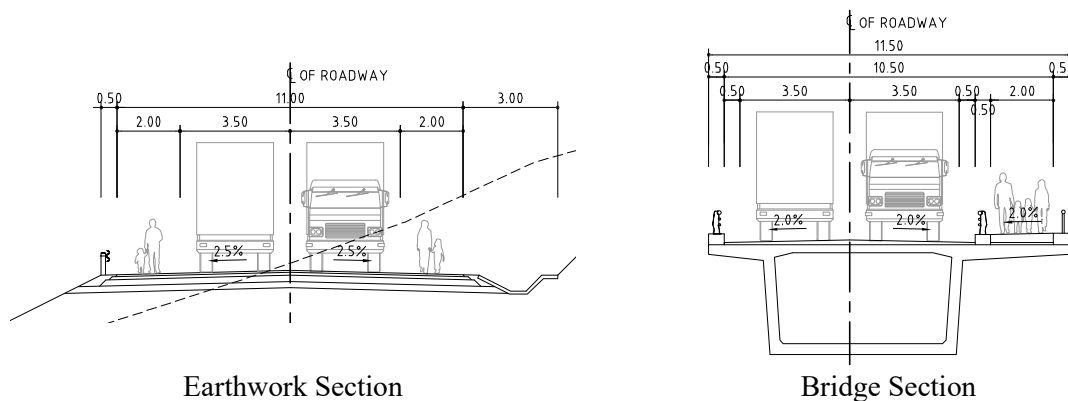


Source: JICA Survey Team

**Figure 3.3.1 General Drawing of New Karuma Bridge**

#### 3.3.2. Typical Cross Section

The typical cross sections for earthwork and bridge sections are shown below:



Source: JICA Survey Team

**Figure 3.3.2 Typical Cross Sections**

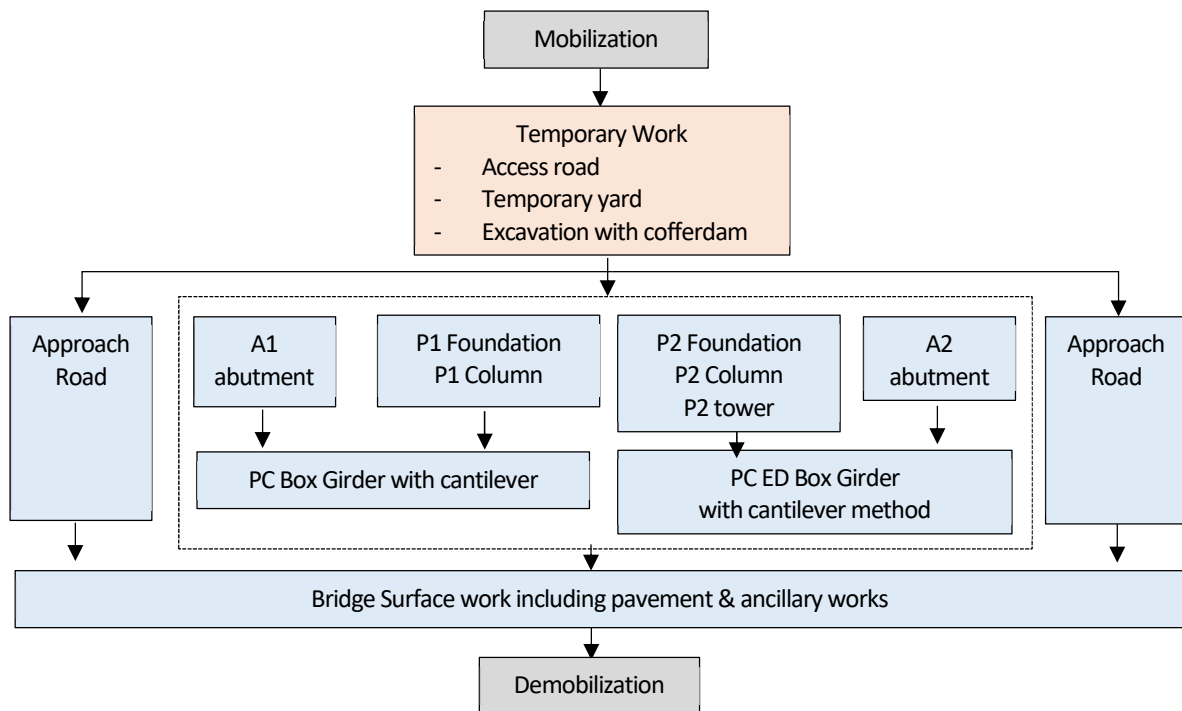


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### 3.4. Construction Methodology

#### 3.4.1. Overall Construction Sequence

The major construction sequence for the construction of New Karuma Bridge is shown in Figure 3.4.1. The key points of the construction methodologies for specific works in this project are introduced in the following sections.



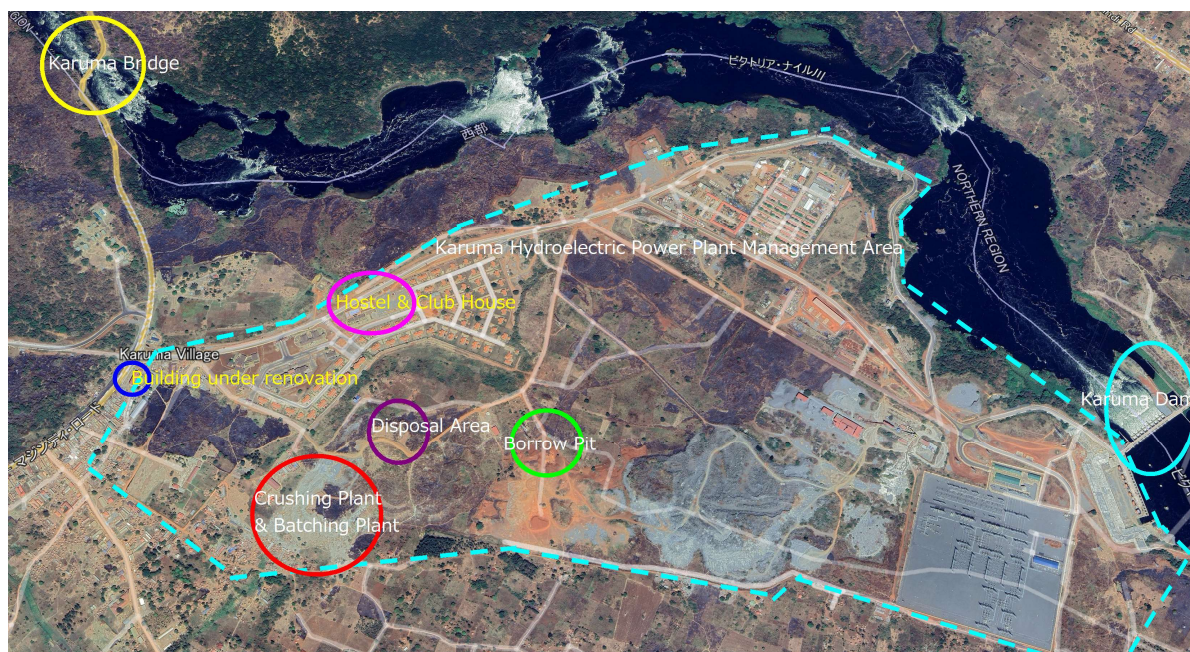
Source: JICA Survey Team

**Figure 3.4.1 Overall Construction Sequence**

#### 3.4.2. Temporary Works

##### (1) Construction Yards

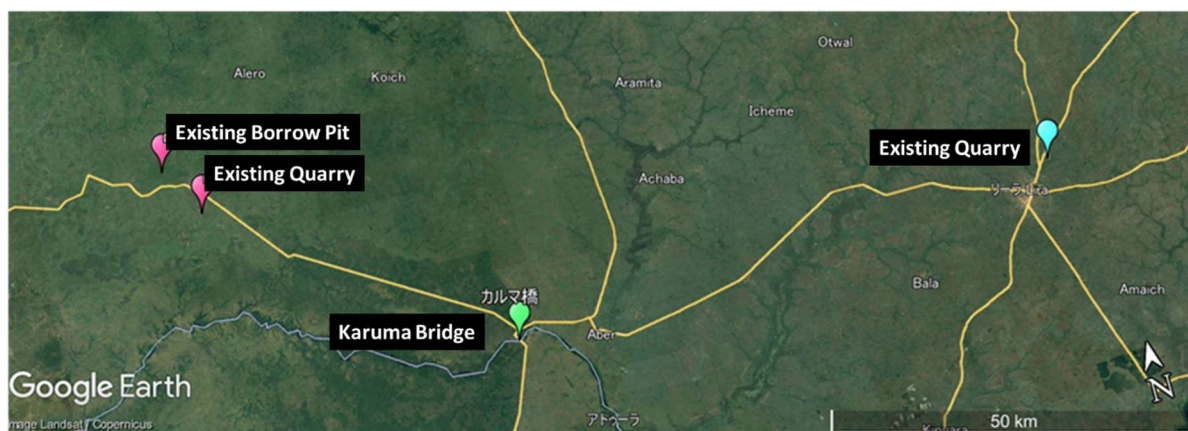
Since the bridge in this project will be constructed and erected on-site, there will be no need for a yard for precast production. However, the concrete plant installation and materials storage yard will be located within the Karuma Hydroelectric Power Plant site. Figure 3.4.2 shows the layout of temporary facilities in the Karuma Hydropower Plant land.



Source: JICA Survey Team

**Figure 3.4.2 Layout of temporary facilities in the Karuma Hydropower Plant land**

Additionally, developing new quarries and borrow pits is difficult, so materials will be procured from existing facilities of projects around the bridge construction site.



Source: JICA Survey Team

**Figure 3.4.3 Location map of existing quarries and borrow pits around Karuma Bridge**

## (2) Temporary Access Roads

Temporary access road construction is not required. The approach road construction site can be directly accessed from Kampala-Gulu/Arua Road.

Additionally, the temporary access road will utilize the New Karuma Bridge approach road site, therefore additional land for the temporary access road will not be required.

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### 3.4.3. Bridge Foundation Works

#### (1) Foundation Works

Based on the results of the geological survey conducted at this phase, the groundwater at the bottom of the foundation level was not confirmed. Since dynamite cannot be used for the excavation of the bedrock due to environmental issues, the breaker can be used for excavation.

### 3.4.4. Substructure Works

The main substructure elements are divided into columns and pier heads. Ready-mixed concrete is produced at a concrete plant installed in the camp yard, transported by agitator, and poured using a concrete pump truck. For pier columns and pier heads, metal formwork will be adopted to ensure workability and surface quality of curved/variable parts of these elements.

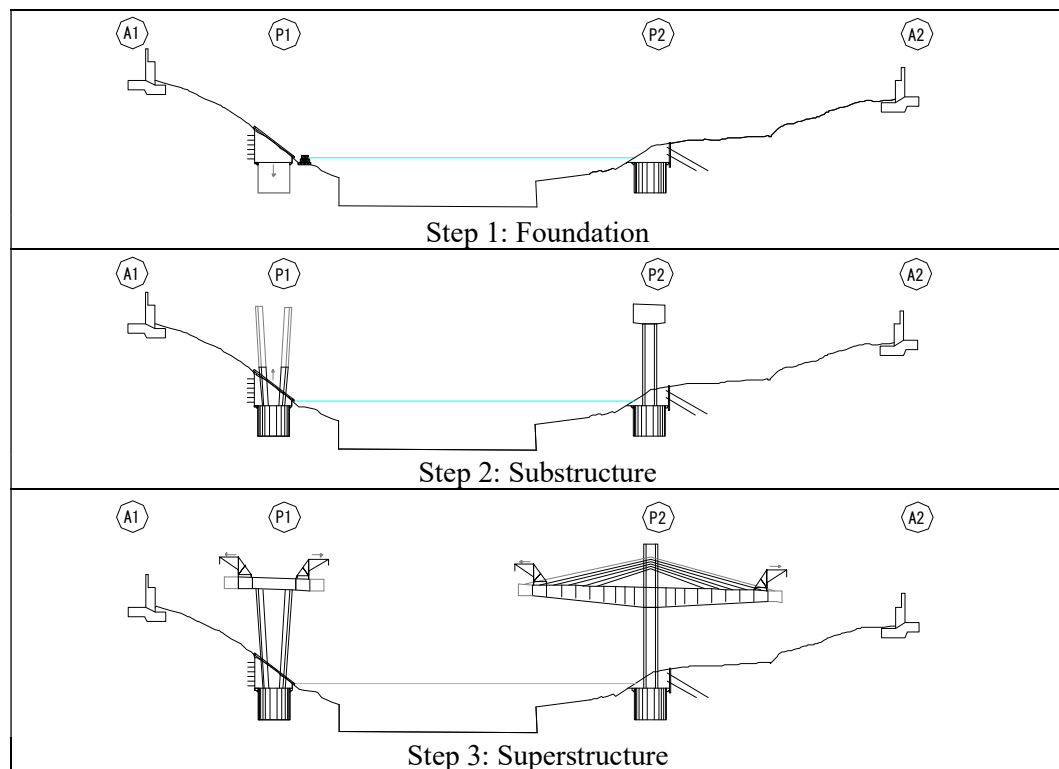
### 3.4.5. Superstructure Works

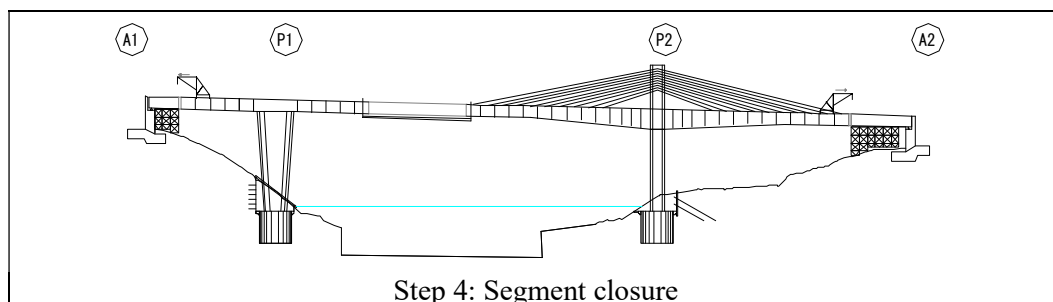
#### (1) Superstructure Type

The new Karuma Bridge is a combination of a cantilevered bridge and an extradosed bridge, both of which will be constructed using mobile work vehicles (Wagen).

#### (2) Construction Method

The construction procedure is shown in Figure 3.4.4.





Source: JICA Survey Team

**Figure 3.4.4 Construction Steps for Superstructure**

### 3.5. Procurement Plan

#### 3.5.1. Procurement Plan for Major Materials and Source of Materials

Cement, aggregate and temporary materials can be procured domestically in Uganda. PC cable, PC stranded wire, bearing and expansion joint will be procured in Japan. Main materials for construction of the bridges and road, and the sources are shown in Table 3.5.1.

**Table 3.5.1 Procurement Plan for Main Materials**

Material / Country to be Procured	Japan	Uganda	Third Country	Remark
Cement		○		
Aggregate		○		
Ledy mixed concrete		○		
Asphalt concrete		○		
Reinforcing bar		○	○	
Bearing	○		○	
Expansion joint				
PC strand wire	○			
PC cable	○			
Pavement material		○		
Precast products for Road		○		

Source: JICA Survey Team

#### 3.5.2. Procurement Plan for Major Equipment

The new bridge will be constructed using a special combination of cantilevered bridge type and extradosed bridge type.

Additionally, because the height of the bridge piers is high, temporary equipment such as wagons for cantilever bridge erection and tower cranes for extradosed bridge erection will be required. These special equipment will be procured in Japan, and general-purpose machinery used for road construction etc. will be procured locally.

**Table 3.5.2 Procurement Plan for Main Equipment**

Equipment / Country to be Procured	Japan	Uganda	Third Country	Remark
Back Hoe		○		
Track Crane		○		
Tower crane for erection	○	○	○	
Roller		○		
Asphalt finisher		○		



Concrete plant		○		
Agitator	○	○	○	
Wagen for cantilever erection	○			
Temporary Equipment (Construction elevators, Scaffolding etc.)	○			

Source: JICA Survey Team

### 3.5.3. Construction Material, Facilities and Manpower

Type and quantity of the construction material, source of water and electricity and manpower is shown below;

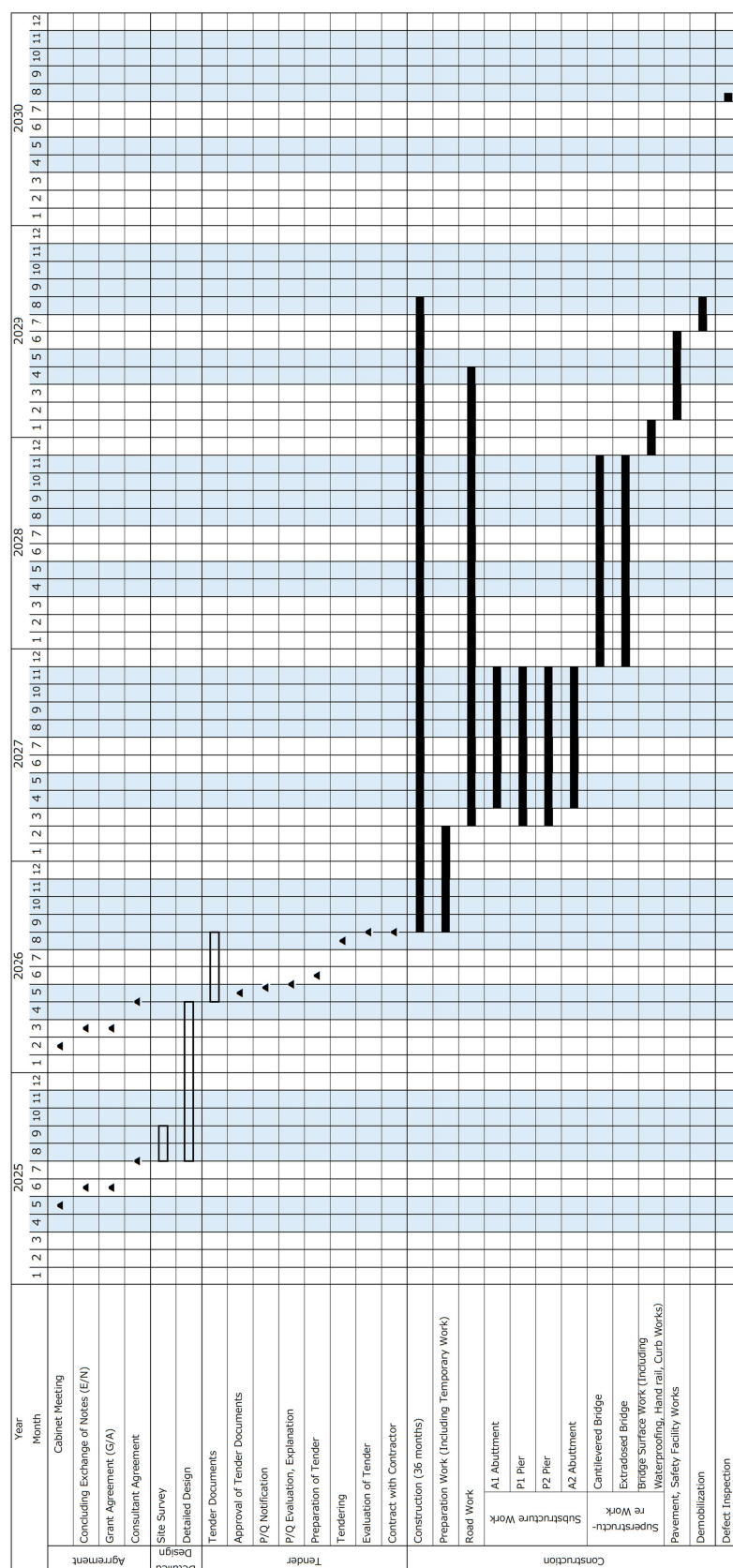
**Table 3.5.3 Construction Material, Facilities and Manpower**

Item	Description
1. Chemical Compounds	None (Using Commercial Power Supply)
2. Construction Material	Concrete: 4,491m <sup>3</sup> (Substructure including Foundation) + 3,037m <sup>3</sup> (Superstructure)
	Asphalt Concrete: 1,421 m <sup>3</sup>
3. Water	Expected Consumption at Construction Office: 3,000 l/day x 38 months (877working days) = 2,6310 m <sup>3</sup> Water Resource: Water Supply of Karuma Hydropower Plant
4. Energy	Power Resource: Commercial Power Supply
5. Man Power (Construction Worker/Labor)	Number of Daily average worker: 100 persons/day x 3.00 years (36 months) with Approximately 828 working days = 82,800 workers for 3.00 years

Source: JICA Survey Team

### 3.6. Construction Schedule

The construction schedule is shown in Figure 3.6.1.



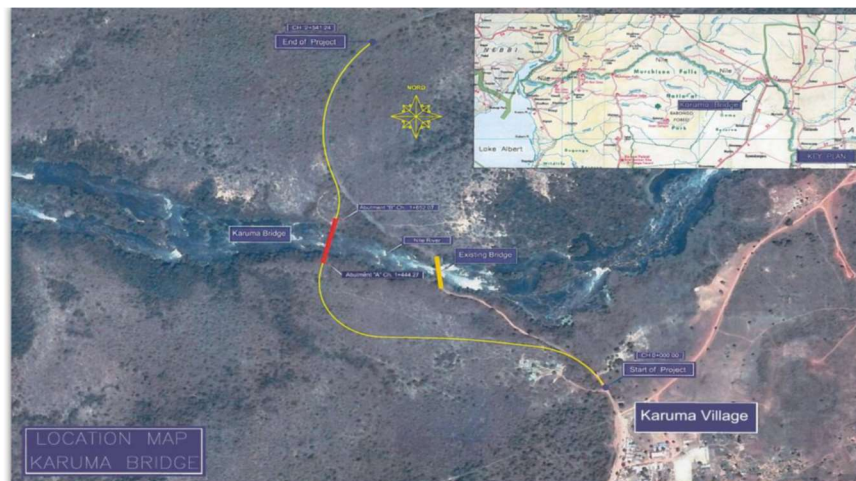
Source: JICA Survey Team

### Figure 3.6.1 Construction Schedule

### 3.7. Alternative analysis

#### 3.7.1. Study Policy

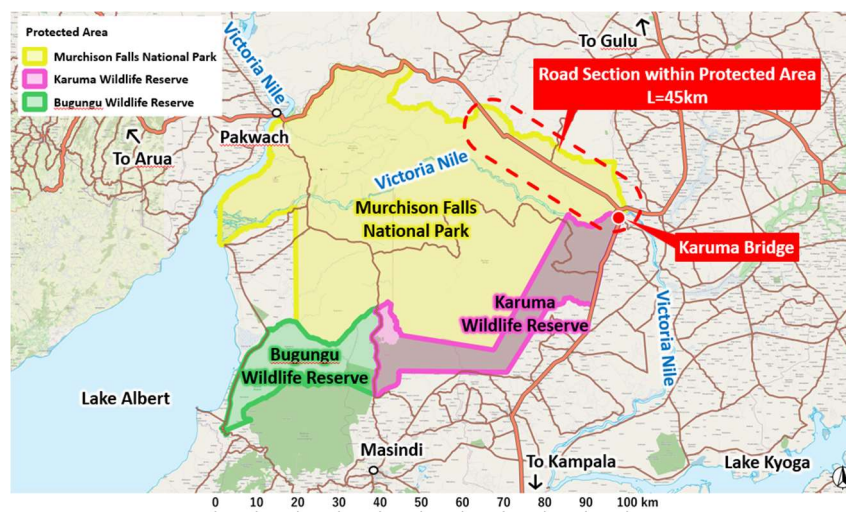
It is recommended that the bridge replacement be undertaken near the existing bridge, unless there are specific reasons not to do so, in order to maintain the functions required for the road and bridge and to minimise negative impacts on the economic activities along the road. Similarly, a study conducted by UNRA in 2014 and 2018 considered the possibility of constructing the new bridge near the existing bridge. It recommended that the optimal bridge location be approximately 400 m downstream from the existing bridge, as shown in Figure 3.7.1.



Source: UNRA. 2018. Karuma Bridge Updated ESIS

**Figure 3.7.1 Bridge Location proposed by UNRA's Study**

On the other hand, as illustrated in Figure 3.7.2, the existing Karuma Bridge is situated within Murchison Falls National Park and Karuma Wildlife Reserve. Additionally, the approximately 45 km section of the Kampala-Gulu/Arua road north of the bridge also traverses the same environmentally protected area.



Source: JICA Survey Team

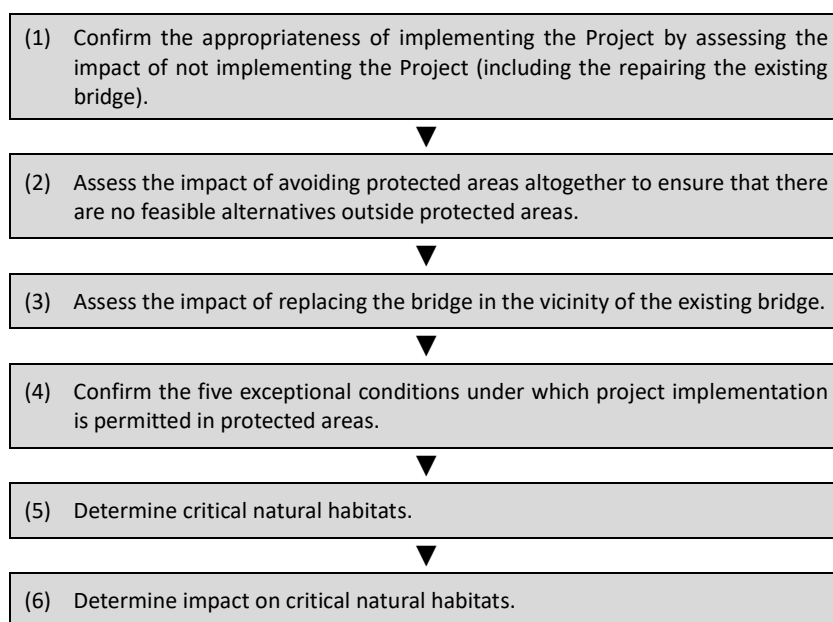
**Figure 3.7.2 Road Network around Karuma Bridge**

In principle, the JICA Guidelines for Environmental and Social Considerations (April 2010 version) do not allow projects to be implemented in environmentally protected areas, and the following five conditions must be met in order to make an exception.

- (1) no feasible alternative plans shall be available in areas other than the area designated as such by the country and/or local governments by laws and/or ordinances to protect nature and cultural heritage (“the Designated Area”):
  - (2) development in the Designated Area shall be legally acceptable by the host country’s domestic laws:
  - (3) Project proponents etc., shall comply with the laws, ordinance concerning the Designated Area and management plan of the protected zones:
  - (4) Project proponents etc., shall form a consensus about project implementation with stakeholders including organizations responsible for managing the Designated Area, local communities through consultations: and
  - (5) Project proponents etc., shall perform additional programmes, where necessary, to ensure that the Designated Area is effectively managed for its conservation.\*<sup>1</sup>
- \*1 IFC’s Performance Standards note the following: “Implementing additional programs may not be necessary for projects that do not create a new footprint.”

Source: FAQs and JICA’s answers for JICA Guidelines for Environmental and Social Considerations (April 2010)

For this reason, the following study flow was used to examine the optimum location of the bridge and its approach road.



Source: JICA Survey Team

**Figure 3.7.3 Study Flow for Examination of the Optimum Bridge Location**

### 3.7.2. Assessment of the Impact of not Implementing the Project

The following assumptions have been made in assessing the impact of not implementing the project.

- The existing Karuma Bridge has significant damage and deterioration of the main structural components (thinning of the paint, corrosion and cracking of the deck slab), and it is estimated that the damage to the deck slab will continue to progress, requiring a restriction to heavy vehicle traffic within the next five years (until around 2029).
- After the five years, it is estimated that the deck slab will begin to chip away, requiring a restriction to all vehicular traffic in a further three years (until around 2032), even if

restrictions to heavy vehicle traffic are introduced.

Based on the above assumptions, the positive and negative impacts of not implementing the Project are summarised in Table 3.7.1. The positive impacts of not implementing the Project, such as the absence of construction-related impacts on the natural and social environment, outweighed by the negative impacts from an economic and basic human needs perspective.

In particular, the area west of the existing Karuma Bridge up to Lake Albert belongs to the Murchison Falls National Park and there are no public roads that can be used as alternative routes, while the area east of the bridge only has bridges upstream of Lake Kyoga. If the existing Karuma Bridge is blocked, traffic from Kampala to northern Uganda and South Sudan will have to be diverted to the east side of Lake Kyoga, which will have a significant impact on the movement of people and goods.

Furthermore, even if the existing bridge is repaired, the risk of road accidents will remain due to road safety issues such as the road alignment of the approach road and the insufficient width of the bridge, regardless of the damage and deterioration of the structural components. Given the rapids of River Nile, it is very difficult to widen of the existing bridge while keeping the traffic open, and therefore, the problems of the project cannot be solved by repairing the existing bridge.

In view of the above, there is no option not to implement the project and the need to implement the project is extremely high.

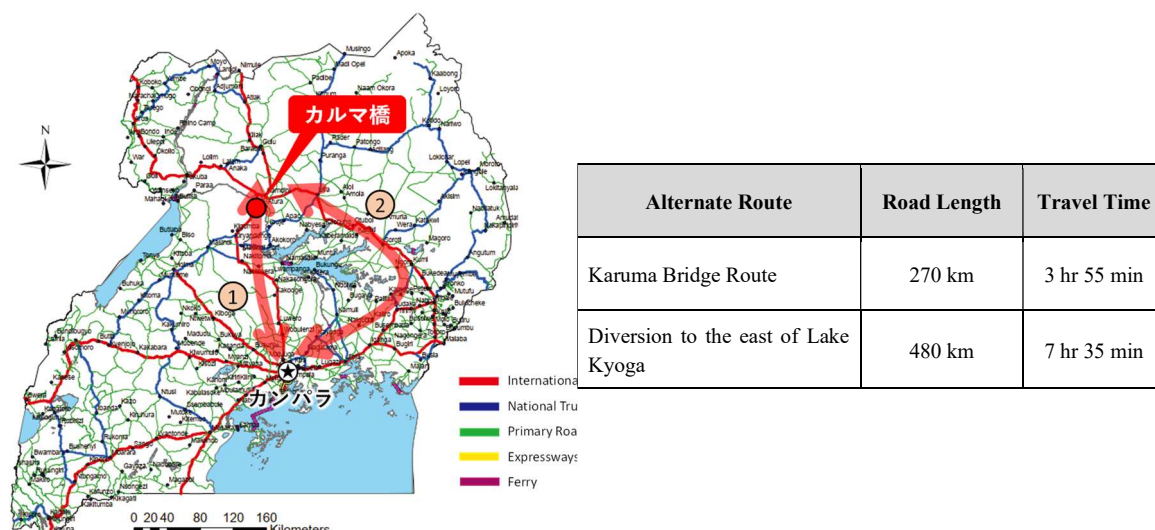
**Table 3.7.1 Assessment of the Impact of not Implementing the Project**

Positive Impacts	Negative Impacts	
	Contents of Impact	Extent of Impact
<ul style="list-style-type: none"> <li>• There will be no construction-related negative impact on the flora and fauna that live and grow in the area.</li> <li>• There will be no social impact on the commercial and other areas of Karuma Town as there will be no traffic restrictions, etc. during the construction period.</li> </ul>	► Traffic accidents, including fatalities, will occur on the approach road to the Karuma Bridge, resulting in negative impacts, including loss of life and goods.	Approx. 10 road accidents per year (expected fatalities: 10 to 20)
	▷ Significant negative impacts on passenger and freight transport will occur.	<ul style="list-style-type: none"> <li>• Increase in travel distance of about 210 km</li> <li>• Increase in travel time of about 3 hr 40 min</li> </ul> (see Figure 3.7.4)
	▷ An increase in greenhouse gases is expected due to the increased travelling distance (210 km more travelled).	Increase in CO2 emissions of about 110 thousand tonnes per year
	▷ Concentration of traffic on other routes will cause traffic congestion outside the project site and an increase in road accidents due to the increased traffic volume.	-
	▷ Negative impact on human life due to difficulties in emergency medical transport from northern Uganda to Kampala.	-
	▷ There will be a significant negative impact on economic activities along the road due to lost business opportunities for vendors (e.g. vendors in Karuma Town) selling goods and other items to passing vehicles on the Kampala - Gulu/Arua Road.	Economic adverse impact is approx. 104,000 USD/year

Note: ►: Negative impact regardless of the damage and deterioration of the existing Karuma Bridge

▷: Negative impact if the existing Karuma Bridge deteriorates and needs to be closed to vehicular traffic.

Source: JICA Survey Team



Note: As of 13 August 2024, UNRA has restricted heavy vehicle traffic on the Karuma Bridge due to the implementation of repair works and two diversion routes ( 1) westbound via Kampala-Luwero-Kafu -Masindi-Hoima-Biiso-Buliisa-Paraa road (Murchison Falls National Park) or eastbound 2) Kampala- Iganga -Nakalama -Tirinyi -Pallisa -Kumi -Soroti -Lira) has been announced.

Source: JICA Survey Team

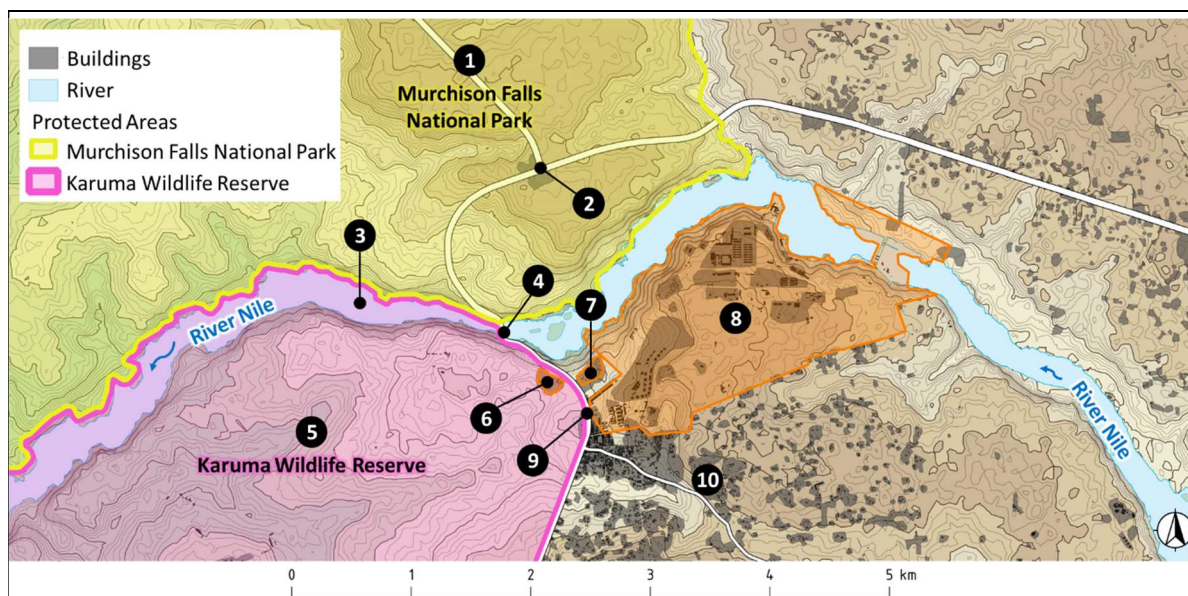
**Figure 3.7.4 Alternate Route of Karuma Bridge**

### 3.7.3. Assessment of the Impact of Avoiding Protected Areas Altogether

The land use situation around the existing Karuma Bridge that should be taken into account when considering the location of the bridge is shown in Figure 3.7.5. In order to cross the River Nile completely avoiding the protected areas, the bridge needs to be constructed upstream of the Karuma Hydropower Plant Dam, and the following three points should be considered when selecting the bridge location.

- The bridge should be replaced as close as possible to the existing bridge in order to maintain the required functions of the existing road and to minimise the impact on economic activities along the road.
- As the River Nile becomes wider upstream from the Karuma Hydropower Plant Dam, it will be more economical to cross the river as close as possible to the dam.
- To minimise the scale of resettlement in Karuma Town, densely populated areas should be avoided.





	Control Points	Planning Policy
Areas North of River Nile (Right Bank)	(1) Murchison Falls National Park: The section from Karuma Bridge to the northern intersection (2 km), the section from the intersection to Kampala-Gulu Road (2 km) and the section from the intersection to Kampala-Arua Road (43 km) are within the protected area.	As there is already a road in the protected area, construction work in the protected area is unavoidable and measures should be taken to minimise the impact on the natural environment.
	(2) There is a difference in elevation of about 60 m from the location of the existing Karuma Bridge (elevation of about 1,003 m) to the intersection on the northern side (elevation of about 1,060 m).	Avoid longitudinal gradients of more than 5% to prevent traffic accidents.
River Nile	(3) River Nile: The rapids downstream of the Karuma Dam make it very difficult to construct piers and other works in the river.	Avoid bridge pier works in rivers.
	(4) Existing Karuma Bridge	Ensure traffic during construction.
Areas South of River Nile (Left Bank)	(5) Karuma Wildlife Reserve	Same as (1)
	(6) Karuma Wildlife Reserve Management Office	Avoid as much as possible
	(7) Uganda Military Garrison	Ditto
	(8) Karuma Hydropower Station: The area where the power generating facilities are located is strictly controlled as a high security area.	Avoid the fenced area
	(9) The intersection in front of the entrance/exit gate of the power station: The elevation is about 1,040 m.	Same as (2)
	(10) Residential Area of Karuma Town	Avoid as much as possible

Source: JICA Survey Team

**Figure 3.7.5 Control Points for Consideration of Bridge Location**

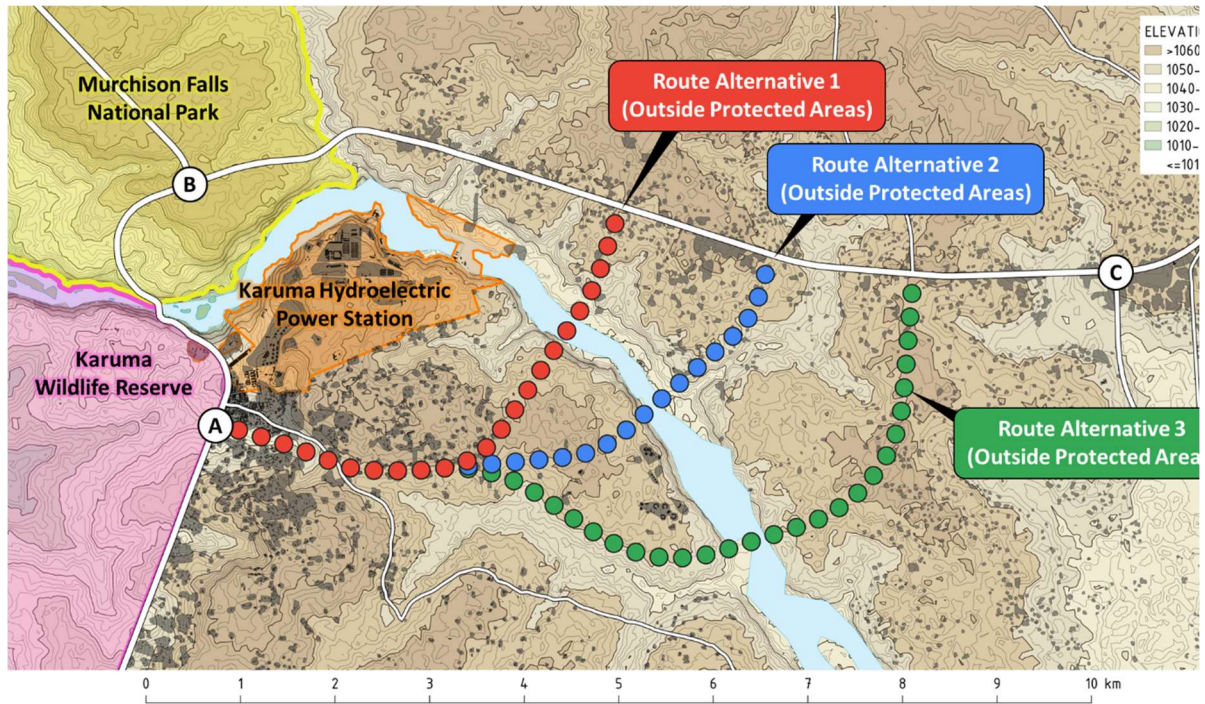
Based on the above, in order to select a bridge location and bridge type for crossing the River Nile by completely avoiding protected areas, an evaluation was carried out using a four-step study process: 1) selection of the route, 2) selection of the river crossing zone, 3) selection of the road alignment and 4) selection of the bridge type.

(1) Selection of Optimal Route (Outside Protected Areas)

As narrower river width locations are economically superior when constructing bridges, three narrow river width zones were selected upstream of the Karuma Hydropower Plant dam, and the route zones were established based on the surrounding topographical conditions and the

location of the dwellings.

- Route Alternative 1 (Outside Protected Areas): Approx. 1.5 km upstream of Karuma Dam
- Route Alternative 2 (Outside Protected Areas): Approx. 2.8 km upstream of Karuma Dam
- Route Alternative 3 (Outside Protected Areas): Approx. 4.5 km upstream of Karuma Dam



Source: JICA Survey Team

**Figure 3.7.6 Route Alternatives (Outside Protected Areas)**

Table 3.7.2 shows the results of the comparative evaluation of the route alternatives. The evaluation indicators and points allocated for the comparative evaluation are: Traffic Impact (10 points), Natural Environmental Impact (30 points), Social Environmental Impact (30 points), Economic Efficiency (estimated construction cost) (25 points), Constructability (5 points) and Total (100 points), where the evaluation items for Natural Environmental Impact and Social Environmental Impact were set with reference to the Scoping Matrix.

The results of the comparative assessment show that Route Alternative 1, as a route outside the protected area, was evaluated as the optimal route, as it has less impact on the natural and social environment and less impact on traffic than the other alternative routes. It was also found to be more economical, as the river width is the narrowest and the maximum bridge span length is the shortest.



**Table 3.7.2 Comparison of Route Alternatives (Outside Protected Areas)**

Table 3.7.2 Comparison of Road Alternatives (Outside Protected Areas)								
Item			Route Alternative 1 (Outside Protected Areas): Approx. 1.5 km upstream of Karuma Dam		Route Alternative 2 (Outside Protected Areas): Approx. 2.8 km upstream of Karuma Dam		Route Alternative 3 (Outside Protected Areas): Approx. 4.5 km upstream of Karuma Dam	
Spec.	River Width		190 m		220 m		275 m	
	Bridge Length		620 m (max. Span Length 200m)		540 m (max. Span Length 230m)		620 m (max. Span Length 285m)	
	Road Length		6.0 km		7.0 km		10 km	
Evaluation Item		Point	Evaluation		Evaluation		Evaluation	
Impact of Traffic	Traveling Distance A and B	5	Increase 7.2km (average) (increase 3.6km-10.8km)	1.17	Increase 9.8km (average) (increase 3.6km-13.4km)	0.94	Increase 14.4km (average) (increase 3.6km-18.0km)	0.70
	Traveling Distance A and C	5	Decrease 7.2km (average) (Decrease 13.7km-11.5km)	4.17	Decrease 3.0km (average) (Decrease 13.7km-10.7km)	4.48	Decrease 1.5km (average) (Decrease 13.7km-12.2km)	3.93
	Sub Total	10		5.34		5.42		4.63
Impact of Natural Environment	Air Pollution	2	No significant differences by alternatives due to same traffic volume, travelling speed, roadside environment and cross section	2.00	Same as on the left	2.00	Same as on the left	2.00
	Wastes	2	Cutting tree (app.2ha)	2.00	Cutting tree (app.2.6ha)	1.54	Cutting tree (app.6.6ha)	0.61
	Noise and Vibration	2	No significant differences by alternatives due to same traffic volume, travelling speed, roadside environment and cross section	2.00	Same as on the left	2.00	Same as on the left	2.00
	Cutting Tree	10	Cutting tree (app.2ha)	10.00	Cutting tree (app. 2.6ha)	7.69	Cutting tree (app.6.6ha)	3.03
	Ecosystem	10	The main land use along the road section is agricultural land and there is little wildlife. (*1) However, habitat for Hippopotamus and Nile Crocodile may be impacted in the bridge section, the Nile River.	10.00	Same as on the left	10.00	Same as on the left	10.00
	Hydrological Situation	2	The number of piers in the Nile River is similar for each alternative, although piers may be constructed in the river and the flow regime may change.	2.00	Same as on the left	2.00	Same as on the left	2.00
	Topography and Geology	2	Fill work is required in stream areas, there is the risk of slope failure and slide.	1.00	There are few risks of slope failure and slide due to no streams.	2.00	Fill work is required in stream areas, there is the risk of slope failure slide.	1.00
	Sub Total	30		29.00		27.23		20.64
Impact of Social Impact	Resettlement and Land Acquisition	10	Land Acquisition : 30ha Resettlement : 60 structures	8.33	Land Acquisition : 35ha Resettlement : 50 structures	8.57	Land Acquisition : 50ha Resettlement : 60 structures	5.00
	Local Economy	4	The road does not pass through the business areas of Karuma Town, which will negative impact on the livelihoods and local economy.	4.00	Same as on the left	4.00	Same as on the left	4.00
	Land-use and	4	Since the road is passing	4.00	Since the road is passing	3.43	Since the road is passing	2.40

Item			Route Alternative 1 (Outside Protected Areas): Approx. 1.5 km upstream of Karuma Dam	Route Alternative 2 (Outside Protected Areas): Approx. 2.8 km upstream of Karuma Dam	Route Alternative 3 (Outside Protected Areas): Approx. 4.5 km upstream of Karuma Dam
Local resources			through the agricultural area, land acquisition gives negative impact on livelihood and economic loss for farmers. Additionally, construction activities may give adverse impact to the fishing ground and activities in the section of bridge, River Nile.	through the agricultural area, land acquisition gives negative impact on livelihood and economic loss for farmers. The road length is longer 17% than the alternative 1. It is expected that the degree of negative impact on fishery is same as the alternative 1.	through the agricultural area, land acquisition gives negative impact on livelihood and economic loss for farmers. The road length is longer 67% than the alternative 1. It is expected that the degree of negative impact on fishery is same as the alternative 1.
Existing Social Services and Infrastructures	4		Social infrastructures such as clinic and meeting places may be included in the affected 60 structures. 3.33	Social infrastructures such as clinic and meeting places may be included in the affected 50 structures. 4.00	Social infrastructures such as clinic and meeting places may be included in the affected 60 structures. 3.33
Infection Disease※2	2		Expected maximum construction workers are approximately 750 workers/day 2.00	Expected maximum construction workers are approximately 800 workers/day 1.65	Expected maximum construction workers are approximately 1,150 workers/day 1.30
Labor Environment & Accident※2	2		Expected maximum construction workers are approximately 750 workers/day 2.00	Expected maximum construction workers are approximately 800 workers/day 1.65	Expected maximum construction workers are approximately 1,150 workers/day 1.30
Traffic Accident(post construction) ※3	2		Length of the road with bridge is approximately 6.62km 2.00	Length of the road with bridge is approximately 7.54km 1.76	Length of the road with bridge is approximately 10.62km 1.25
Generation of GHGs※4	2		Length of the road with bridge is approximately 6.62km 2.00	Length of the road with bridge is approximately 7.54km 1.76	Length of the road with bridge is approximately 10.62km 1.25
Sub Total	30		27.67	26.81	19.84
Cost (Construction Cost)	25		Cost Rate: 1.00 Bridge length is longer than Alternative 2, but maximum span length and road length are shorter, and construction costs are minimal. 25.00	Cost Rate: 1.05 Minimal bridge length, but higher construction cost than Alternative 1 because the maximum span length of the main bridge is longer than Alternative 1 23.70	Cost Rate: 1.36 Bridge size is similar to other alternatives, but construction costs are the highest due to the longer road length 18.38
Constructability	5		High construction accuracy is required because the span length is exceeding 200 m. 3.00	Same as on the left 3.00	Same as on the left 3.00
Evaluation	100		<b>Recommended</b> Because it has less impact on the natural and social environment and traffic than other alternatives and is more economical. <b>90.01</b>	- <b>86.16</b>	- <b>66.48</b>

Note: Full points were given to the highest rated alternative, while the other alternatives were given points proportional to quantity.

\*1: In June 2023, a trench was installed at the boundary of KWR (Karuma Wildlife Reserve) on the south bank of the Nile River to prevent wildlife from entering Karuma town, and African elephants, hippopotamuses, African Buffalo, and other wildlife are unable to enter the area around Karuma town.

\*2: The number of infections and accidents during construction was assumed to occur in proportion to the number of construction workers.

3: The number of accidents during service phase is assumed to occur in proportion to the length of the road bridge.

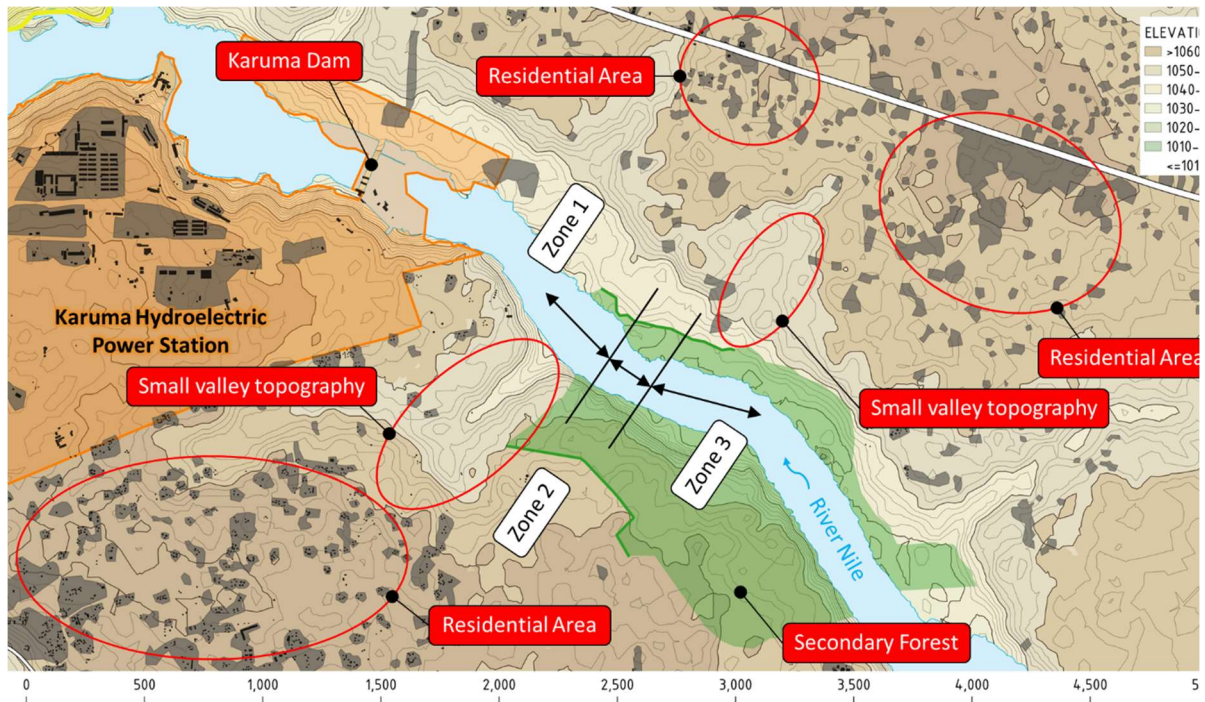
4: Global warming gas (CO2) emissions during construction are assumed to occur in proportion to the length of the road bridge.

Source: JICA Survey Team

(2) Selection of Optimal River Crossing Zone (Outside Protected Areas)

For the Route Alternative 1 (Outside Protected Areas), the area before and after the river narrowing was divided into three zones to compare and assess their suitability as bridge locations.

- Zone Alternative 1: Downstream of the narrowed section of the river
- Zone Alternative 2: Narrowed section of the river
- Zone Alternative 3: Upstream of the narrowed section of the river



Source: JICA Survey Team

**Figure 3.7.7 Comparison of River Crossing Zones (Outside Protected Areas)**

Table 3.7.3 shows the results of the comparative assessment of the river crossing zones for the Route Alternative 1 (Outside Protected Areas). Small valley topography can be seen on both banks before and after the narrowed section of the river, and these areas should be avoided for the road alignment. The river width in this area is approximately 200 m. However, in order to construct the bridge piers in the river, it is necessary to construct the bridge substructure with a temporary cofferdam in the river, so Zone Alternative 2, which has the narrowest river width, should be selected as the bridge location from the viewpoint of economy and ease of construction. In addition, considering the extent of secondary forest on both banks of the river, Zone Alternative 2 was identified as the most suitable location for the bridging area, as it is the shortest section of the river that passes through the secondary forest, and is the location where the impact on the natural environment can be minimised.

**Table 3.7.3 Comparison of River Crossing Zones (Outside Protected Areas)**

Item			Zone Alternative 1: Downstream of the narrowed section of the river		Zone Alternative 2: Narrowed section of the river		Zone Alternative 3: Upstream of the narrowed section of the river	
Spec.	River Width		250 ~ 280 m		185 ~ 200 m		200 ~ 230 m	
	Bridge Lenth		620 m (max. Span Length 260～290m)		620 m (max. Span Length 195～210m)		620 m (max. Span Length 210～240m)	
Evaluation Item		Point	Evaluation	Point	Evaluation	Point	Evaluation	Point
Impact of Natural Environment	Air Pollution	2	No significant differences by alternatives due to same traffic volume, travelling speed, roadside environment and cross section	2.00	Same as on the left	2.00	Same as on the left	2.00
	Wastes	2	Cutting tree (app. 1.4ha)	1.86	Cutting tree (app. 1.3ha)	2.00	Cutting tree (app. 1.7ha)	1.53
	Noise and Vibration	2	No significant differences by alternatives due to same traffic volume, travelling speed, roadside environment and cross section	2.00	Same as on the left	2.00	Same as on the left	2.00
	Cutting Tree	10	Cutting tree (app. 1.4ha)	9.29	Cutting tree (app. 1.3ha)	10.00	Cutting tree (app. 1.7ha)	7.65
	Ecosystem	10	Since the bridge lengths are similar, the impact on the ecosystem in the river section is also same level.	10.00	Same as on the left	10.00	Same as on the left	10.00
	Hydrological Situation	2	There is a possibility that piers will be constructed in the Nile River and the flow regime will change. Both alternatives have the same number of piers in the river.	2.00	Same as on the left	2.00	Same as on the left	2.00
	Topography and Geology	2	Fill work is required in a small valley, there is the risk of slope failure and slide.	1.00	There are few risks of slope failure and slide due to the .	2.00	Fill work is required in a small valley, there is the risk of slope failure slide.	1.00
	Sub Total	30		28.14		30.00		26.18
Impact of Social Impact	Resettlement and Land Acquisition	10	No resettlement is caused in the vicinity of the bridge location. The land acquisition area at the bridge section is same level in any alternatives.	10.00	Same as on the left	10.00	Same as on the left	10.00
	Local Economy	4	Agricultural and commercial area is not existing at the bridge section. The land acquisition area at the bridge section is same level in any alternatives.	4.00	Same as on the left	4.00	Same as on the left	4.00
	Land-use and Local resources	4	The area of land acquisition and the degree of impact on the fishery are same level in any alternatives.	4.00	Same as on the left	4.00	Same as on the left	4.00
	Existing Social Services and Infrastructures	4	There are not any public / social infrastructures in the bridge section.	4.00	Same as on the left	4.00	Same as on the left	4.00
	Infection Disease※2	2	Since the bridge lengths are same, and the number of expected workers and the risk of infection are also	2.00	Same as on the left	2.00	Same as on the left	2.00

Item			Zone Alternative 1: Downstream of the narrowed section of the river		Zone Alternative 2: Narrowed section of the river		Zone Alternative 3: Upstream of the narrowed section of the river	
			expected to be similar.					
Labor Environment & Accident※2	2		Since the bridge lengths are same, and the number of expected workers and the risk of accident during construction are also expected to be similar.	2.00	Same as on the left	2.00	Same as on the left	2.00
Traffic Accident(post construction) ※3	2		Since the bridge lengths are same, and the risk of traffic accident post construction are also expected to be similar.	2.00	Same as on the left	2.00	Same as on the left	2.00
Generation of GHGs※4	2		Since the bridge lengths are same, and the expected GHGs volume post construction are also expected to be similar.	2.00	Same as on the left	2.00	Same as on the left	2.00
Sub Total	30			30.00		30.00		30.00
Cost (Construction Cost)	25		Cost Rate: 1.11 Bridge length is equal to the other alternatives, but the maximum span length is the longest and the construction cost is the largest.	22.52	Cost Rate: 1.00 The maximum span length is the smallest among the alternatives and the construction cost is the smallest.	25.00	Cost Rate: 1.05 Maximum span length is longer than Alternative 2 and shorter than Alternative 1, resulting in medium construction costs	23.81
Constructability	5		High construction accuracy is required because the span length is exceeding 200 m.	3.00	Same as on the left	3.00	Same as on the left	3.00
Evaluation	100			<b>83.66</b>	<b>Recommended</b> Because it has less impact on the natural and social environment and traffic than other alternatives and is more economical.	<b>88.00</b>		<b>82.99</b>

Note: Full points were given to the highest rated alternative, while the other alternatives were given points proportional to quantity.

\*1: In June 2023, a trench was installed at the boundary of KWR (Karuma Wildlife Reserve) on the south bank of the Nile River to prevent wildlife from entering Karuma town, and African elephants, hippopotamuses, African Buffalo, and other wildlife are unable to enter the area around Karuma town.

\*2: The number of infections and accidents during construction was assumed to occur in proportion to the number of construction workers.

\*3: The number of accidents during service phase is assumed to occur in proportion to the length of the road bridge.

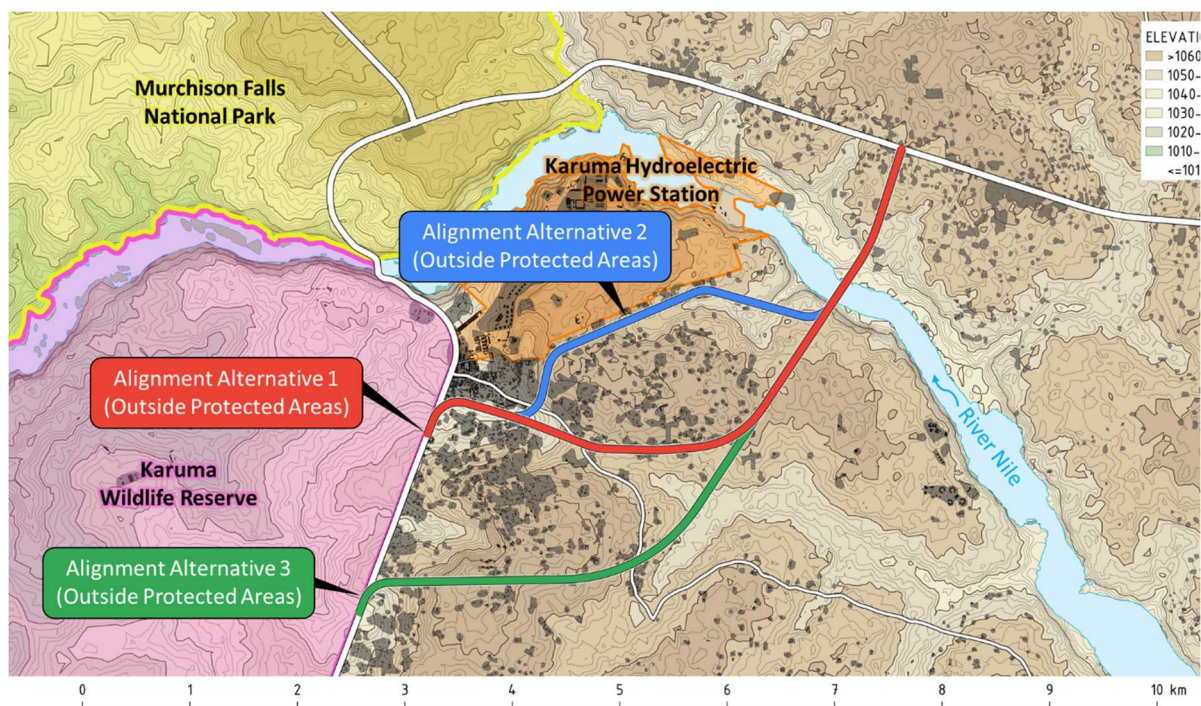
\*4: Global warming gas (CO2) emissions during construction are assumed to occur in proportion to the length of the road bridge.

Source: JICA Survey Team

### (3) Selection of Optimal Road Alignment (Outside Protected Areas)

In the bridging zones selected above, three possible road alignments were identified and their suitability as road alignments was assessed comparatively.

- Alignment Alternative 1: Shortest alignment avoiding densely populated areas
- Alignment Alternative 2: Alignment passing close to the power station
- Alignment Alternative 3: Alignment with the starting point shifted to the Kampala side, avoiding densely populated areas.



Source: JICA Survey Team

**Figure 3.7.8 Road Alignment Alternatives (Outside Protected Areas)**

Table 3.7.4 shows the results of the comparative assessment. It is confirmed that Alignment Alternative 1 is the most suitable road alignment for the following reasons:

- **Drivability:** Alignment Alternatives 1 and 3 have a road alignment with gentle horizontal curves, except at the beginning point, and therefore high drivability can be expected. In contrast, Alignment Alternative 2 is slightly less manoeuvrable as the road alignment runs through densely populated residential areas and there is a certain degree of separation between the communities in the area, with a slightly higher risk of traffic accidents related to pedestrian crossings.
- **Natural Environmental Impacts:** There are no significant differences between any of the alternatives.
- **Social Environmental Impacts:** Land acquisition and resettlement would be minimal for Alignment Alternatives 1 and 2.
- **Economic Efficiency:** As the size of the bridges is the same for all alternatives, the longer the road length and the more terrain irregularities, the higher the construction costs. Alignment Alternative 1 has the lowest construction costs due to the small terrain irregularities.



**Table 3.7.4 Comparison of Road Alignment Alternatives (Outside Protected Areas)**

Item		Alignment Alternative 1: Shortest alignment avoiding densely populated areas		Alignment Alternative 2: Alignment passing close to the power station		Alignment Alternative 3: Alignment with the starting point shifted to the Kampala side, avoiding densely populated areas.		
Spec.	Road Length	6.2 km		6.1 km		7.4 km		
	River Width	620 m		620 m		620 m		
	Maximum Span Length	200 m		200 m		200 m		
	Minimum curve radius	R = 800 m		R = 250 m		R = 1500 m		
Evaluation Item		Point	Evaluation	Point	Evaluation	Point	Evaluation	Point
Driveability		5	High driveability can be expected due to the gently curving road alignment, except at the starting point.	5.00	Slightly less drivable due to the alignment that passing through high density populated residential areas.	4.00	Same as alternative 1	5.00
Traffic Safety		5	The alignment avoids densely populated areas, so there is little separation of communities, and it is expected that pedestrian crossing accidents will be low.	4.00	There is a little separation of communities, and it is expected that pedestrian crossing accidents will be higher than alternative 1.	3.00	Same as alternative 1	4.00
Impact of Natural Environment	Air Pollution	2	No significant differences by alternatives due to same traffic volume, travelling speed, roadside environment and cross section	2.00	Same as on the left	2.00	Same as on the left	2.00
	Wastes	2	Cutting tree (app. 2ha)	2.00	Cutting tree (app. 3.7ha)	1.08	Cutting tree (app. 3.6ha)	1.11
	Noise and Vibration	2	No significant differences by alternatives due to same traffic volume, travelling speed, roadside environment and cross section	2.00	Same as on the left	2.00	Same as on the left	2.00
	Cutting Tree	10	Cutting tree (app. 2ha)	10.00	Cutting tree (app. 3.7ha)	5.41	Cutting tree (app. 3.6ha)	5.56
	Ecosystem	10	The main land use along the road section is agricultural land and there is little wildlife after setting up Elephant trench on the boundary of KWR. (*1) However, the Nile River crossing section is inhabited by Hippopotamuses and Nile crocodiles, which are likely to be affected.	10.00	Same as on the left	10.00	Same as on the left	10.00
	Hydrological Situation	2	There is a possibility that piers will be constructed in the Nile River and the flow regime will change. Both alternatives have the same number of piers in the river.	2.00	Same as on the left	2.00	Same as on the left	2.00
	Topography and Geology	2	There are many embankment sections throughout the entire alignment. Relatively high embankments, especially around bridge abutments, are at risk of soil erosion	2.00	Same as on the left	2.00	Same as on the left	2.00

Item			Alignment Alternative 1: Shortest alignment avoiding densely populated areas		Alignment Alternative 2: Alignment passing close to the power station		Alignment Alternative 3: Alignment with the starting point shifted to the Kampala side, avoiding densely populated areas.	
			and slope failure, but to the same risks in any alternatives.					
	Sub Total	30		30.00		24.49		24.67
Impact of Social Impact	Resettlement and Land Acquisition	10	Land Acquisition : 30ha Resettlement : 60 structures	10.00	Land Acquisition : 30ha Resettlement : 60 structures	10.00	Land Acquisition : 35ha Resettlement : 80 structures	6.43
	Local Economy	4	The road does not pass through the business areas of Karuma Town, which will negative impact on the livelihoods and local economy.	4.00	Same as on the left	4.00	Same as on the left	4.00
	Land-use and Local resources	4	The access road passes through agricultural lands. The access road is 2% longer than Alternative 1 and has a slightly greater impact on agriculture than Alternative 2. Negative impacts to fisheries are similar in any alternatives due to the same bridge length.	3.94	The access road length is the shortest and have the least impact on agriculture. Impacts on fisheries are expected to be similar for all alternatives.	4.00	Because the distance of the access road is greater than Alternative 2, the impact on agriculture is approximately 19% greater than Alternative 1. Negative impacts on fisheries are expected to be similar for all alternatives.	3.35
	Existing Social Services and Infrastructures	4	Social infrastructures such as clinic and meeting places may be included in the affected 60 structures.	4.00	Social infrastructures such as clinic and meeting places may be included in the affected 60 structures.	4.00	Social infrastructures such as clinic and meeting places may be included in the affected 80 structures.	3.00
	Infection Disease※2	2	Expected maximum construction workers are approximately 760 workers/day	1.97	Expected maximum construction workers are approximately 750 workers/day	2.00	Expected maximum construction workers are approximately 890 workers/day	1.68
	Labor Environment & Accident※2	2	Expected maximum construction workers are approximately 760 workers/day	1.97	Expected maximum construction workers are approximately 750 workers/day	2.00	Expected maximum construction workers are approximately 890 workers/day	1.68
	Traffic Accident(post construction)※3	2	Length of the road with bridge is approximately 6.82km	1.97	Length of the road with bridge is approximately 6.72km	2.00	Length of the road with bridge is approximately 8.02km	1.68
	Generation of GHGs※4	2	Length of the road with bridge is approximately 6.82km	1.97	Length of the road with bridge is approximately 6.72km	2.00	Length of the road with bridge is approximately 8.02km	1.68
	Sub Total	30		29.82		30.00		23.48
	Cost (Construction Cost)	30	Cost Rate: 1.00 Road length is same as Alternative 2 and construction costs are minimum for all alternatives.	25.00	Cost Rate: 1.02 Although the road length is minimum in the any alternatives, the construction cost is slightly higher than Alternative 1 due to the need for bridges or high embankment at stream crossings.	24.57	Cost Rate: 1.07 Longest road length and largest construction cost for all alternatives.	23.35
Reasons of Selection		100	<b>Recommended</b>	<b>93.82</b>		<b>86.06</b>		<b>80.50</b>



Item	Alignment Alternative 1: Shortest alignment avoiding densely populated areas	Alignment Alternative 2: Alignment passing close to the power station	Alignment Alternative 3: Alignment with the starting point shifted to the Kampala side, avoiding densely populated areas.
	High driveability and safety, minimal overall impact on the natural and social environment, and high economic efficiency		

Note: Full points were given to the highest rated alternative, while the other alternatives were given points proportional to quantity.

\*1: In June 2023, a trench was installed at the boundary of KWR (Karuma Wildlife Reserve) on the south bank of the Nile River to prevent wildlife from entering Karuma town, and African elephants, hippopotamuses, African Buffalo, and other wildlife are unable to enter the area around Karuma town.

\*2: The number of infections and accidents during construction was assumed to occur in proportion to the number of construction workers.

3: The number of accidents during service phase is assumed to occur in proportion to the length of the road bridge.

4: Global warming gas (CO<sub>2</sub>) emissions during construction are assumed to occur in proportion to the length of the road bridge.

Source: JICA Survey Team

#### (4) Selection of Optimal Bridge Type (Outside Protected Areas)

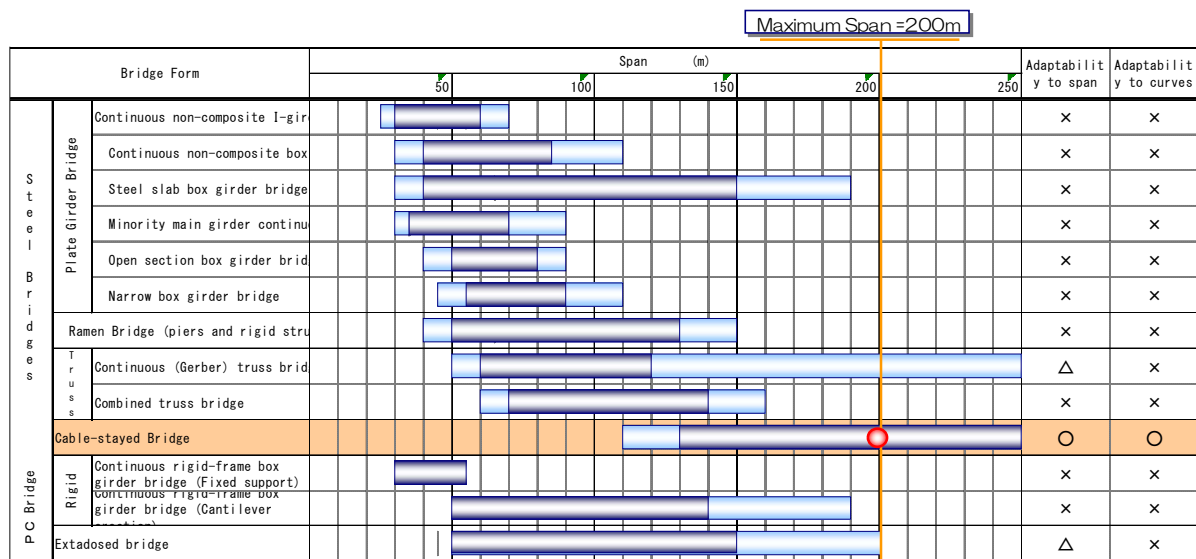
For the road alignment selected above, a study was conducted on the applicable bridge type. Considering the following site conditions, the combination of the cable-stayed bridge and PC box girder bridge (90+200+90+3@60=620m)” was assessed as the most suitable bridge type.

- The width of the River Nile at the crossing point is confirmed to be 200 to 300 m. In particular, the water depth near the middle of the river exceeds 5 m, so a large-scale embankment would need to be constructed. In this case, due to the negative impact on the natural environment, piers should not be installed near the middle of the river, where the water depth is deeper, and the length of the central span should be 200 m (see Figure 3.7.9).



**Figure 3.7.9 Image of Temporary Cofferdam Avoiding Pier Construction in River**

- Bridge types to which the 200 m span length can be applied are steel truss bridges, steel cable-stayed bridges, PC extradosed bridges and other special bridges (see Figure 3.7.10). For this bridge, steel cable-stayed bridges, which are the most proven in the 200 m span length class, will be used.

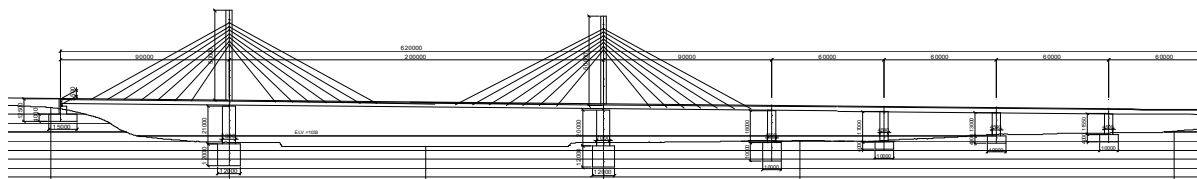


○ : Very suitable to adopt, △ : impossible to adopt, but needs special treatment, × : Not applicable

Source: JICA Survey Team

**Figure 3.7.10 Applicable Bridge Type per Span Length**

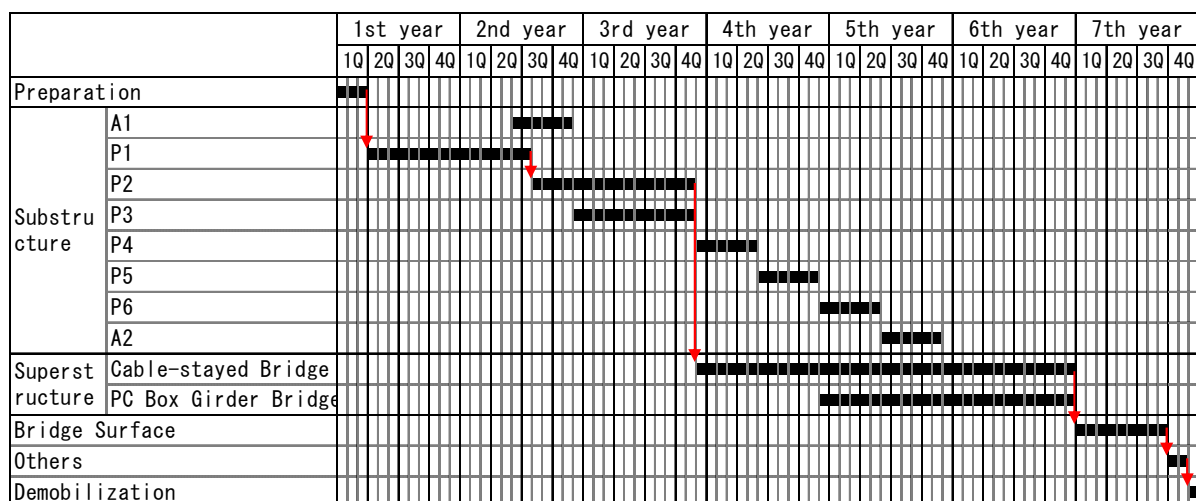
- PC box-girder bridge type can be applied to the low-lying sections outside the river zone as the most economical bridge type.



Source: JICA Survey Team

**Figure 3.7.11 Optimum Bridge Type (Outside Protected Areas)**

As shown in Figure 3.7.12, the construction period required for the bridge shown in Figure 3.7.11 is estimated to be seven years, with an estimated construction cost of over JPY 15 billion (approximately USD 98 million).



Source: JICA Survey Team

**Figure 3.7.12 Estimated Construction Schedule for Bridge (Outside Protected Areas)**

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(5) Assessment of Absence of Feasible Alternatives for Project Implementation Outside Protected Areas

The overall assessment of the results of the above studies resulted in the assessment that avoiding protected areas altogether is “not feasible as a project” for the following reasons. Therefore, it was confirmed that “no feasible alternatives exist for implementation in areas outside the protected area”.

- Socio Environmental Impacts: the route that completely avoids the protected area is the construction of a new road passing through a settlement in the south of Karuma town, which will result in the acquisition of more than 30 ha of land (mainly agricultural land) and the relocation of a certain number of people, resulting in the loss or reduction of livelihood options. In addition, there are concerns about the impact of road construction in terms of separation of local communities and increased traffic accidents. In addition, as the road will largely bypass Karuma town to the east, the route is expected to have a negative economic impact on commercial areas and vendors along the existing road to the south of the existing Karuma Bridge.
- Natural Environmental Impact: In June 2023, a large trench was constructed on the boundary between Karuma Wildlife Reserve and the neighbouring Karuma town, limiting the wildlife activity zone to within the reserve. As a result, the study area for the alternative route outside the reserve is largely unaffected by terrestrial wildlife. However, the bridge location is within the habitat range of hippopotamuses and Nile crocodiles, which will affect their habitat and require tree clearance over an area of more than 20 ha, mainly in secondary and riparian forests.
- Assessment of feasibility and economic viability: The construction cost of approximately JPY 14.77 billion (approximately USD 96.53 million) is far in excess of the budget ceiling for Japan’s Grant Aid, and it is necessary to apply other funding schemes, such as Japanese ODA loan, to implement the project. On the other hand, the Economic Internal Rate of Return (EIRR) was estimated to be 2.7%, which is not viable for project implementation. In addition, if the start of construction is delayed due to delay in land acquisition and resettlement, the EIRR will show a negative value.

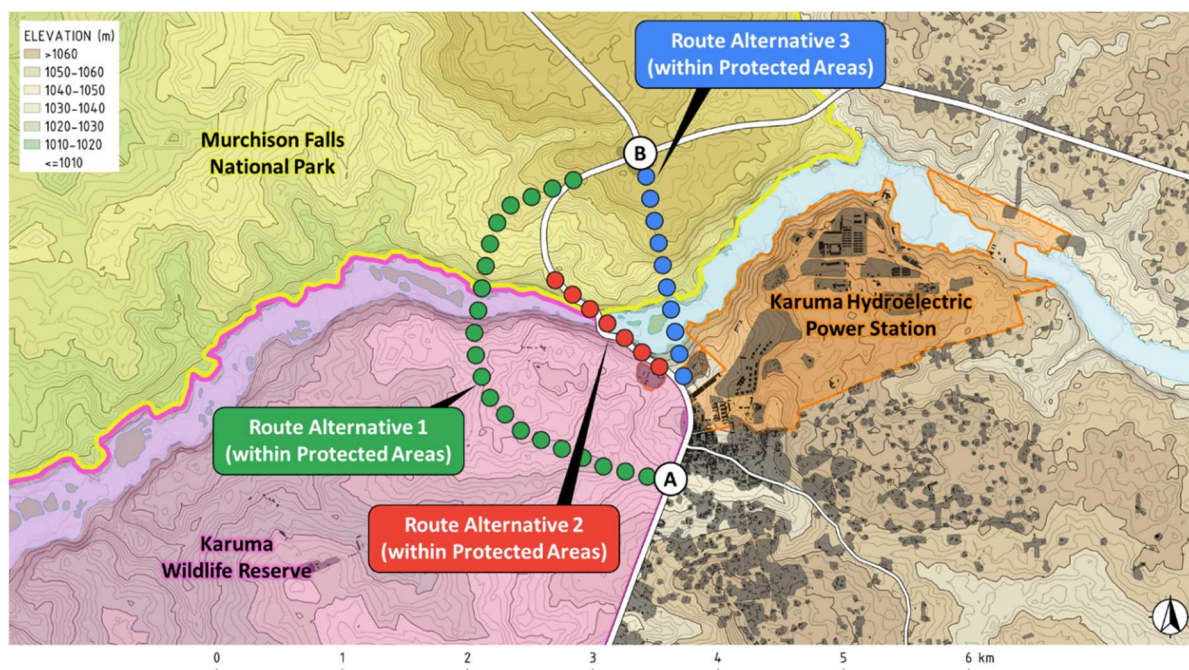
3.7.4. **Assessment of the Impact of Replacing Bridge near the Existing Bridge**

As in the case of avoiding the protected areas altogether, the possible bridge locations in the vicinity of the existing bridge was assessed through a four-step study process: 1) selection of the route, 2) selection of the river crossing zone, 3) selection of the road alignment and 4) selection of the bridge type.

(1) Selection of Optimal Route (within Protected Areas)

Three route alternatives were identified as possible candidates for the construction of a new bridge and were compared.

- Route Alternative 1 (within Protected Areas): Bypass route to the west of the existing bridge
- Route Alternative 2 (within Protected Areas): Route near the existing bridge
- Route Alternative 3 (within Protected Areas): Bypass route on the east of the existing bridge



Source: JICA Survey Team

**Figure 3.7.13 Route Alternatives (Inside Protected Areas)**

Table 3.7.5 shows the results of the comparative evaluation of the route alternatives within the protected areas. As with the evaluation of the route outside of the protected areas, the evaluation indicators and points allocated for the comparative evaluation are: Traffic Impact (10 points), Natural Environmental Impact (30 points), Social Environmental Impact (30 points), Economic Efficiency (estimated construction cost) (25 points), Constructability (5 points) and Total (100 points), where the evaluation items for Natural Environmental Impact and Social Environmental Impact were set with reference to the Scoping Matrix.

The results of the comparative evaluation confirmed that Route Alternative 2 is the most preferable route in the protected area, as it minimises the natural environmental impact and the size of the project compared to the other route alternatives, and also minimises the traffic and social environmental impacts in the project area.

**Table 3.7.5 Comparison of Route Alternatives (within Protected Areas)**

Item			Route Alternative 1 (within Protected Areas): Bypass route to the west of the existing bridge		Route Alternative 2 (within Protected Areas): Route near the existing bridge		Route Alternative 3 (within Protected Areas): Bypass route on the east of the existing bridge	
Spec.	River Width		300~380 m		70~100 m		300~380 m	
	Bridge Length		App. 700 m (max. Span Length 320m)		250~500 m (max. Span Length 120m)		App. 800 m (max. Span Length 320m)	
	Road Length		4.0 km		2.0 km		2.2 km	
Evaluation Item		Point	Evaluation		Point	Evaluation		Point
Impact of Traffic	Traveling Distance A and B	10	Increase 0.4km (Distance between A and B increased from 3.6 km to 4.0 km)		6.30	No increase or decrease		7.00
						Shortening of 1 km (Distance between A and B decreased from 3.6 km to 2.6 km)		9.69
Impact of Natural	Air Pollution	2	No significant differences by alternatives due to same traffic volume, travelling speed, roadside environment and cross section		2.00	Same as on the left		2.00

Item			Route Alternative 1 (within Protected Areas): Bypass route to the west of the existing bridge		Route Alternative 2 (within Protected Areas): Route near the existing bridge		Route Alternative 3 (within Protected Areas): Bypass route on the east of the existing bridge	
	Wastes	2	Cutting tree (app.2ha)	1.00	Cutting tree (app. 1ha)	2.00	Cutting tree (app. 1.1ha)	1.82
	Noise and Vibration	2	No significant differences by alternatives due to same traffic volume, travelling speed, roadside environment and cross section	2.00	Same as on the left	2.00	Same as on the left	2.00
	Cutting Tree	10	The road passes through both protected areas and has a significant impact on the ecosystem due to the long road length and large logging area (approximately 12,000m <sup>2</sup> ).	5.00	Although the road passes through both protected areas, the road length is the shortest and the area to be cut is the smallest of the alternatives, approximately 6,000 m <sup>2</sup> .	10.00	The road passes through only the Murchison Falls National Park, but the road length through the protected area is longer than Alternative 2, with approximately 66,000 m <sup>2</sup> of logged area.	9.09
	Ecosystem	10	The area through which the route passes is the range of the hippopotamus and may affect land access points and major feeding areas.	6.00	The river crossing point is the narrowest in width and is likely not a major habitat for hippopotamuses, Nile crocodiles, and fish due to its high velocity of flow. It is likely to have the least impact due to its location near an existing road.	10.00	It is likely to affect the habitat of hippopotamuses, resting African elephants, and their moving course to watering place.	6.00
	Hydrological Situation	2	No piers will be installed in the Nile River and there will be no impact on the hydrological situation.	2.00	Same as on the left	2.00	Same as on the left	2.00
	Topography and Geology	2	The road length is the longest at approximately 4 km and the earthwork section (cut and fill) is the longest for all alternatives.	1.00	The road length is the shortest at approximately 2 km and the earthwork section (cut and fill) is the shortest for all alternatives.	2.00	The road length and earth work section is shorter than alternative 2.	1.81
	Sub Total	30		19.00		30.00		24.72
Impact of Social Impact	Resettlement and Land Acquisition	10	Private land acquisition and resettlement is not caused	10.00	Private land acquisition and resettlement is not caused	10.00	Small scale private land acquisition and resettlement are expected.	5.00
	Local Economy	4	The access road does not pass through the commercial area of the Karuma Town, which will have a significant negative impact on the local economy along the existing road.	2.00	Traffic will continue to pass through the commercial area after the bridge is constructed, so there will be no impact.	4.00	Traffic will continue to pass through the commercial area after the bridge is constructed, so there will be no impact.	4.00
	Land-use and Local resources	4	The location of the bridge is close to the KFA fishing grounds and could have a negative impact on the fishing grounds.	2.00	The location of the bridge is far from the fishing grounds of the KFA and is assumed to have no negative impact on the fishing grounds.	4.00	The bridge location is a fishing ground for residents and could be impacted.	2.00
	Existing Social Services and Infrastructures	4	No adverse impact to the public infrastructures	4.00	No adverse impact to the public infrastructures	4.00	Some facilities of UPDF (Uganda People's Defence Force) may be impacted.	2.00
	Infection	2	Expected maximum	1.19	Expected maximum	2.00	Expected maximum	1.70

Item			Route Alternative 1 (within Protected Areas): Bypass route to the west of the existing bridge		Route Alternative 2 (within Protected Areas): Route near the existing bridge		Route Alternative 3 (within Protected Areas): Bypass route on the east of the existing bridge	
	Disease※2		construction workers are approximately 470 workers/day		construction workers are approximately 280 workers/day		construction workers are approximately 330 workers/day	
	Labor Environment & Accident※2	2	Expected maximum construction workers are approximately 470 workers/day	1.19	Expected maximum construction workers are approximately 280 workers/day	2.00	Expected maximum construction workers are approximately 330 workers/day	1.70
	Traffic Accident (post construction)※3	2	Length of the road with bridge is approximately 4.7km	1.06	Length of the road with bridge is approximately 2.5km	2.00	Length of the road with bridge is approximately 3.0km	1.67
	Generation of GHGs※4	2	Length of the road with bridge is approximately 4.7km	1.06	Length of the road with bridge is approximately 2.5km	2.00	Length of the road with bridge is approximately 3.0km	1.67
	Sub Total	30		22.51		30.00		19.73
Cost (Construction Cost)			Cost Rate: 2.44 Project size is larger than Alternative 2 due to longer road length and bridge length	10.23	Cost Rate: 1.00 Since the bridge is constructed at the narrowest point of the river, the cost is minimal for all alternatives.	25.00	Cost Rate: 1.40 Project size is larger than Alternative 1 due to longer road and bridge length	11.03
Constructability			More substructure units than Alternative 2 and more time required for foundation work on base rock	4.00	The river is the narrowest at the bridge site, and the construction can be done on land, so the constructability is the lowest.	5.00	Difficult to construct foundations and substructure on steep slopes	3.00
Evaluation				<b>62.04</b>	<b>Recommended</b> Minimize environmental impacts and the extent of impacts compared to other alternatives, as well as minimize traffic and social environmental impacts in the project area	<b>97.00</b>		<b>68.17</b>

\*1: In June 2023, a trench was installed at the boundary of KWR (Karuma Wildlife Reserve) on the south bank of the Nile River to prevent wildlife from entering Karuma town, and African elephants, hippopotamuses, African Buffalo, and other wildlife are unable to enter the area around Karuma town.

\*2: The number of infections and accidents during construction was assumed to occur in proportion to the number of construction workers.

3: The number of accidents during service phase is assumed to occur in proportion to the length of the road bridge.

4: Global warming gas (CO2) emissions during construction are assumed to occur in proportion to the length of the road bridge.

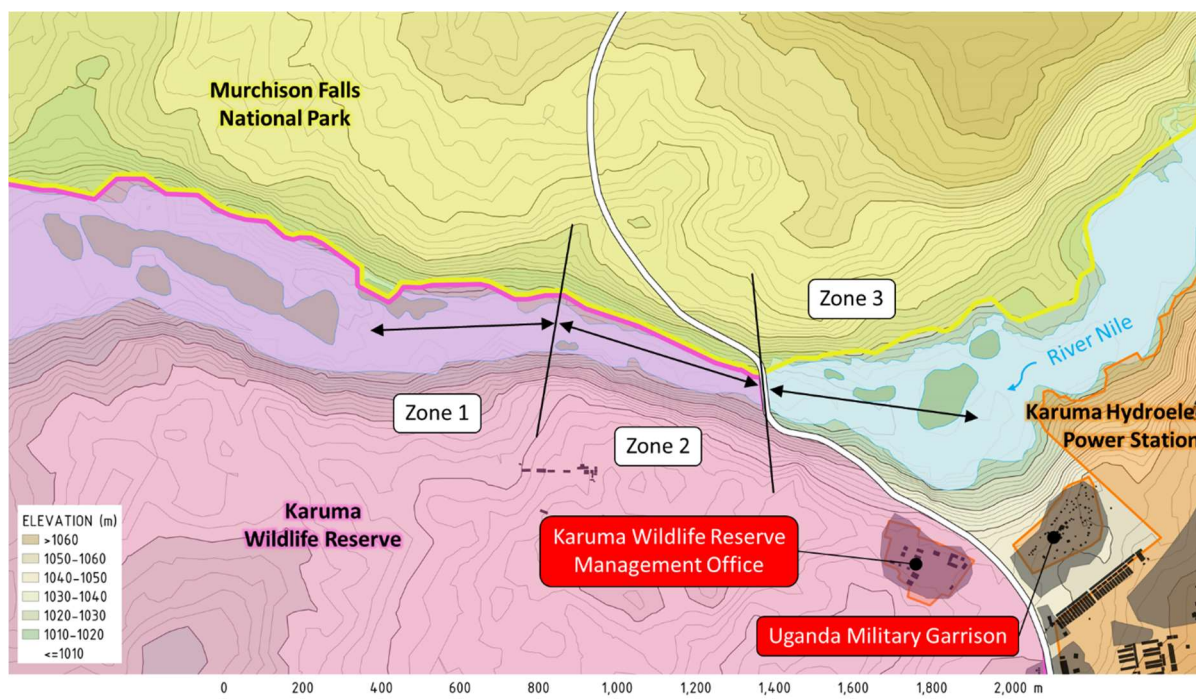
Source: JICA Survey Team

## (2) Selection of Optimal River Crossing Zone (within Protected Areas)

For the route zone of the Protected Area Route Alternative 2, the area before and after the river narrowing was divided into three zones to compare and assess their suitability as bridge locations.

- Zone Alternative 1: Downstream of the narrowed section of the river
- Zone Alternative 2: Narrowed section of the river
- Zone Alternative 3: Upstream of the narrowed section of the river





Source: JICA Survey Team

**Figure 3.7.14 Comparison of River Crossing Zones (within Protected Areas)**

Table 3.7.6 shows the results of the comparative assessment of the river crossing zones for the Route Alternative 2 (within Protected Areas). Zone Alternative 2 (narrowed section of the river) was identified as the most suitable bridge area, as it minimises the degree of impact on the natural environment in the protected area and is the most economical due to the narrower river width and minimised bridge size.

**Table 3.7.6 Comparison of River Crossing Zones (within Protected Areas)**

Item		Zone Alternative 1: Downstream of the narrowed section of the river		Zone Alternative 2: Narrowed section of the river		Zone Alternative 3: Upstream of the narrowed section of the river		
Spec.	River Width	150 ~ 300 m		70 ~ 100 m		150 ~ 300 m		
	Bridge Lenth	350~500 m (max. Span Length 170m)		250~400 m (max. Span Length 120m)		350~500 m (max. Span Length 210~240m)		
Evaluation Item		Point	Evaluation	Point	Evaluation	Point	Evaluation	Point
Impact of Natural Environment	Air Pollution	2	No significant differences by alternatives due to same traffic volume, travelling speed, roadside environment and cross section	2.00	Same as on the left	2.00	Same as on the left	2.00
	Wastes	2	The number of piers is the same, and the amount of excavated soil (construction debris) and cut trees is also similar.	2.00	Same as on the left	2.00	Same as on the left	2.00
	Noise and Vibration	2	No significant differences by alternatives due to same traffic volume, travelling speed, roadside environment and cross section	2.00	Same as on the left	2.00	Same as on the left	2.00
	Cutting Tree	10	The number of trees cut in the bridge section is same level.	10.00	Same as on the left	10.00	Same as on the left	10.00
	Ecosystem	10	The bridge location has	3.00	The bridge location beyond	5.00	The bridge location is	3.00

Item			Zone Alternative 1: Downstream of the narrowed section of the river		Zone Alternative 2: Narrowed section of the river		Zone Alternative 3: Upstream of the narrowed section of the river	
			several access points to the south and north bank for hippopotamuses and is likely to be affected.		300 m downstream from the current bridge is likely to be affected due to the access point to the land area of the hippopotamus. However, the area within 300m downstream will have little impact because the current velocity is fast and the area is not suitable for habitat of hippopotamus and Nile crocodiles.		known as a part of habitat of hippopotamuses and may be affected.	
	Hydrological Situation	2	No piers will be constructed in the river, thus hydrological situation does not change.	2.00	Same as on the left	2.00	Same as on the left	2.00
	Topography and Geology	2	The height of the embankment around the abutment is similar, and the risk of soil erosion and slope failure is same level in any alternatives.	2.00	Same as on the left	2.00	Same as on the left	2.00
	Sub Total	30		23.00		25.00		23.00
Impact of Social Impact	Resettlement and Land Acquisition	10	Private land acquisition and resettlement is not caused	10.00	Same as on the left	10.00	Same as on the left	10.00
	Local Economy	4	Since all alternative routes will pass through the commercial area of Karuma Town after the construction of the bridge, it is expected that there will be no negative impact on the economic situation, livelihood and employment opportunities.	4.00	Same as on the left	4.00	Same as on the left	4.00
	Land-use and Local resources	4	Since the designated fishing ground is located more than 1km downstream, negative impacts are not caused.	4.00	Since the designated fishing ground is located more than 1km downstream, negative impacts are not caused.	4.00	A known fishing ground for local community is located approximately 400 m upstream of the current bridge and could be impacted.	2.00
	Existing Social Services and Infrastructures	4	There are not any social infrastructures at the bridge section.	4.00	Same as on the left	4.00	Same as on the left	4.00
	Infection Disease※2	2	The maximum bridge length is about 500 m. The number of expected workers and the risk of infectious diseases are expected to be changed to the length of the bridge.	1.60	The maximum bridge length is about 400 m. The number of expected workers and the risk of infectious diseases are expected to be changed to the length of the bridge.	2.00	Same as Alternative 1	1.60
	Labor Environment & Accident※2	2	The maximum bridge length is about 500 m. The number of expected workers and the risk of accident during construction are expected to	1.60	The maximum bridge length is about 400 m. The number of expected workers and the risk of accident during construction are expected to	2.00	Same as Alternative 1	1.60



Item			Zone Alternative 1: Downstream of the narrowed section of the river		Zone Alternative 2: Narrowed section of the river		Zone Alternative 3: Upstream of the narrowed section of the river	
			be changed to the length of the bridge.		be changed to the length of the bridge.			
Traffic Accident(post construction)※3	2		The maximum bridge length is about 500 m. The number of expected workers and the risk of traffic accident post construction are expected to be changed to the length of the bridge.	1.60	The maximum bridge length is about 400 m. The number of expected workers and the risk of traffic accident post construction are expected to be changed to the length of the bridge.	2.00	Same as Alternative 1	1.60
Generation of GHGs※4	2		The maximum bridge length is about 500 m, and CO2 is generated according to the length of the bridge.	1.60	The maximum bridge length is about 400 m, and CO2 is generated according to the length of the bridge.	2.00	Same as Alternative 1	1.60
Sub Total	30			28.40		30.00		26.40
Cost (Construction Cost)	25		Cost Rate: 1.40 High cost due to large scale bridge	17.86	Cost Rate: 1.00 Economical cost due to shortest bridge size	25.00	Cost Rate: 1.40 High cost due to large scale bridge	17.86
Constructability	5		The river width at the crossing point is wider than Alternative 2 and more difficult to construct.	4.00	The river width at the crossing is the narrowest and the least difficult to construct.	5.00	The river width at the crossing point is wider than Alternative 2 and more difficult to construct.	4.00
Evaluation	100			73.26	<b>Recommended</b> Since the river is narrowest at the crossing point, the size of the bridge can be minimized, which is economical and at the same time minimizes the impact on the natural environment by minimizing of alteration area.	85.00		71.26

Note: Full points were given to the highest rated alternative, while the other alternatives were given points proportional to quantity.

\*1: In June 2023, a trench was installed at the boundary of KWR (Karuma Wildlife Reserve) on the south bank of the Nile River to prevent wildlife from entering Karuma town, and African elephants, hippopotamuses, African Buffalo, and other wildlife are unable to enter the area around Karuma town.

\*2: The number of infections and accidents during construction was assumed to occur in proportion to the number of construction workers.

3: The number of accidents during service phase is assumed to occur in proportion to the length of the road bridge.

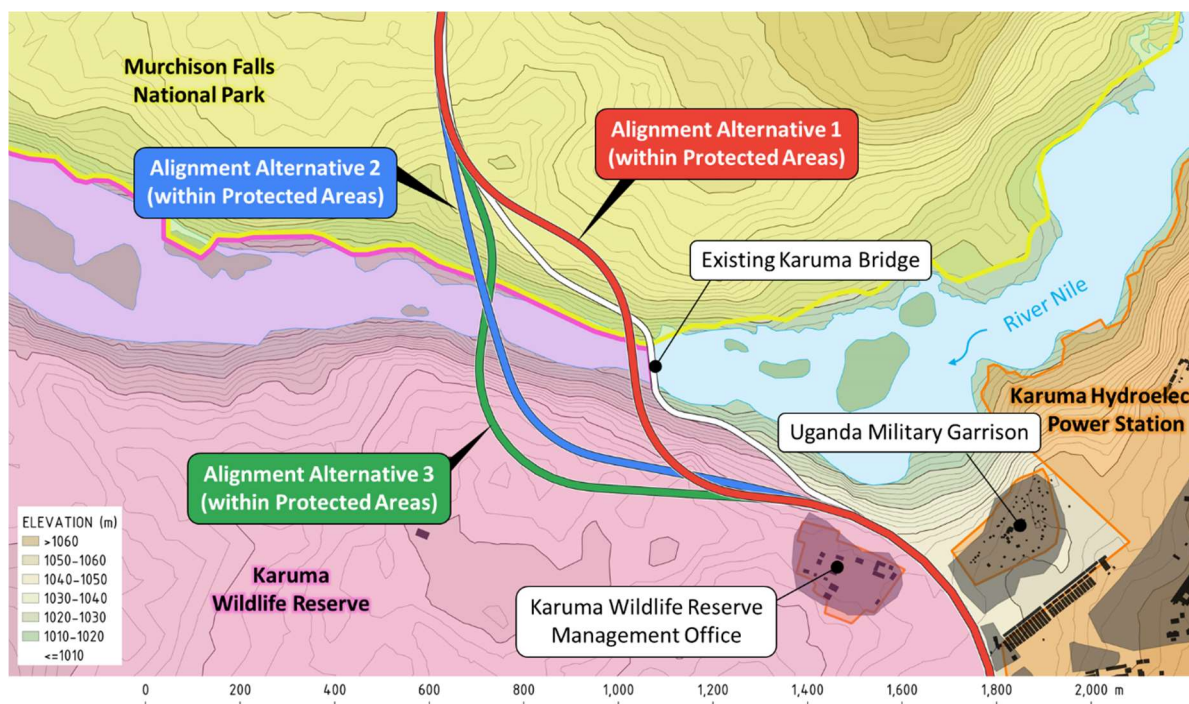
4: Global warming gas (CO2) emissions during construction are assumed to occur in proportion to the length of the road bridge.

Source: JICA Survey Team

### (3) Selection of Optimal Road Alignment (within Protected Areas)

Within the river crossing zone selected above, three possible road alignments were identified and their suitability as road alignments was comparatively assessed.

- Alignment Alternative 1: Construct a bridge as close as possible to the existing Karuma Bridge in order to minimise the size of the bridge for economic reasons. The scale of works on both sides of the river is similar and there is an intersection with the existing road. The road alignment will be an S-shaped alignment around the river crossing.
- Alignment Alternative 2: Elimination of the above S-shaped curve to improve driveability.
- Alignment Alternative 3: An intermediate option between Alignment Alternatives 1 and 2, closest to the plan proposed by UNRA.



Source: JICA Survey Team

**Figure 3.7.15 Road Alignment Alternatives (within Protected Areas)**

Table 3.7.7 shows the results of the comparative assessment. The Alignment Alternative 1, which has the lowest environmental impact and is the most economical, was selected as the most suitable option for replacing the bridge in the vicinity of the existing bridge.

**Table 3.7.7 Comparison of Road Alignment Alternatives (within Protected Areas)**

Item		Alignment Alternative 1 Minimize Bridge Length		Alignment Alternative 2 Improve Drivability		Alignment Alternative 3 Intermediate Alternative 1 & 2	
Spec.	Road Length	1,700 m		1,850 m		1,800 m	
	Bridge Length	280 m		390 m		300 m	
	Maximum Span Length	120 m		170 m		160 m	
	Minimum curve radius	R = 200 m		R = 250 m		R = 250 m	
Evaluation Item	Point	Evaluation	Point	Evaluation	Point	Evaluation	Point
Driveability	5	Satisfies the "desirable minimum curve radius" of the Road Structure Ordinance, ensuring comfortable driving, but inferior to Alternative 2.	4.00	Satisfies the "desirable minimum curve radius" of the Road Structure Ordinance, ensuring comfortable traveling performance.	5.00	Satisfies the "desirable minimum curve radius" of the Road Structure Ordinance, ensuring comfortable traveling performance.	4.50
Traffic Safety	5	Visibility of the bridge from the approach road on both banks provides traffic safety.	5.00	Same as on the left	5.00	Same as on the left	5.00
Impact of Natural Environment	Air Pollution	No significant differences by alternatives due to same traffic volume, travelling speed, roadside environment and cross section	2.00	Same as on the left	2.00	Same as on the left	2.00
	Wastes	Cutting tree (app. 2.9ha)	2.00	Cutting tree (app. 3.3ha)	1.76	Cutting tree (app. 3.1ha)	1.87
	Noise and Vibration	No significant differences by alternatives due to same traffic volume, travelling	2.00	Same as on the left	2.00	Same as on the left	2.00

			speed, roadside environment and cross section					
	Cutting Tree	10	Cutting tree (app. 2.9ha)	10.00	Cutting tree (app. 3.3ha)	8.79	Cutting tree (app. 3.1ha)	9.35
	Ecosystem	10	The area which is separated by the project between current alignment and new alignment is approximately 7.1 ha.	10.00	The area which is separated by the project between current alignment and new alignment is approximately 14.3 ha.	4.97	The area which is separated by the project between current alignment and new alignment is approximately 17.7 ha.	4.01
	Hydrological Situation	2	No piers will be installed in the Nile River and there will be no impact on the hydrological situation.	2.00	Same as on the left	2.00	Same as on the left	2.00
	Topography and Geology	2	There is no significant difference in earthwork (cut and fill) for any of the alternatives.	2.00	Same as on the left	2.00	Same as on the left	2.00
	Sub Total	30		30.00		23.51		23.24
Impact of Social Impact	Resettlement and Land Acquisition	10	Private land acquisition and resettlement is not caused	10.00	Same as on the left	10.00	Same as on the left	10.00
	Local Economy	4	Since all alternative routes will pass through the commercial area of Karuma Town after the construction of the bridge, it is expected that there will be no negative impact on the economic situation, livelihood and employment opportunities.	4.00	Same as on the left	4.00	Same as on the left	4.00
	Land-use and Local resources	4	It is far enough away from known fishing grounds that it is not affected.	4.00	Same as on the left	4.00	Same as on the left	4.00
	Existing Social Services and Infrastructures	4	There are not any social infrastructures at the bridge section.	4.00	Same as on the left	4.00	Same as on the left	4.00
	Infection Disease※2	2	Expected maximum construction workers are approximately 200 workers/day	2.00	Expected maximum construction workers are approximately 230 workers/day	1.75	Expected maximum construction workers are approximately 210 workers/day	1.87
	Labor Environment & Accident※2	2	Expected maximum construction workers are approximately 200 workers/day	2.00	Expected maximum construction workers are approximately 230 workers/day	1.75	Expected maximum construction workers are approximately 210 workers/day	1.87
	Traffic Accident(post construction)※3	2	Length of the road with bridge is approximately 1.78km	2.00	Length of the road with bridge is approximately 2.04km	1.75	Length of the road with bridge is approximately 1.90km	1.87
	Generation of GHGs※4	2	Length of the road with bridge is approximately 1.78km	2.00	Length of the road with bridge is approximately 2.04km	1.75	Length of the road with bridge is approximately 1.90km	1.87
	Sub Total	30		30.00		28.98		29.49
Cost (Construction Cost)		25	Cost Rate: 1.00 The maximum span length of 120 m allows for the adoption of PC box girder bridges, an economical bridge type with excellent	25.00	Cost Rate: 1.47 The maximum span length of 170 m makes it difficult to adopt a PC box girder bridge. In addition, the bridge is the longest and	17.01	Cost Rate: 1.19 The maximum span length of 160 m makes it difficult and uneconomical to adopt PC box girder bridges.	21.01

		economic efficiency.		therefore the most expensive to construct.			
Constructability (Construction Period)	5	Construction Period: 2.7 years	5.00	Construction Period: 3.5 years	3.86	Construction Period: 2.9 years	4.66
Evaluation	100	<b>Recommended</b> Minimal impacts on natural and social environment, and economical cost.	<b>99.0</b>		<b>83.36</b>		<b>87.90</b>

Note: Full points were given to the highest rated alternative, while the other alternatives were given points proportional to quantity.

\*1: In June 2023, a trench was installed at the boundary of KWR (Karuma Wildlife Reserve) on the south bank of the Nile River to prevent wildlife from entering Karuma town, and African elephants, hippopotamuses, African Buffalo, and other wildlife are unable to enter the area around Karuma town.

\*2: The number of infections and accidents during construction was assumed to occur in proportion to the number of construction workers.

3: The number of accidents during service phase is assumed to occur in proportion to the length of the road bridge.

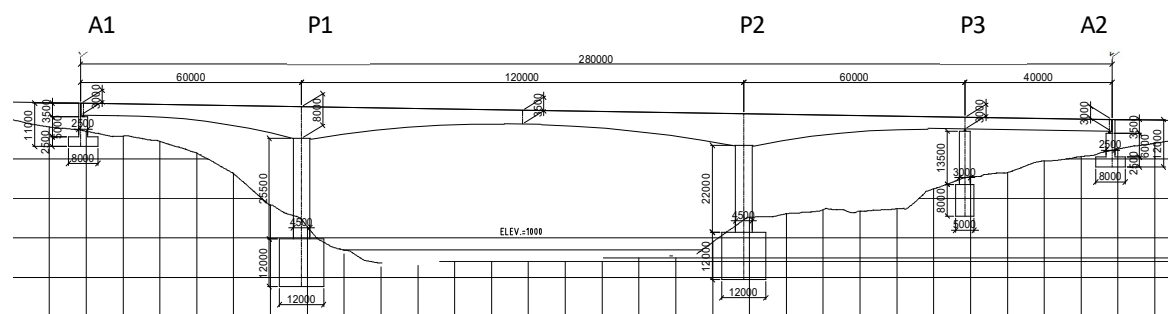
4: Global warming gas (CO<sub>2</sub>) emissions during construction are assumed to occur in proportion to the length of the road bridge.

Source: JICA Survey Team

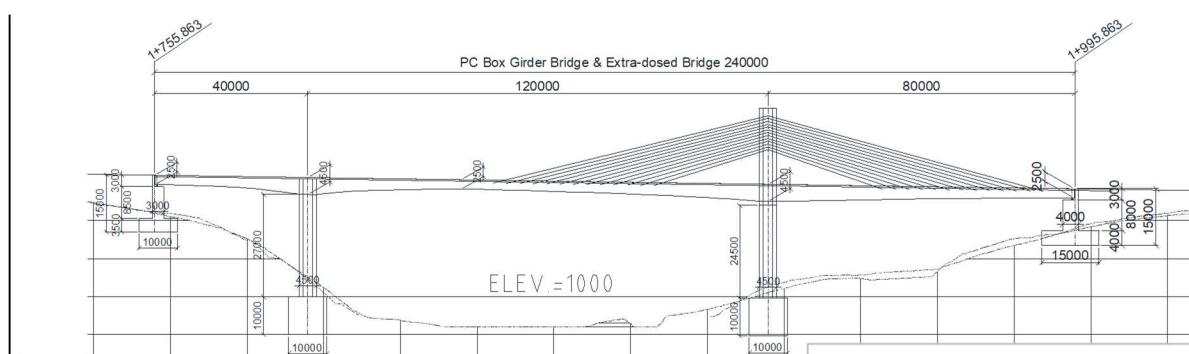
#### (4) Selection of Optimal Bridge Type (within Protected Areas)

As a result of the study on the appropriate bridge type for the road alignment selected above, the “PC 3-span continuous box girder with extra-dosed bridge (40+120+80=240 m)” was assessed as the most suitable bridge type for the following reasons:

- **Span Length:** It is very difficult to construct piers in the river due to the very fast and dangerous flow velocity at the crossing point. Taking into account the possible high water level, the bridge span length required to construct piers outside the river would be 120 m.
- **Challenge 1:** The most economical type of superstructure for a 120 m span is a PC box girder bridge (overhanging), but the side span length should be half of the 120 m center span length (60 m on the A1 side), so the span length must be extended beyond what is required for the topographical conditions.
- **Challenge 2:** Further cost reduction can be achieved by omitting the P3 pier on the right bank side, but in this case the side span length must be increased to about 80 m, which is too long for a PC box girder bridge (overhanging structure) compared to the 120 m central span length.
- To overcome these challenges, the superstructure was optimised by using a PC box girder bridge at the left bank, where a shorter span length is required, and an extra-dosed bridge at the right bank, where a longer span length is required. This reduces the bridge length from 280 m to 240 m.



PC 3-span Continuous Box Girder Bridge Option



PC 3-span Continuous Box Girder with Extra-dosed Bridge Option

Source: JICA Survey Team

**Figure 3.7.16 Optimum Bridge Type (within Protected Areas)**

### 3.7.5. Confirmation of Five Exceptional Conditions for Project Implementation within Protected Areas

#### (1) Condition 1: No Feasible Alternative Plans are Available outside Protected Areas

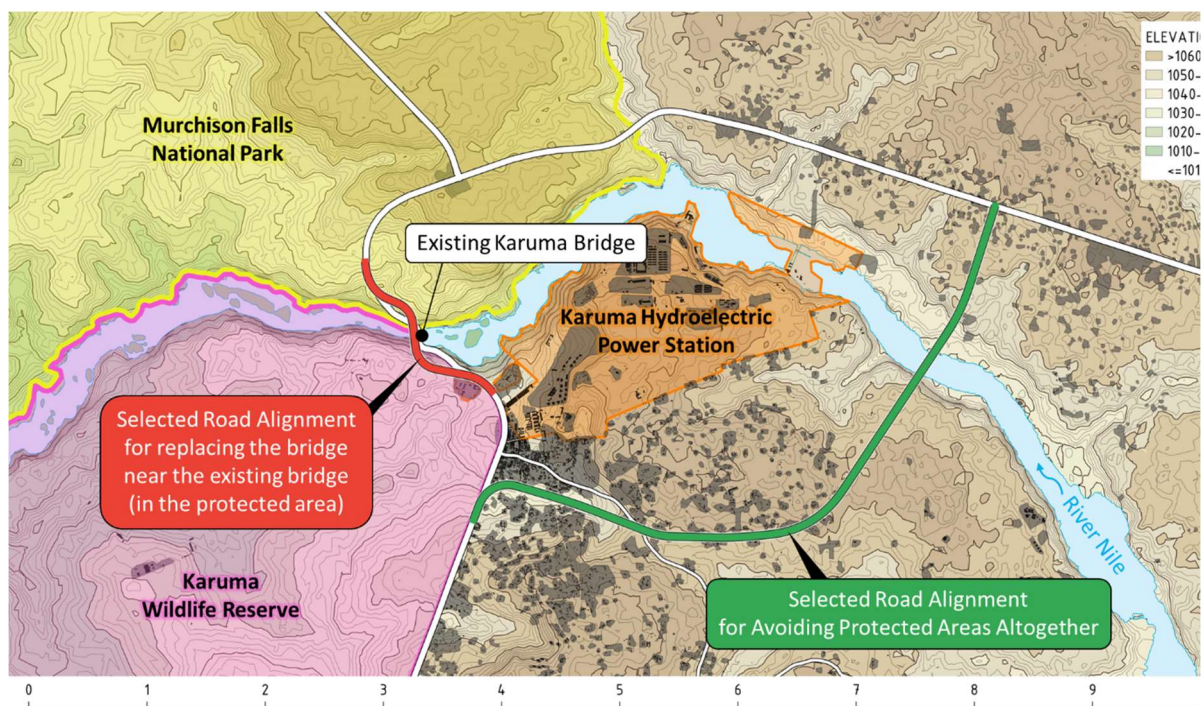
Table 3.7.8 shows the results of the comparative evaluation of i) not implementing the project, ii) avoiding the protected area altogether and iii) replacing the bridge near the existing bridge (in the protected area). For the following reasons, it was concluded that there are no feasible alternatives for project implementation outside the protected area and that replacing the bridge in the vicinity of the existing bridge (in the protected area) is appropriate.

- **Driveability:** If the protected area is completely avoided, a diversion of approximately 7 km from the existing road is required and the convenience of the local residents is reduced, whereas if the bridge is replaced near the existing bridge, no significant change from the current situation is expected, and therefore replacing the bridge near the existing bridge is preferable.
- **Natural Environmental Impacts:** Replacing the bridge near the existing bridge is preferable in terms of the area of alteration and the amount of GHGs generated. The area of alteration within the protected area is unlikely to be a key habitat for keystone species within the protected area and is not considered to be significantly greater than the impact of the current road and bridge operations. It is also considered that impacts can be minimised through the implementation of mitigation measures.
- **Socio Environmental Impacts:** It is preferable to replace the bridge in the vicinity of the existing bridge, considering the impact on private land acquisition, resettlement and the



local economy. In addition, the results of the route preference questionnaire at the local stakeholder meeting showed that more than 90% preferred a route through the protected area, taking into account the damage to the existing bridge and the possibility of early construction.

- **Project Duration:** If the protected area is completely avoided, the project is expected to be delayed due to delays in land acquisition and resettlement, whereas if the bridge is replaced near the existing bridge, no land acquisition or resettlement is required and construction can start earlier. Furthermore, if the protected area is completely avoided, it is expected that the construction of a large bridge such as a cable-stayed bridge will take about seven years, whereas if the bridge is replaced near the existing bridge, the construction period will be 2.7 years for the construction of the bridge. The urgency of replacing the existing Karuma Bridge is very high and the project needs to be implemented quickly, but the option to avoid the protected area altogether will not meet the challenge.
- **Economic Efficiency:** If the protected area is completely avoided, the project cannot be implemented with Japan's Grant Aid due to the scale of the project, and with an EIRR of 2.7%, which does not exceed the social discount rate of 12%, the criterion for determining investment, it would be difficult to implement the project with loans. In contrast, replacing the bridge near the existing bridge is more advantageous, as the project can be implemented with Japan's Grant Aid and the EIRR is 20.6%, which is more than 12% of the social discount rate.



Source: JICA Survey Team

**Figure 3.7.17 Comparison of Bridge Locations Outside and within Protected Areas**

**Table 3.7.8 Comparison of Bridge Locations Outside and within Protected Areas**

		Without Project Case	Route Avoiding Protected Area (Alternative 1 outside protected area)		Route near the existing bridge (Alternative 1 within protected area)	
Project Size (Road with Bridge Length)		-	Total Length: 6,100m Bridge Length: 620m Road Length: 5,480m		Total Length: 1,700m Bridge Length: 240m Road Length: 1,460m	
Driveability		-	The road accessibility for nearby residents will be reduced due to the increased travel distance of approximately 7 km from Karuma Town to Kamdini Sub-County on the opposite bank of the river. There are many issues in terms of traffic flow and operation at the intersection.		△	By constructing a new bridge near the current bridge, the travel distance from Karuma Town to Kamdini Sub-County will be almost the same as the current distance. The accident-prone road alignment of the current road will be improved by the construction of the new bridge, which will improve driving safety and comfort. In terms of traffic operation, there are no issues with the replacement of the new bridge and traffic switching.
Impact of Natural Environment	Cutting tree	-	App. 2ha (Mainly Secondly Forest and Fruits Trees)		△	App. 2.9h (Natural Forest)
	Ecosystem of the Protected Area	-	There will be no alteration within the protected area, but approximately 16 hectares will be altered. In the Nile River, hippopotamuses and Nile crocodiles are also likely to be affected due to the installation of piers in the river. However, in other terrestrial areas, wildlife from the protected area will be controlled with the installation of anti-encroachment trenches at the boundary of the protected area, and it is assumed that there will be little impact on wildlife such as African elephants, hippopotamuses, and African crocodiles.		△	About 2.9 ha of alteration within the protected area will occur. The proposed project will not significantly affect hippopotamuses and Nile crocodiles because no piers will be installed in the Nile River and the bridge location is difficult for hippopotamuses and Nile crocodiles to use due to the narrow width of the river and the high velocity of the current in the river. On the other hand, the terrestrial area is part of the activity zone of hippopotamuses, African elephants, and African water buffalo, and may affect some of the feeding areas of these species.
	Green House Gases (CO2)	Restriction of traffic on the current bridge will increase the travelling distance by approximately 210 km and increase GHGs.	▲	The volume of greenhouse gases such as CO2 increases as the length of the road increases.	△	The road length would be the same as the current status. However, it would allow two-way traffic on bridges and increase the overall average travel speed, resulting in lower GHG emissions than the current status.
Impact of Social Environment	Land Acquisition and resettlement	-	◎	Private Land Acquisition: 30 ha (Agriculture land, residential land) Resettlement: 60 structures *Large scale resettlement is expected	△	Land Acquisition: Non expected. Resettlement: Not expected.
	Loss of livelihood	Loss of livelihood and decrease of income for bender and commercial shops due to restriction of current bridge is expected.	▲	Loss of livelihood and decrease of income due to loss of agricultural land is expected.	△	Loss of livelihood is not expected.
	Community Separation	The traffic restrictions on the current bridge will make it difficult to travel between the south and north banks, resulting in regional separation. Most of the residents of Karuma Town are from the Gulu area and regularly visit the Gulu area where their relatives live.	▲	Since the route passes through the towns of Karuma and Kamdini by road, community separation due to road maintenance is anticipated.	△	Since the new bridge and approach road will be constructed at the same location, community separation is not expected.
	Traffic	Continued occurrence of traffic	▲	The number of traffic accidents is	△	Traffic accidents will be reduced

		Without Project Case	Route Avoiding Protected Area (Alternative 1 outside protected area)	Route near the existing bridge (Alternative 1 within protected area)
	Accident post construction	accidents, including personal injury, with possible negative impacts such as loss of life and cargo.	expected to increase as the main road passes through a residential area.	compared to the current situation by improving the approach road alignment.
Construction Period	Land Acquisition and Resettlement	-	5 years Project delays due to land compensation process are expected.	0 year (Land acquisition nor Resettlement is not necessary) ◎
	Construction	-	7.0 years Bridges over dam lakes require special foundation work and construction of large bridges such as cable-stayed bridges.	2.7 years Materials and equipment can be brought in from the vicinity of the current Karuma Bridge to construct the bridge. Construction of a bridge of general scale. ○
Cost	Construction Cost	-	14.7 billion JPY (Construction Cost: 12.3 billion JPY) 96 million USD (Construction Cost: 80 million USD)	4.5 billion JPY (Construction Cost: 3.8 billion JPY) 29.4 million USD (Construction Cost: 24.8 million USD) ▲ ○
	Maintenance Cost	-	2 billion JPY 13 million USD	0.8 billion JPY 5.2 million USD △ ○
	Economic Analysis (EIRR/2050)	-	EIRR:2.7%(<12%) unprofitable Commencement: 2035~	EIRR:20.6%(>12%) profitable Commencement: 2029~ ◎
Reasons for Evaluation and Selection		Cannot be an option. If the current Karuma Bridge is closed to traffic, it would have a tremendous impact on the flow of people and logistics from Kampala to northern Uganda and South Sudan, and would not solve the road safety problem.	Not feasible for implementation Due to the significant negative impacts on agricultural land acquisition and resettlement, the project implementation will take time and cannot address the urgency of the current Karuma Bridge replacement, and the EIRR that will make the project feasible is not expected.	<b>Selected</b> It will pass through a protected area, will require tree cutting, and will have certain natural environmental impacts. However, the road alignment will pass through the vicinity of the current Karuma Bridge, thus the degree of impact can be expected based on current environmental issue on the current road. On the other hand, in the socio-environmental area, no impacts on land acquisition and resettlement are anticipated. In terms of business and economic feasibility, the route is significantly superior to the route outside the protected area, and the route inside the protected area was evaluated and selected as the superior route overall.

Note: The impact was evaluated on a relative scale of ◎, ○, △, ▲, and X.

Exchange rate: 1USD=153.01JPY (as of May 4, 2024)

Source: JICA Survey Team

As a reference, the assessment of project feasibility and economic viability was carried out based on the following procedure:

#### 1) Framework for economic analysis

The economic analysis was carried out by comparing the following With Case and Without Case

- Without Case (without project implementation): It is expected that the Karuma Bridge will be closed to heavy vehicle traffic from September 2029 (with noticeable damage to the deck slabs) and to all vehicle traffic from 2033 (with increasing damage to the deck slabs and the start of chipping away of slabs, which will close the bridge to traffic).



Therefore, the Without Case assumes that current traffic will divert to the east of the Lake Kyoga.

- With Case (where the project is implemented): In the With Case, the new bridge will be operational before the Karuma Bridge becomes impassable. Two alternative routes are expected for the With Case: i) avoiding the protected area altogether and iii) replacing the bridge near the existing bridge.

Economic analysis evaluates investment projects from a macro perspective, considering the potential increase or decrease in national income. It extends the range of costs and benefits to encompass society as a whole. Accordingly, the project costs used in the economic analysis include the construction and maintenance costs of the new bridge, expressed as a shadow price.

On the other hand, the benefits and effects of the project are also expressed in terms of potential prices. The items measured in the 'With-Without' case comparison are as follows:

- The benefits included follow Table 3.7.9 in the IRR Calculation Manual (Chapter 3: Roads, including bridges), published by JICA's Planning Department in September 2017. Among these benefits, “savings in maintenance and management costs of alternative traffic” are not included, as such costs are not expected in the Without case. Additionally, the “effect of increased safety (reduction of traffic accidents)” is disallowed.

**Table 3.7.9 Items to be Considered as Benefit**

Item		Benefit Item	
		Considered into the analysis	Not Considered into the analysis
Benefit for Users	Time Cost Savings Effectiveness	✓	
	Savings on vehicle running costs	✓	
	Savings in transportation maintenance costs due to alternative transportation	✓	
	Improved safety (decrease accident)	✓	
	Saving generation of GHGs		✓
Benefit for Providers	Increase in fee revenue		✓
Ripple Effect	Community Development Effects		✓

Source: JICA Excerpt from the IRR Calculation Manual (p. 43)

- The existing Karuma Bridge is situated at the intersection of three districts: Nwoya, Kiryandongo, and Oyam. Road accidents at this location are predominantly reported in two districts: Nwoya (on the northern side of the bridge) and Kiryandongo (on the southern side). According to an interview with the Karuma Police Station in Kiryandongo District, the closest station to the bridge, there were seven fatal accidents on Karuma Bridge in 2023. On average, there are about 10 road accidents per year, resulting in 10-20 fatalities. Data from police stations in both Nwoya and Kiryandongo Districts indicate that the total number of fatal accidents in 2023<sup>1</sup> was 14, with 29 fatalities. Although the opportunity cost of human capital—the income that would have been earned by those killed in road accidents—can be considered as an “effect of improved safety” for calculating the Economic Internal Rate of Return (EIRR), this practice is controversial. The 2017 JICA Manual for Calculating EIRR advises caution in quantifying the value of human life. Consequently, road accidents are treated as a qualitative assessment and not included as a benefit in the economic analysis.

<sup>1</sup> During the interviews, accident data of the most recent year was answered, as it takes times to collect the information.

Therefore, the benefits used in this study are defined as follows:

- **Travel Time Cost Savings:** This benefit is an estimate of the consumer surplus resulting from time savings. In this project, calculations are based on the time value of a car and do not distinguish between the consumer surplus of individuals and the operating surplus of operators, such as transport companies. It is therefore interpreted as the combined incremental employer income and operating surplus.
- **Savings in Vehicle Operating Costs (VOC):** This is based on quantifying the cost savings resulting from reduced mileage and journey time, which increase the operating surplus.
- **Greenhouse Gas (GHG) Reductions:** In a with-without case comparison, CO<sub>2</sub> emission reductions are quantified using EU-ETS (Emissions Trading Scheme) prices<sup>2</sup>.

The social discount rate<sup>3</sup> was set at 12%, referencing Uganda's 10-year government bond yield. It should be noted that while a 4% rate is generally adopted in Japan, international projects under the World Bank (WB) and Asian Development Bank (ADB) typically use rates between 10% and 12%.

## 2) Results of Economic Analysis

The EIRR for the route that replaces the bridge near the existing bridge is 20.6%, which is economically feasible since the reference discount rate is 12%. In contrast, the EIRR for the route that avoids the protected areas altogether is only 2.7%, making it less viable from a macroeconomic standpoint. From an investment efficiency perspective, resources should be directed towards more economically viable alternatives.

A sensitivity analysis was conducted, assuming fluctuations in costs and benefits of  $\pm 10\%$ . The results, displayed in Table 3.7.10 below, further confirm that the route avoiding protected areas is economically infeasible in all considered cases and is not recommended from an economic viewpoint.

**Table 3.7.10 Result of Sensitive Analysis**

		Replaces Bridge near Existing Bridge			Route Avoiding Protected Areas		
		Cost			Cost		
		-10%	Base Case	+10%	-10%	Base Case	+10%
Benefit	+10%	24.6%	22.5%	20.6%	4.9%	3.7%	2.7%
	Base Case	22.7%	20.6%	18.9%	3.8%	2.7%	1.6%
	-10%	20.6%	18.7%	17.1%	2.7%	1.5%	0.5%

Source: JICA Survey Team

<sup>2</sup> Refer to EUA Emission Spot Primary Market Auction Report (<https://www.eex.com/en/market-data/environmental-markets/eua-primary-auction-spot-download>) issued from European Energy Exchange AG

<sup>3</sup> It is a correction for value over time and is the ratio of present to future exchanges of the same good; the IRR is compared with the discount rate to assess the appropriateness of the project's implementation; if the IRR is higher than the discount rate, the project is considered to be worth investing in.

- 
- (2) Condition 2: Development in Protected Areas is Legally Acceptable under Uganda's National Law:

Uganda's legislation (e.g. Wildlife Act) and the guidelines for the implementation of development in protected areas and other areas based on it allow the construction of roads and bridges in protected areas, provided that an appropriate environmental assessment is carried out and approved. The ESIA prepared by UNRA in 2014 for the construction of the new Karuma Bridge (the route passing approximately 400 m downstream of the existing Karuma Bridge) was approved by NEMA in 2016, confirming that the project is permitted under Ugandan national law.

In addition, Uganda's national laws relevant to the case include the following:

- Wildlife Act 2019: It states that “economic activities are permitted in national parks and wildlife reserves provided an environmental impact assessment is carried out” (items 26, 5e and 6f). There is no definition of “economic activities” in the Decree, but according to the UWA it is interpreted as “including the construction of hotels and road infrastructure necessary for tourism”.
- Murchison Falls National Park (Karuma Wildlife Reserve, Bugungu Wildlife Reserve) ((Murchison Falls Protected Area)) General Management Plan (2013 -2023: plan still valid in 2024) July 2014/UWA: Management plan under Wildlife Act 2019, Section 17(3b) “The Executive Director of UWA shall be responsible for the development and implementation of management plans for conservation areas or for species and classes of species of wildlife populations”. The area around the existing Karuma Bridge is classified as a Tourism Zone, which is described as “The Zone represents areas in Murchison of spectacular scenery and wild game for visitor enjoyment”, and where roads and other facilities necessary for sport fishing and tourism are provided. (4.1 The Tourism Zone)
- Operational Guidelines for Developments in Wildlife Protected Areas/UWA: Operational Guideline under Wildlife Act 2019, Section 17(3b) “The Executive Director of UWA shall be responsible for the development and implementation of management plans for conservation areas or for species and classes of species of wildlife populations”. It states that “i. Main roads, access roads, pipelines, electricity transmission lines, and any other infrastructure shall be limited to only those that are approved. As much as possible, pipelines and electricity transmission shall be subsurface. In case of unforeseen access roads, the developer shall undertake Environmental and Social Impact Assessments in accordance with the National Environment Act 2019 and Wildlife Act 2019.” and “ii. Routing of approved access roads, power lines, shall be approved by UWA so as to avoid ecologically sensitive ecosystems and impacts on tourism activities”. (Described in 3. The Guidelines / 3.3 Infrastructure / 3.3.1 Construction and Operation of Roads and Pipelines”).

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(3) Condition 3: Compliance with Legal and Regulatory Framework

Project proponents must comply with the laws and ordinances concerning the Protected Area and adhere to the management plan of the protected zones. Recognizing the need to conform to the zoning plan and operational guidelines of the Protected Area Management Plan, UNRA, with assistance from the JICA Survey Team, conducted an environmental assessment in accordance with applicable laws, regulations, and guidelines.

- National Environmental Act 2019
- National Environment Regulation 2020
- Wildlife Act 2019
- Murchison Falls National Park General Management Plan (2013-2023) 2014
- Operational Guidelines for Developments in Wildlife Protected Areas 2020
- JICA Guidelines for Environmental and Social Considerations 2010

(4) Condition 4: Stakeholder Consultation and Agreement

The project implementing agency (UNRA) has consulted with the agency responsible for the management of the protected area (UWA), the local community in the vicinity, and other relevant stakeholders. An agreement has been reached on the project's implementation. Historically, UNRA conducted a legally compliant environmental assessment in 2015 and achieved consensus with local communities and other stakeholders. Additionally, during the ESIA update, two local stakeholder meetings were held, reaching a basic agreement on the project's implementation. A questionnaire regarding the preferred alternative route showed that more than 90% of respondents favored the project under the route that replaces the bridge near the existing location.

The management body for the protected area is the Uganda Wildlife Authority (UWA), and the National Environment Management Authority (NEMA) is the approving body for the environmental assessment. NEMA will review the contents of the Environmental and Social Impact Statement (ESIS) prepared in this study, hold discussions with the project operator, and grant its approval.

(5) Implementation of Additional Programs to Ensure Effective Management

To ensure the protected area is managed effectively in accordance with its conservation objectives, additional programs will be implemented by the project implementing agencies and others as required. UNRA will implement mitigation measures as requested by the Protected Area Management Authority (UWA) and the Approving Authority (NEMA) during the environmental assessment process.

The Environmental Management Plan (EMP) contained in the Environmental and Social Impact Statement (ESIS) prepared under this study includes these mitigation measures and monitoring plans. Furthermore, UNRA and UWA plan to collaborate on environmental monitoring, including studies, forecasts, and assessments related to the environmental assessment to enhance the nature reserve. Additional mitigation measures and monitoring may also be considered based on the monitoring results.

## CHAPTER 4 FEATURES OF THE SURROUNDING ENVIRONMENT

### [Summary of the Chapter 4]

This chapter presents the characteristics of the project area based on the latest statistical data, secondary data, ESIA of the Karuma Hydropower Station project conducted in the vicinity of the project area, and previous ESIA of the Karuma Bridge, and other data on pollution items such as air quality, water quality and noise, natural environment items such as flora and fauna, and social environment items such as population and economic information.

#### 4.1. Natural Environment

##### 4.1.1. Land Use

As shown in following figure, the project site to the west part of the existing Karuma Bridge is covered by the natural tropical forest in the Murchison Falls National Park and the Karuma Wildlife Reserve, and the vegetation can be roughly divided into two types such as savanna grassland with riparian forests and trees along the Nile River.

In addition, on the west side of the main road (Gulu-Kampala), a paved maintenance road is constructed above the TRT (Tailrace Tunnel), which is part of the Karuma Hydropower plant facility. On the other hand, the east side of the existing Karuma Bridge is developed by the Karuma Hydropower plant project and the residential area of Karuma village, and the south and east sides are agricultural areas basically.

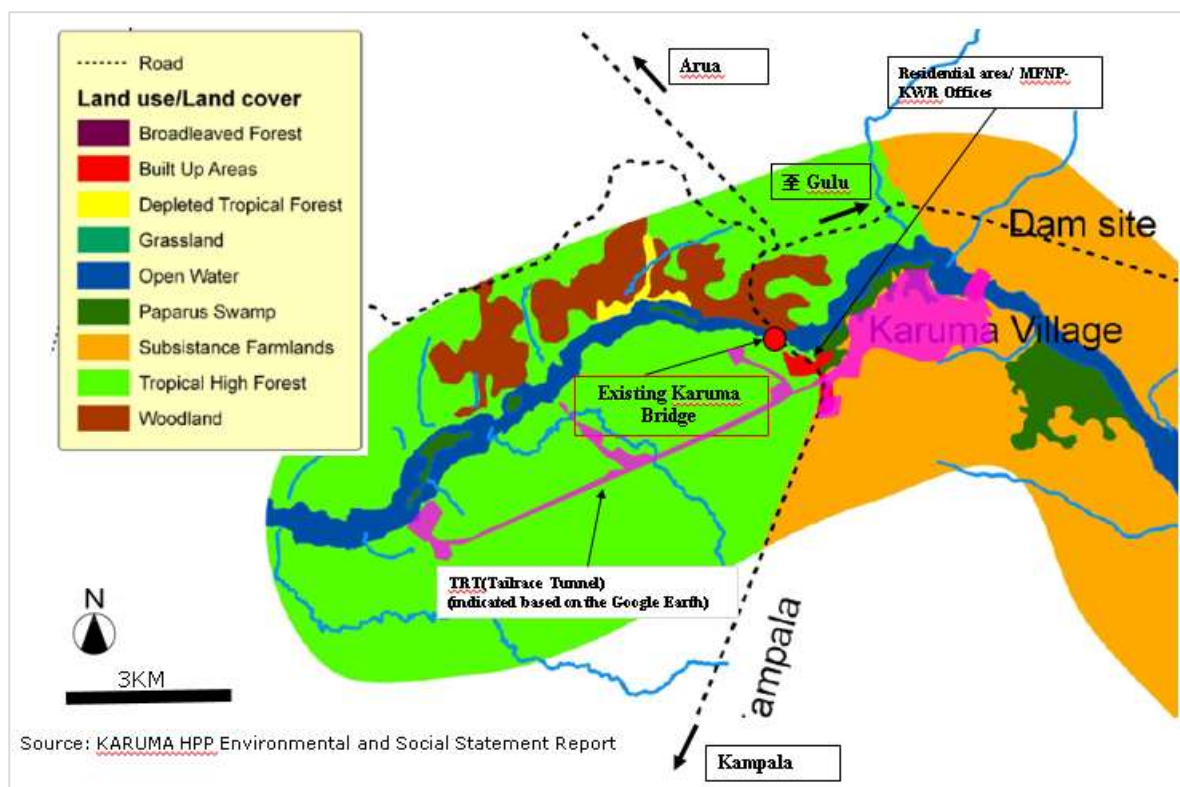
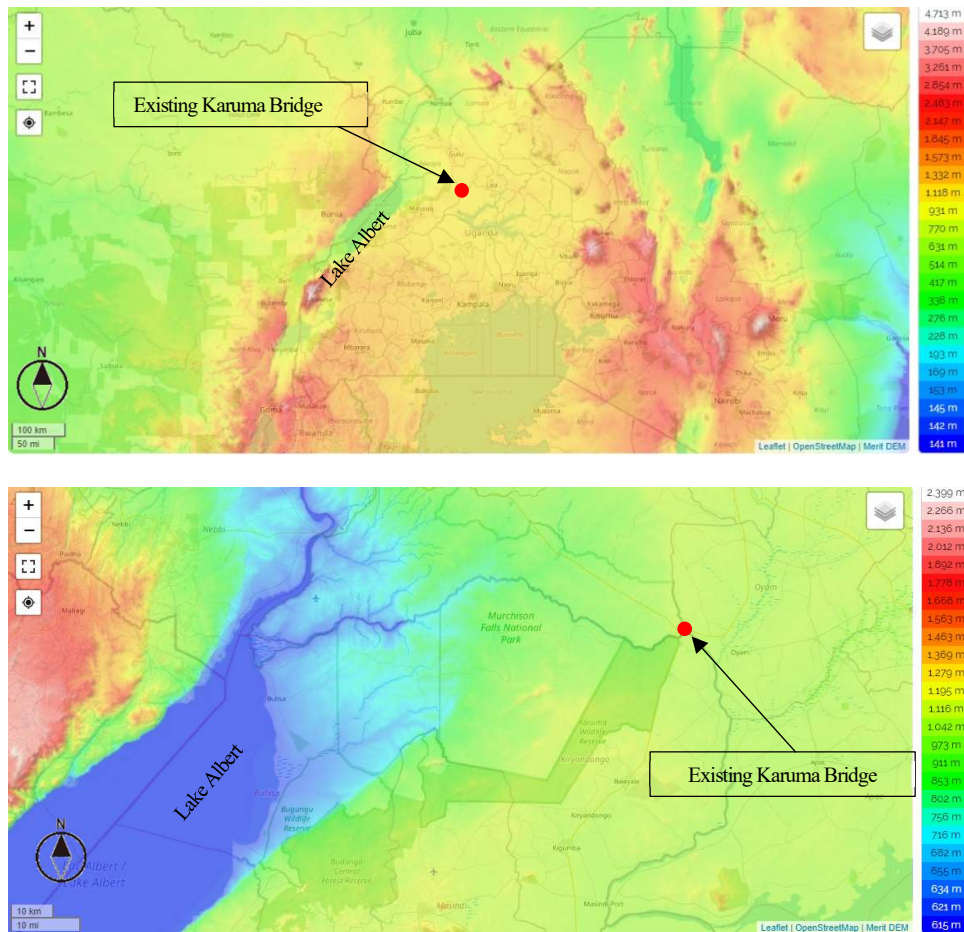


Figure 4.1.1 Land Use of the Project Site

#### 4.1.2. Topography and Geology

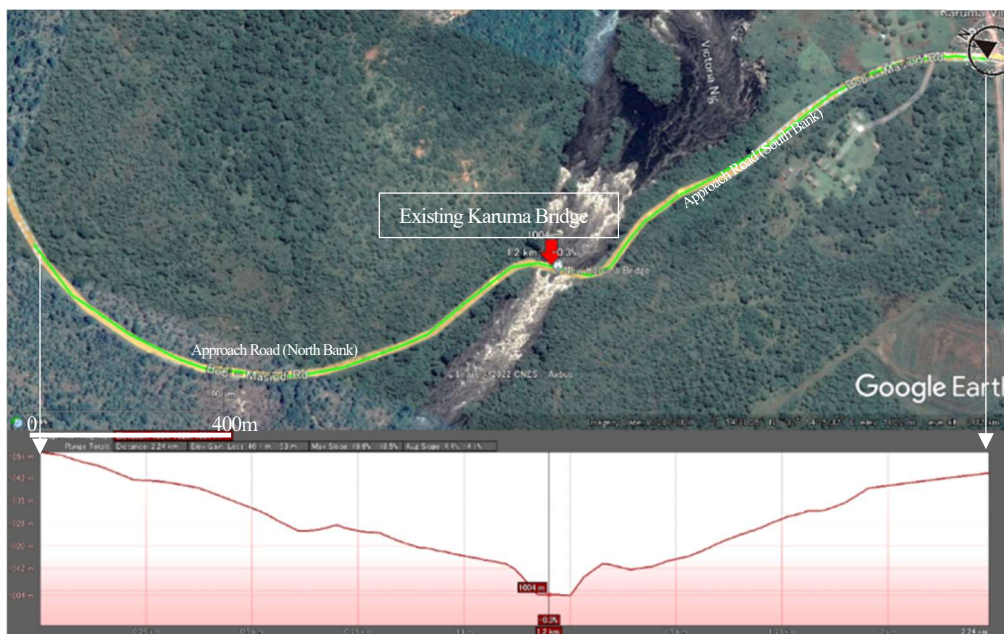
##### (1) Topography

The project area is located in northern Uganda at around 1,000m elevation. Lake Albert lies in the lower reaches of the Nile River, which flows to the west of the project area, and lowlands with approximately 600m to 700m spread out. The cross section of the current bridge route indicates the elevation 1,050m to 1,010m for the approach road, and the bridge section is approximately 1,000m as shown following elevation maps.



Source : <https://en-gb.topographic-map.com/maps/zrw/Uganda/>

**Figure 4.1.2 Elevation of the Project Area**



Source: JICA Survey Team based on the Google Earth

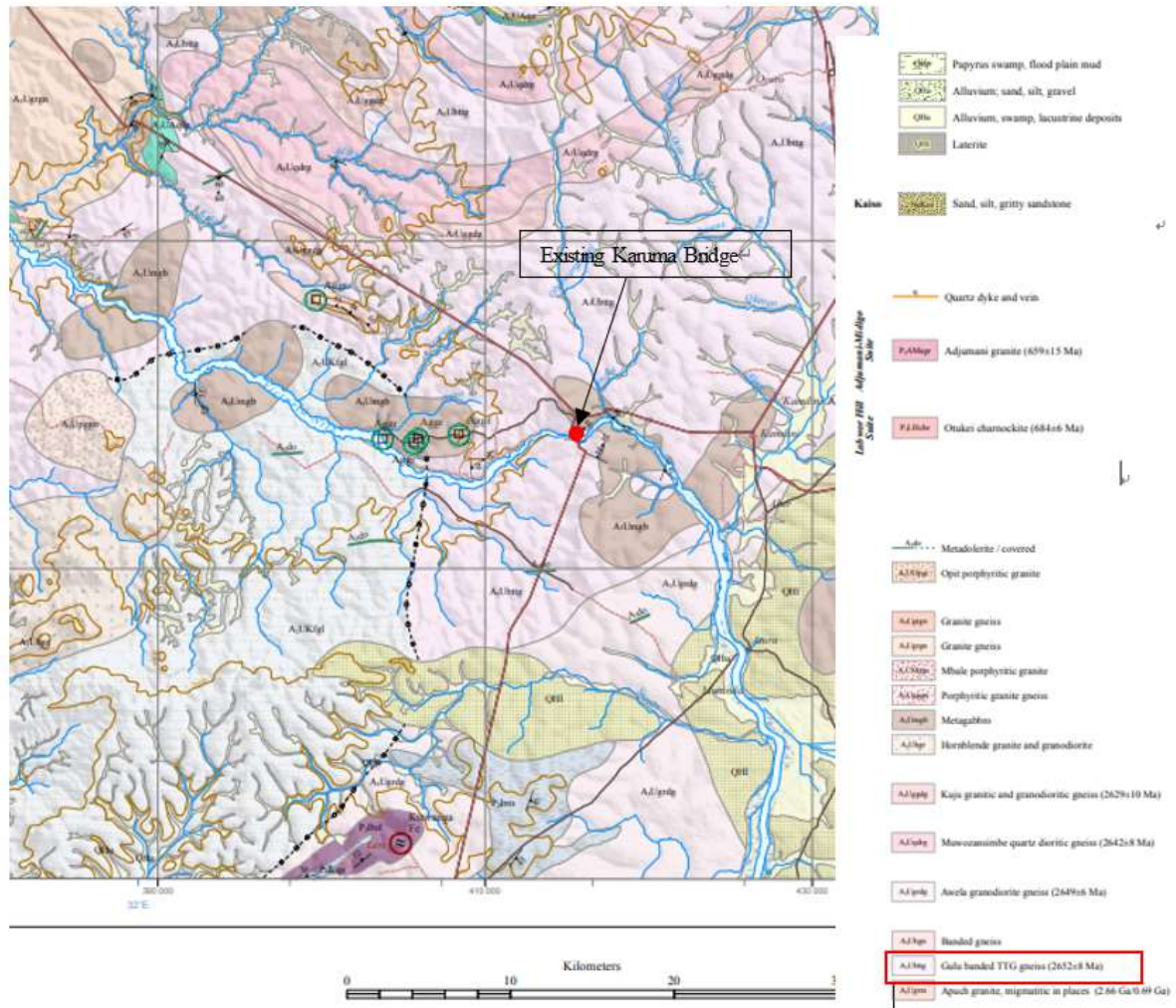
**Figure 4.1.3 Topography Feature of the Project Area**

## (2) Geology

The African continent is a stable land not affected by crustal movement, and flat landforms (shield) called semi-plains are widely distributed due to weathering and erosion of Precambrian metamorphic rocks over many years. In Uganda, too, flat terrain of about 1,100 m above sea level is widespread, except near the western border, which is bordered by the Great Rift Valley of Africa, and near the Kenyan border to the east, where Mount Elgon and other mountains are located.

The project area is also shield-shaped, and Gulu banded TTG Gneiss ( $2,652 \pm 8$  Ma) of late Eocene age is distributed.





Source: Sustainable Management Of Mineral Resources Project: Geological Mapping, Geochemical Surveys And Mineral Resources Assessment In Selected Areas Of Uganda / Contract No.: Memd/Smmrp/Services/2006/00004 Ndf

**Figure 4.1.4 Geological Character in the Project Area**

Gneiss is formed in the deep continental crust under high-temperature, medium-pressure formation and often shows a slight schist-like structure due to the sequence of minerals, but it is not as thin and easily broken as crystalline schist and is used as a stone material like granite. The weathered areas along the riverbanks are thin due to erosion, and relatively fresh bedrock is thought to appear from shallow areas. The photo on the right shows the exposed rock at the southern part of the existing Karuma Bridge, where hard bedrock is outcropping. The geological survey conducted during the construction of the Karuma Dam, along the river in the area where the same bedrock is distributed also showed that the base rock with sufficient bearing capacity is distributed after passing through the topsoil and weathered bedrock in about 2m.



Source: JICA Survey Team

**Figure 4.1.5 Geological Condition around Existing Karuma Bridge**

#### 4.1.3. Climate

Uganda is located on the East African plateau and has a land area of 241,000 km<sup>2</sup>, however inland waters such as Lake Victoria and Lake Choga account for approximately 44,000 km<sup>2</sup> (18% of the total), and the land area is approximately 197,000 km<sup>2</sup>. The average elevation of the country is 1,100m, and it slopes gently go down from the southern region to the Sudan Plain in the northern region along the Nile River.

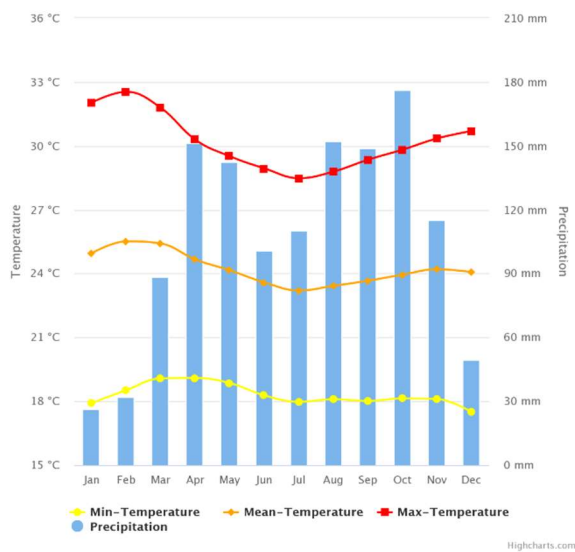
The climate type belongs to the tropical savanna climate according to the Köppen climate classification. According to the World Bank database, the average temperature in Kiryandongo and Nwoya provinces from 1991 to 2020 was about 24 °C, and the average annual rainfall was approximately 1,300mm, especially from April to May and August to October is strong rainy season. In general, the East Africa region is divided into major and minor rainy seasons and dry seasons. In the project area, these are classified as follows: major dry season from December to March, minor rainy season from April to May, minor dry season from June to July, and major rainy season from August to November.

**Table 4.1.1 Month for Rainy and Dry Season**

Period	Classification of Season
December - March	Major Dry Season
April - May	Minor Rainy Season
June - July	Minor Dry Season
August - November	Major Rainy Season

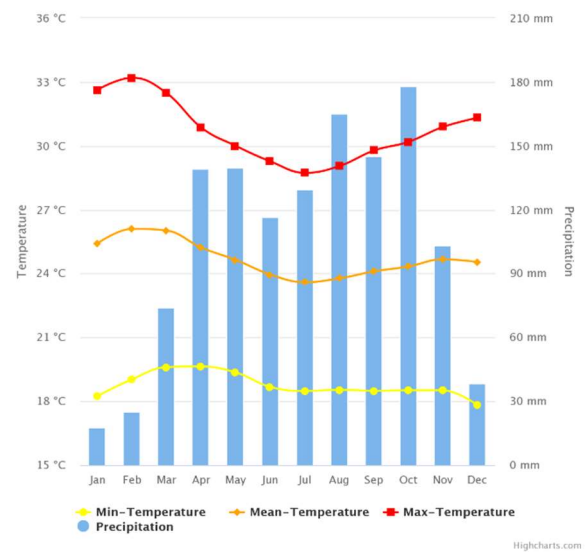
Source: JICA Survey Team based on World Bank Group, Climate Change Knowledge Portal

Monthly Climatology of Min-Temperature, Mean-Temperature, Max-Temperature & Precipitation 1991–2020  
Kiryandongo, Uganda



Kiryandongo District

Monthly Climatology of Min-Temperature, Mean-Temperature, Max-Temperature & Precipitation 1991–2020  
Nwoya, Uganda



Nwoya District

Source: World Bank Group, Climate Change Knowledge Portal

**Figure 4.1.6 Climate Conditions in the Project Site**

#### 4.1.4. Air Quality

Emission standard values for air quality and standard values for general ambient air quality in Uganda are prescribed in the National Environment (Air Quality Standards) Regulations, 2024.

The past air quality measurement results near the project site are shown in Table 4.1.2. The measurement points were the current Karuma Bridge and the planned new Karuma Bridge area. (approximately 400m downstream of the current bridge location). Most of the results were lower than the Uganda standard, the IFC standard, and the Japanese standard. However, the value of PM (particulate matter) is exceeded the standard value of Uganda and Japan due to the dust impacts, because there are many natural grounds in the surrounding area, and depending on the direction and speed of the wind.

**Table 4.1.2 Air Quality at the Nearest Point in the Project Area (Current Karuma Bridge)**

Location \ Item	Measured Data (Standards : <sup>1</sup> Uganda Standard, <sup>2</sup> IFC Standard, <sup>3</sup> Japanese Standard, )				
	PM10 1(60µg/m <sup>3</sup> ; 24hrs.)	PM2.5 1(35µg/m <sup>3</sup> ; 24hrs)	CO 1(6 ppm; 24hrs)	NO2 1(0.026ppm; 24hrs)	SO2 1( 0.008 ppm; 24hrs)
Current Karuma Bridge	150	Not measured	2	NOx B.D.	SOx B.D.
New Karuma Bridge Point (Downstream 400m from current Karuma Bridge)	130	Not measured	1	NOx B.D.	SOx B.D.

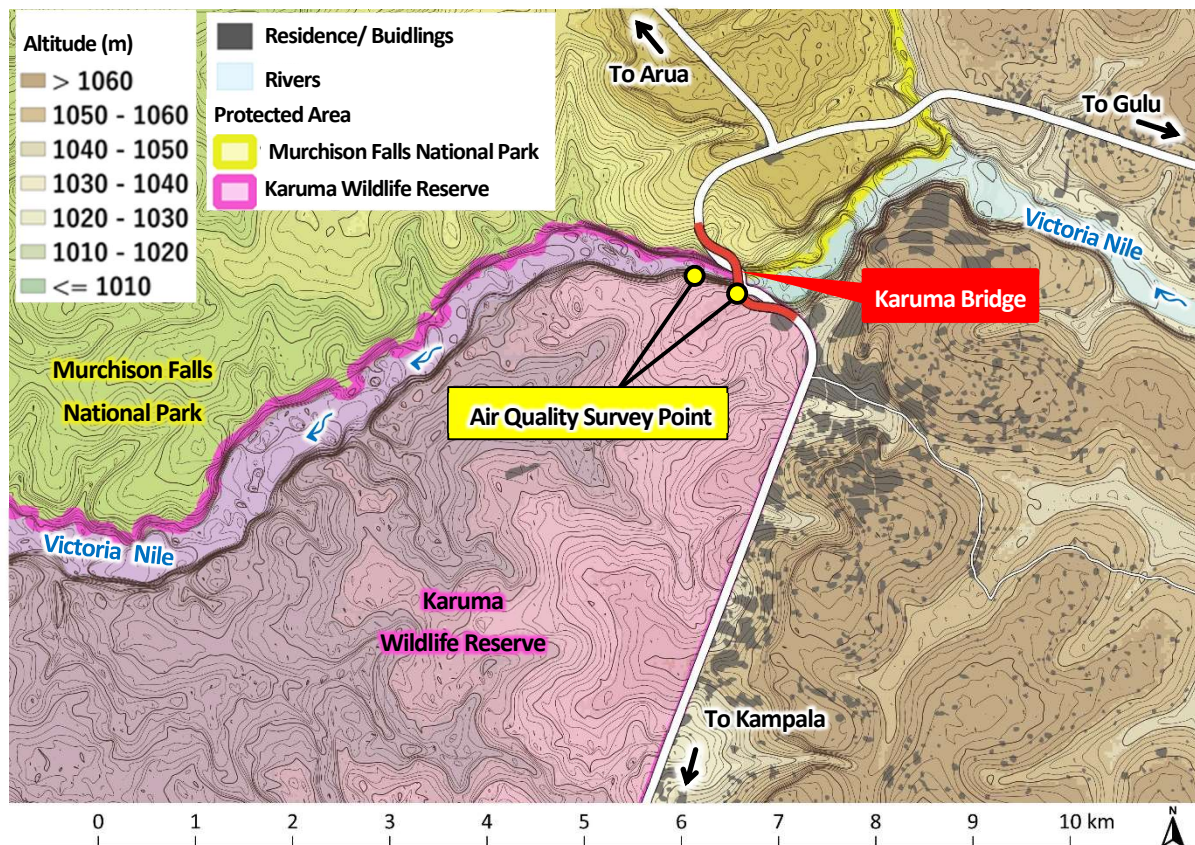
Note) B.D.: Below detection limit

Source: measured in September 2013, Environmental and Social Impact Assessment Report for New Karuma Bridge/ UNRA (Feb.2015)



**Table 4.1.3 National and International Standards on Ambient Air Quality**

Standard \ Item	PM10	PM2.5	CO	NO2	SO2
The National Environment (Air Quality Standards) Regulations, 2024	60 $\mu\text{g}/\text{m}^3$ (24hrs)	35 $\mu\text{g}/\text{m}^3$ (24hrs)	7mg/m <sup>3</sup> (24hrs) (converted value 6ppm)	50 $\mu\text{g}/\text{m}^3$ (24hrs) (converted value 0.026 ppm)	20 $\mu\text{g}/\text{m}^3$ (24hrs) (converted value 0.008 ppm)
IFC (International Finance Corporation)	150 $\mu\text{g}/\text{m}^3$ (24hrs)	75 $\mu\text{g}/\text{m}^3$ (24hrs)	Not Specified	200 $\mu\text{g}/\text{m}^3$ (1hr) (converted value 0.1 ppm)	125 $\mu\text{g}/\text{m}^3$ (24hrs) (converted value 0.05 ppm)
Japanese Standard	SPM 0.10 mg/m <sup>3</sup> (24hrs) (converted value 100 $\mu\text{g}/\text{m}^3$ )	-	10ppm (24hrs)	0.04-0.06ppm (24hrs)	0.04ppm (24hrs)



Source: JICA Survey Team

**Figure 4.1.7 Measurement Points on the Ambient Air Quality**

#### 4.1.5. Water Quality

In Uganda, the National Environment (Standards for Discharge of Effluent into Water or Land) Regulations (2020) establishes the standards for effluent from factories and standard for drinking water in 2014. However, the water surface quality such as rivers and lakes have not established yet. In general, NEMA is refers and uses the standard of not-purified drinking water as standard for surface water quality.

Past water quality measurement points near the project site and their results are shown in Table 4.1.4 and Figure 4.1.8.

The water quality measurement in the ESIA of Karuma Hydropower plant project has been carried out at 12 sites in 2010.

The survey results show high values of Escherichia-Coliform on the left bank of the S5 point,

however since it is inside of the Murchison Falls National Park and there is no human activity, therefore it is assumed that the excrement of mammals may give impacts. Furthermore, the measured value of Dissolved Oxygen (DO) at S1 and S2 at the upstream of Karuma Dam were not exceeding the standard value. A possible reason is that the concentration of oxygen in the water at the measurement point was low due to inflow of domestic wastewater, livestock excrement and chemical fertilisers and overgrowth of floating plants such as water hyacinth (Scientific Name: *Eichhornia crassipes*).

**Table 4.1.4 Water Quality at the Nearest Point in the Project Area (Secondly Data)**

Parameter	Unit	LS1	RS1	LS2	RS2	LS3	RS3	LS4	RS4	LS5	RS5	LS6	RS6	Uganda Standard (Untreated Potable Water)	Japanese Standard (river water)
1 Elevation	m	1,039				1,037				1,003					
2 DO	mg/l	1.4	1.8	2.0	1.6	4.2	4.7	5.1	5.1	7.8	7.2	7.3	7.2	NS	≥2
3 pH	-	7.0	7.3	7.1	7.1	7.4	7.5	7.2	7.2	7.5	7.5	7.7	7.8	5.5-9.5	6.5-8.5
4 Temperature	°C	27.2	27.4	28.4	28.2	28.7	29.0	27.6	27.5	27.8	27.4	28.4	28.6	NS	NS
5 Electrical Conductivity	µS/cm	112.0	106.0	109.0	107.0	109.0	107.0	109.0	107.0	110.0	118.0	109.0	107.0	2,500	NS
6 BOD	mg/l	6.0	14.0	9.0	6.0	7.0	3.0	4.0	8.0	3.0	5.0	4.0	4.0	NS	≤8
7 Oil and Grease	mg/l	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	NS	NS
8 E-coli form	CFU/100ml	0.0	0.0	2.0	0.0	8.0	0.0	12.0	18.0	3,000.0	16.0	11.0	72.0	NS	NS

Note) **xx** : exceeding standard value of Uganda or Japanese

NS = Not specified LS1: Masindi / Apac Port, LS2: Mutunda / Atura, LS3: Awoo / Nora, Upstream of Weir, LS4: Awoo / Nora Downstream of Weir, LS5: Kampala Beach, LS6: Chobe Lodge

Uganda Standard : Standard for general chemicals and microbiological discharge / The National Environment (Standards For Discharge Of Effluent Into Water Or Land) Regulations, 2020

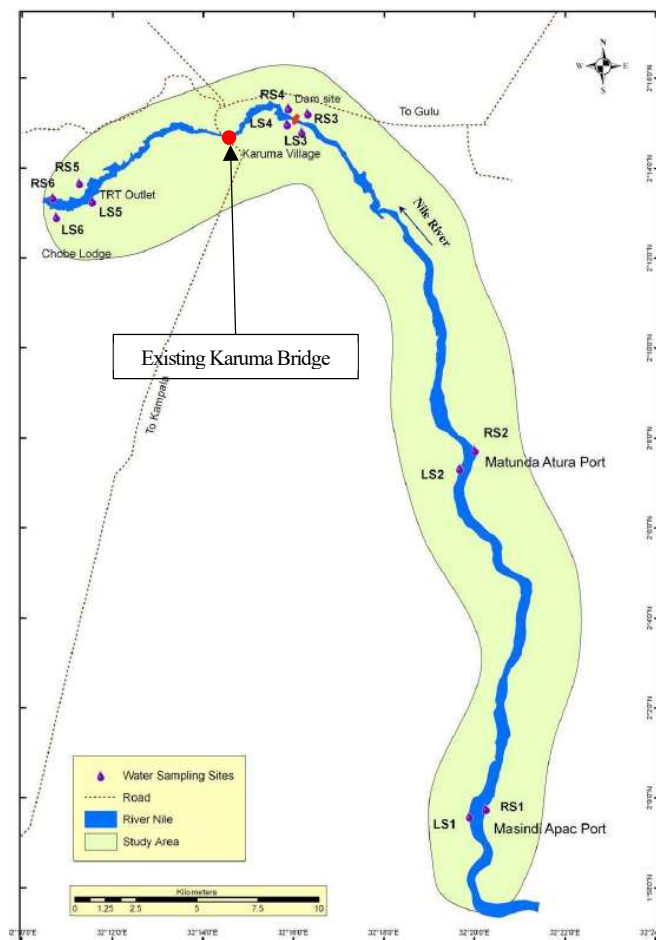
Japanese Standard : River Category D / Ministry of Environment, Japan

Source: Karuma Hydropower Plant ESIA (measured in 2010)

**Table 4.1.5 Standard Value on Water Quality**

Standard	Item	pH	Turbidity	Total Dissolved Solids: TDS	Suspende d Solids: SS	Biological Oxygen Demand: BOD	Conductivity	Dissolved Oxygen: DO	E-Coliform
Draft Portable waters standards as per the Uganda draft standard for portable water 2014 (Untreated / Natural Potable Water Limits)		5.5-9.5	25 (NTU)	1,500 (mg/l)	Not Detected (mg/l)	NS	2,500 (µS/cm)	NS	NS
Japanese Standard for Surface Water in the river (Classification: River Category D)		6.5-8.5	NS	NS	100 (mg/l)	8 (mg/l)		⇒ 2 (mg/l)	NS (MPN/100ml)

Note) NS = Not specified,



Source: Environmental and Social Impact Assessment Report for Karuma HPP (2011)

**Figure 4.1.8 Measurement Points on the Ambient Air Quality (Secondly Data)**

#### 4.1.6. Noise

In Uganda, the National Environment (Noise Standards and Control) Regulations (2003) stipulate standards for “ambient noise”, “construction noise”, and “noise at workplaces” respectively. The past noise measurement points near the project site and results are shown in Figure 4.1.9 and Table 4.1.6

The measurement on noise level in the ESIAS of Karuma Hydropower plant project has been carried out at 18 locations including the point of current Karuma Bridge in 2010.

Comparing the measurement results with the ambient noise standards (Zone-C: mixed residential and commercial areas), 6 out of 18 points exceeded the standards even before construction activities. It is assumed that there was a residential/commercial area that could be the sound source around survey points.

Measurements were conducted at the existing Karuma Bridge. It is expected that there are not any human activities in the surrounding area, and the main sound sources are road traffic noise and the sound of river water flow. The measured point does not have standard value because any human activities are not observed there. Thus, the measured noise level is not compared with standard value in Uganda, but the noise level is the standards for roadside roads in Japan were satisfied.

**Table 4.1.6 Noise Level at the Nearest Point in the Project Area (Secondly Data)**

No	Location	Measured Noise Level dB(A)		Standard Value (dB(A))					
		Day Time 0600-2200	Night Time 2200-0600	Uganda				Japanese (along trunk road)	
				General Environment (C: Mixed Residential with some commercial and entertainment)		Construction Site (Commercial)		Along trunk road	
				Day Time 0600-2200	Night Time 2200-0600	Day Time 0600-2200	Night Time 2200-0600	Day Time 0600-2200	Night Time 2200-0600
1	Main Dam and Power Intake area	68.2	56.4	55	45	75	50	NA	NA
2	Project Area-1	33.8	28.2	55	45	75	50	NA	NA
3	Project Area-2	36.4	30.6	55	45	75	50	NA	NA
4	Project Area-3	44.7	34.9	55	45	75	50	NA	NA
5	Equipment Yard	40.2	32.8	55	45	75	50	NA	NA
6	Work shop area	45.4	37.2	55	45	75	50	NA	NA
7	Steel Yard	38.5	29.9	55	45	75	50	NA	NA
8	Fuel & Consumables area	33.1	25.6	55	45	75	50	NA	NA
9	Fabrication yard	53.4	47.4	55	45	75	50	NA	NA
10	Labour Camp	35.6	27.5	55	45	75	50	NA	NA
11	Office Colony	67.6	58.4	55	45	75	50	NA	NA
12	Permanent camp	67.4	58.8	55	45	75	50	NA	NA
13	Explosive Magazine area	67.7	54.4	55	45	75	50	NA	NA
14	Muck Disposal Area	34.4	26.7	55	45	75	50	NA	NA
15	Construction Facilities area	36.7	28.4	55	45	75	50	NA	NA
16	Karuma village/center	65.8	54.6	55	45	75	50	NA	NA
17	Bedmot	42.9	33.7	55	45	75	50	NA	NA
18	Karuma Bridge	62.9	54.5	NA	NA	75	50	70	65

NA: Not Applicable

Note) xx : exceeding standard value of Uganda (General Environment Noise : C)

Source: Karuma Hydropower Plant ESIA (measured in 2010)

**Table 4.1.7 Standard Value by Land-Use on Ambient Noise Level in Uganda**

Zone	Standard	Uganda (dB(A) Leq)		IFC (dB(A) Leq)		Japan (dB(A) Leq)	
		Day Time (0600-2200)	Night Time (2200-0600)	Day Time (0700-2200)	Night Time (2200-0700)	Day Time (0700-2200)	Night Time (2200-0700)
A. Any building used as hospital, convalescence home, home for the aged, sanatorium and institutes of higher learning, conference rooms, public library, environmental or recreational sites.		45	35	55	45	50	40
B. Residential buildings		50	35	55	45	55	45
C. Mixed residential (with some commercial and entertainment)		55	45	-	-	60	50
D. Residential + industry or small-scale production + commercial		60	50	-	-	60	50
E. Industrial		70	60	70	70	-	-

Note) NS = Not specified

Source:

Uganda: The National Environment (Noise Standards And Control) Regulations, 2003/ Under sections 28 and 107 of the National Environment Act Cap 153

IFC: International Finance Corporation / Environmental, Health, and Safety (EHS) Guidelines/General EHS Guidelines: Environmental/Noise Management

Japan: Noise Standards / Ministry of Environment, Japan

**Table 4.1.8 Standard Value by Land-Use on Construction Noise Level in Uganda**

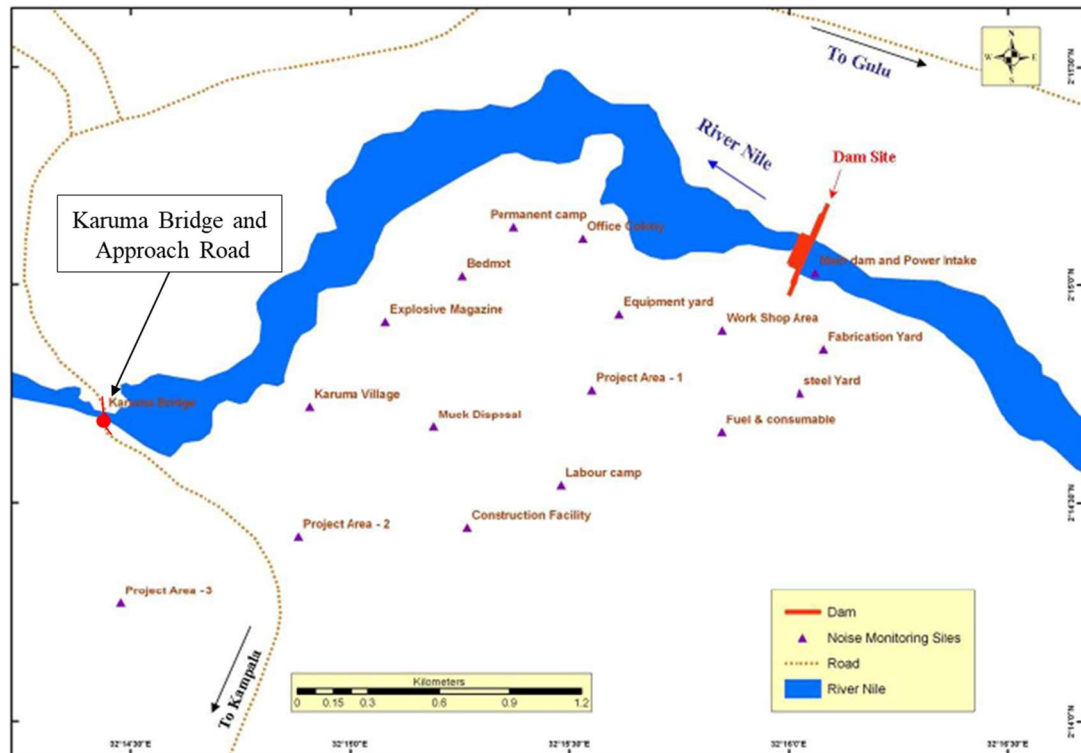
Zone	Standard	Uganda (dB(A) Leq)		Japan dB(A) Upper level of 98% range
		Day Time (0600-2200)	Night Time (2200-0600)	Day Time (0700-1900)
Residential		60	40	85
Commercial		75	50	85
Industrial		85	65	85

Source: Uganda :The National Environment (Noise Standards And Control) Regulations, 2003/

Under sections 28 and 107 of the National Environment Act Cap 153

Japan: Construction Noise Standards / Ministry of Environment, Japan





Source: Environmental and Social Impact Assessment Report for Karuma HPP (2011)

**Figure 4.1.9 Measurement Points on Noise Level (Secondly Data)**

#### 4.1.7. Ecosystem and Natural Protected Areas

##### (1) Natural Protected Areas

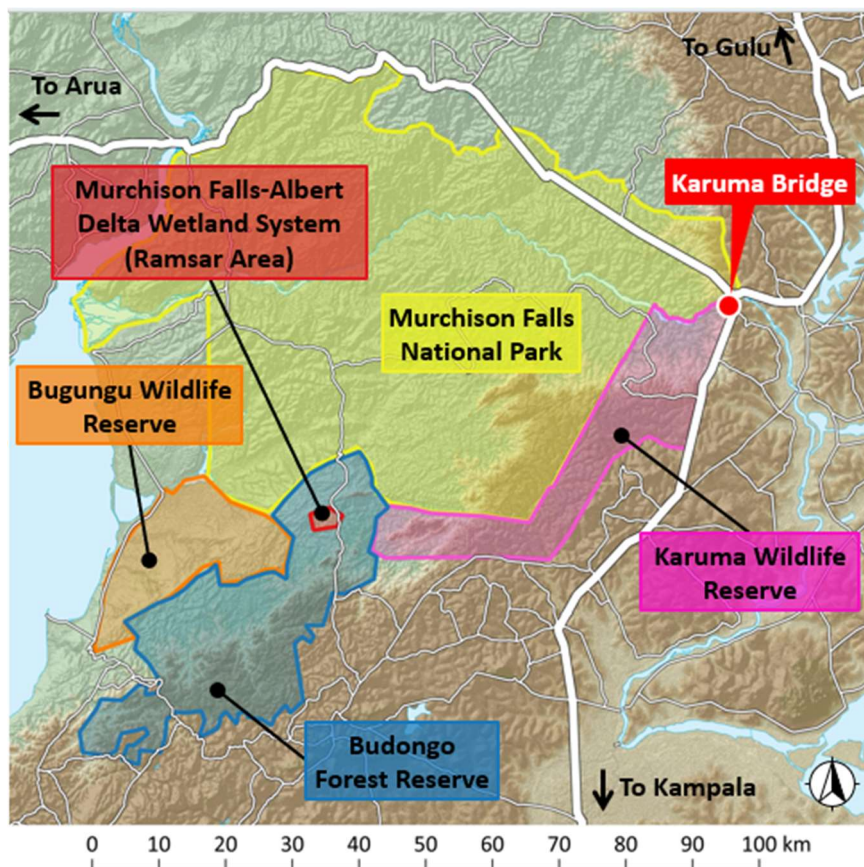
Natural protected area in accordance with the Wildlife Act near project area are indicated in the following table. The estimated distance from the existing Karuma Bridge and summary are shown in Table 4.1.9.

It should be noted that Murchison Falls National Park, where the Karuma Bridge is located, was established in 1952 and the Karuma Bridge itself was constructed in 1964. As the result of the inquiries on the environmental and social considerations related to the construction of the Kalma Bridge at that time to the Uganda Wildlife Authority (UWA, established in 1996), the body responsible for managing protected areas such as Murchison Falls National Park, and the UNRA (established in 2006), which manages the road, no information nor document regarding protected area legislation or the construction of the Karuma Bridge was obtained. The Wildlife Act (1996, 2019) and the National Environmental Act (1995, 2019) that regulate the conservation of protected areas, etc. currently in operation did not exist in 1964.

**Table 4.1.9 Summary of Natural Protected Area near Project Site**

(Distance from the Karuma Bridge) Name of Natural Protected Area	Summary	Remarks
(0 km) Murchison Falls National Park	<ul style="list-style-type: none"> <li>Establish/Area: 1926 (As Bunyoro Gulu Game Reserve), 1952 established as National Park /App.3,893km<sup>2</sup></li> <li>Objectives of Establishment: Conservation of wildlife along the Nile River</li> <li>Major Valuable Species: Hippocampus(VU), African Savanna Elephant (VU), Chimpanzee (EN)</li> </ul>	<ul style="list-style-type: none"> <li>Category in the Wildlife Act 2019: National Park (Areas of national and international importance for biodiversity, landscape or national heritage)</li> <li>KBA and IBA</li> <li>IUCN Management Category : II</li> </ul>
(0 km) Karuma Wildlife Reserve	<ul style="list-style-type: none"> <li>Establish/Area: 1964 / App. 720km<sup>2</sup></li> <li>Objectives of Establishment: Buffer zone for MFNP in south-east area</li> <li>Major Valuable Species: Black Rhinoceros (CR), Chimpanzee (EN), African Savanna Elephant (VU), Lion (VU), Shoebill (VU)</li> </ul>	<ul style="list-style-type: none"> <li>Category in the Wildlife Act 2019: Wildlife Reservation (Area of national or local importance for its biodiversity, landscape or natural heritage)</li> <li>KBA</li> <li>IUCN Management Category : III</li> </ul>
(55km) Budongo Forest Reserve	<ul style="list-style-type: none"> <li>Establish/Area: 1990 / App. 82,040 km<sup>2</sup></li> <li>Objectives of Establishment: Buffer zone of MFNP in south –east areas</li> <li>Major Valuable Species: Chimpanzee (EN), Stone Partridge (LC)</li> </ul>	<ul style="list-style-type: none"> <li>Forest Reserve under Ugandan legislation (the National Forestry and Tree Planting Act. 2003)</li> <li>KBA and IBA</li> <li>IUCN Management Category: None</li> </ul>
(65km) Murchison Falls-Albert Delta Wetland System (Ramsar Area)	<ul style="list-style-type: none"> <li>Establish/Area: 2006 / App. 173km<sup>2</sup></li> <li>Objectives of Establishment: Protection of terrestrial and inland waters (Protection of birds and fishes)</li> <li>Major Valuable Species: Shoebill (VU)</li> </ul>	<ul style="list-style-type: none"> <li>Located inside the Budongo Central Forest Conservation Area described above</li> <li>KBA and IBA</li> <li>IUCN Management Category: None</li> </ul>
(70km) Bugungu Wildlife Reserve	<ul style="list-style-type: none"> <li>Establish/Area: 1968 / App. 473km<sup>2</sup></li> <li>Objectives of Establishment: Buffer zone of MFNP in south –east areas</li> <li>Major Valuable Species: Black Rhinoceros (CR), Chimpanzee (EN), African Savanna Elephant (VU), Lion(VU), Shoebill (VU), Lesser kestrel (LC), African Skimmer (LC)</li> </ul>	<ul style="list-style-type: none"> <li>Category in the Wildlife Act 2019: Wildlife Reservation (Area of national or local importance for its biodiversity, landscape or natural heritage)</li> <li>KBA</li> <li>IUCN Management Category: III</li> </ul>

Source: UWA website and other websites



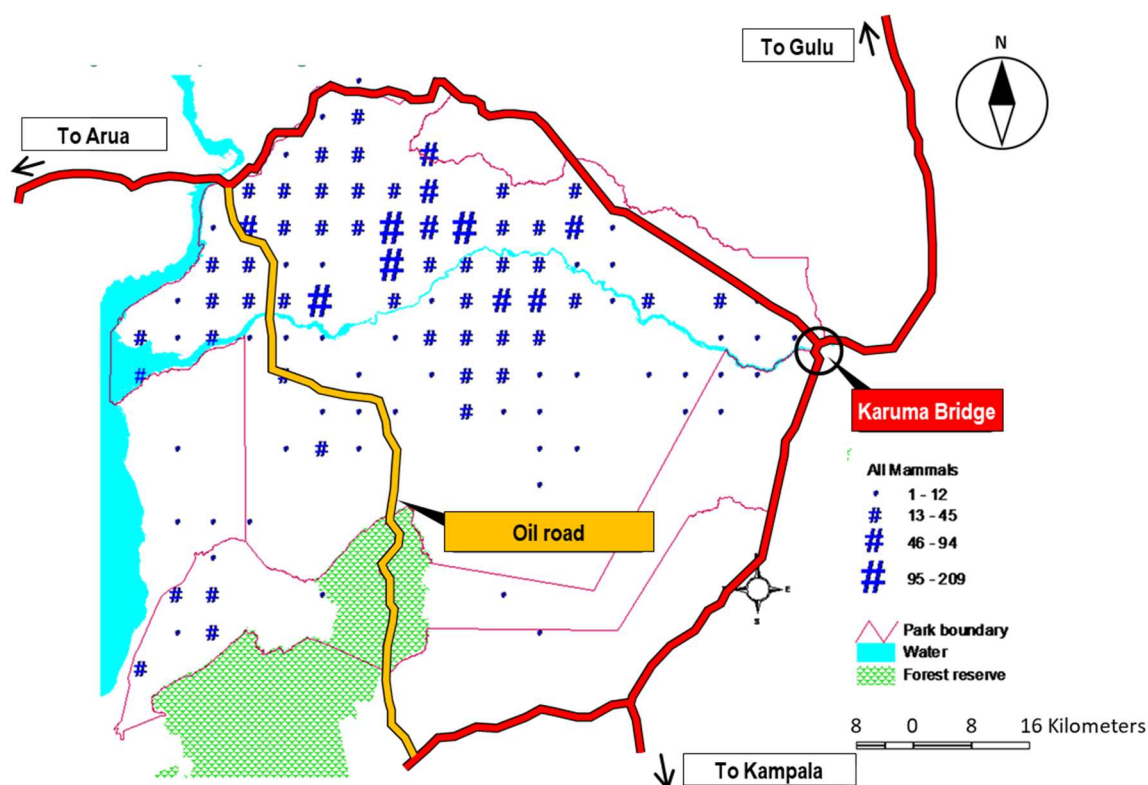
Source: JICA Survey Team

**Figure 4.1.10 Law-Based Natural Protected Area near the Project Site**

#### 4.1.8. Fauna and Flora

##### (1) Major Habitats of Animal Species in Murchison Falls National Park

Murchison Falls National Park and the surrounding protected area as a whole is a vast protected area that covers approximately 100 km from east to west and 80 km from north to south, with a total area of 5,056 km<sup>2</sup>, which is equivalent to the area of Chiba Prefecture (5,164 km<sup>2</sup>). Mammals, including rare species, mainly live in the grassland area around Lake Albert (commonly known as the oil road area), as shown in the following figure. In contrast, the Karuma Bridge is located at the northeastern end of the National Park, and although African elephants and hippopotamuses have been observed in the area, their density is low.



source : JICA Survey Team based on Murchison Falls National Park General Management Plan (2013-2023)(UWA/2014)

**Figure 4.1.11 Habitat Status of Mammals in Murchison Falls National Park and surrounding protected areas**

(2) Status of flora and fauna around the project area (Recorded Valuable Species near Project Site)

According to the environmental assessment conducted by UNRA in the past for the Karuma Hydropower Plant Project and the construction of the New Karuma Bridge, and the literature species of KBA, 116 animal species (29 mammals, 10 birds, 13 amphibians, 19 reptiles, 21 fish, 1 insect, and 23 benthic animals) and 203 plant species were recorded around the project area. Of these, 12 animal species and 1 plant species listed below were organized as valuable species as a result of evaluation using the latest IUCN Red List (March 2021).

However, as a result of interviews with MFNP and KWR staff in charge of protected area management at the site and field surveys, the number of valuable mammal species with a behaviour range in the area around the Karuma Bridge was limited to African elephant (EN), hippopotamus (VU), African water buffalo (NT), and, Interviews with Ziwa Rhino Sanctuary<sup>4</sup> indicated that black rhinoceroses are not considered to be present in MFNP and KWR.

According to the results of interviews with MFNP local officials, according to the 2019 census, there are approximately 2,800 African elephants in the entire MFNP, with approximately 2,000 on the north bank of the Nile River and 800 on the south bank, of which approximately 200 are living around Karuma village. As shown in Figure 4.1.12 , the migration corridor between MFNP and South Sudan used to be used for seasonal migration

<sup>4</sup> Uganda's wild rhinos became extinct in the early 1980s due to human encroachment, poaching and conflict; in 2005, six rhinos were reintroduced to Uganda. The Ziwa Rhino Sanctuary is a 70 sq. km non-profit private reserve established with the long-term goal of returning rhinos to Murchison Falls National Park (MFNP). The reserve is located approximately 50 km east of the MFNP boundary.

and breeding, but due to the increase in housing and other facilities along the way, the number of migrating animals has decreased in recent years, and they are now breeding in MFNP.

**Table 4.1.10 Recorded Valuable Species on the Past ESIA**

Category		ID	English Name	Scientific Name	Document				Check in IUCN Website								Uganda Threatened Sp 2016	
					Approved ESIA (2015)	Updated ESIA (2018)	HPP ESIA	IBAT Web	CR	EN	VU	NT	LC	DD	Other	National Threat Status	Endemic	
Fauna	Mammal	1	African Savanna Elephant	<i>Loxodonta africana</i>	○	○	○	○		○							CR	
		2	Hippopotamus	<i>Hippopotamus amphibius</i>	○	○	○	○			○						VU	
		3	African Buffalo	<i>Syncerus caffer</i>	○	○	○					○						
		4	Black Rhinoceros	<i>Diceros bicornis</i>				○	○								RE	
		5	Chimpanzee	<i>Pan troglodytes</i>				○		○							EN	
		6	Lion	<i>Panthera leo</i>				○			○						CR	
	Birds	7	Papyrus Gonolek	<i>Laniarius mufumbiri</i>	○	○	○					○					VU	
		8	Shoebill	<i>Balaeniceps rex</i>				○				○					EN	
	Reptiles	9	Gaboon Viper	<i>Bitis gabonica</i>	○	○	○											
		10	Rhinoceros Viper	<i>Bitis nasicornis</i>	○	○	○					○						
		11	Central African Rock Python	<i>Python sebae</i>	○	○	○						○					
	Fishes	12	Ningu	<i>Labeo victorianus</i>			○		○									
	Flora	Trees	13		<i>Jacaranda mimosifolia</i>		○					○						
Total					7	8	8	6	2	2	6	3	0	0	0	7	0	

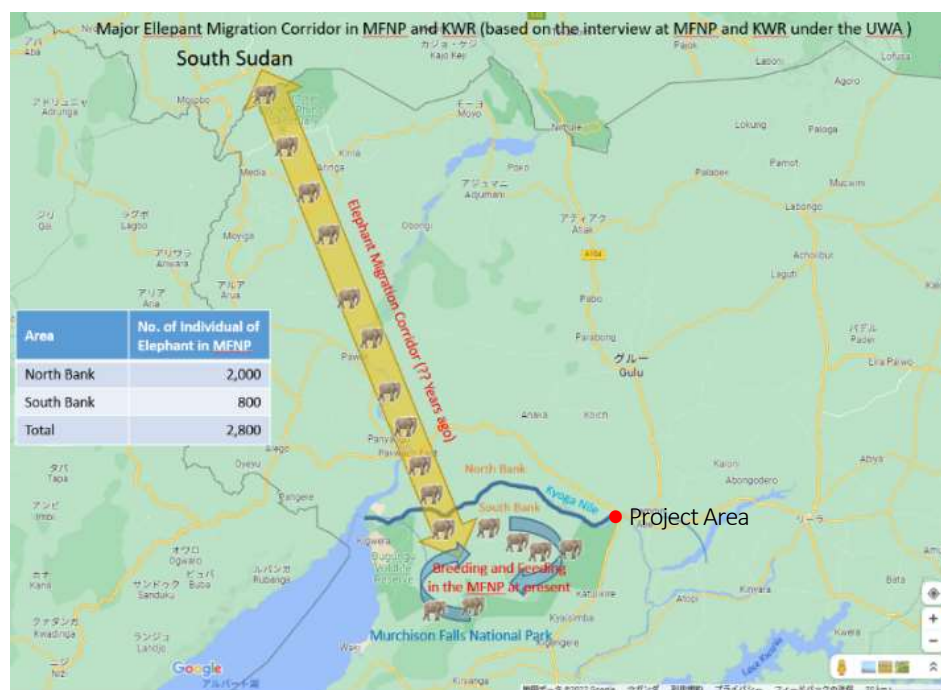
Note) IUCN Category: Extinct (EX), Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT), Least Concern (LC), Data Deficient (DD), RE: the species is regionally extinct in the wild

Source: Approved ESIA: Environmental and Social Impact Assessment Report for New Karuma Bridge / UNRA (Feb. 2015)

Updated ESIA: Updated Environmental and Social Impact Assessment Report for the Proposed New Karuma Bridge / UNRA (Sep. 2018)

HPP ESIA: Environmental and Social Impact Assessment Report for Karuma HPP (2011)

IBAT web: [https://www.ibat-alliance.org/users/sign\\_in](https://www.ibat-alliance.org/users/sign_in)



Source : JICA Survey Team based on the interview with MFNP and KWR (based on Google Map)

**Figure 4.1.12 Major Elephant Migration Corridor (between MFNP and South Sudan)**

### Habitat of valuable species in the Project site

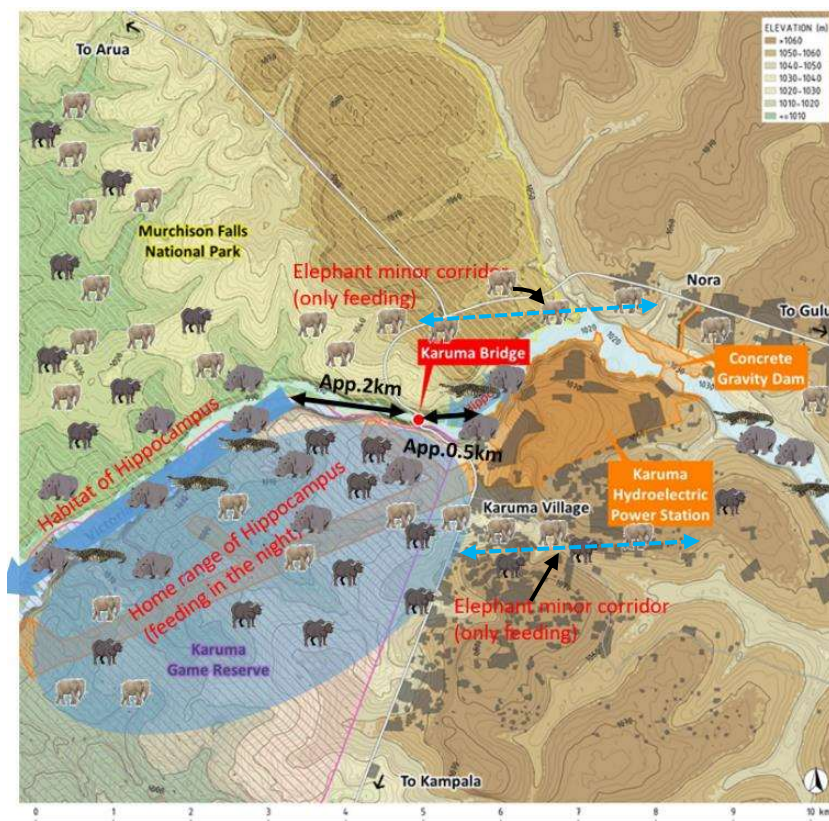
According to the interviews with KWR staff, local residents, and fishery cooperatives, the ranges of major habitat of valuable species in the vicinity of the study area are shown below (Figure 4.1.13 ).



- i. African elephants sometimes migrate between MFNP and Nora village at about 1.3 km north of the current Karuma Bridge location and between KWR and Karuma village at about 1.6 km south of the Karuma Bridge location in search of food and water along lowland swamp (small rivers).
- ii. African buffalo breed within the MFNP and KWR and migrate in groups looking for food (crops) and water over a wide range area.
- iii. Hippos and Nile Crocodiles (LC) have similar habitats in the river, mainly in the inlets in the river where the river flow is slow about 500 m upstream of the Karuma Bridge and about 2 km downstream. At night, however, they sometimes migrate several kilometres from the river to land in search of food (herbaceous plants).

Regarding with the habitat area, villagers were killed in 2021 and 2022 due to hippo attacks on the south bank, approximately 500 meters upstream of the current Karuma Bridge according to the information from the staffs of Karuma Hydropower Plant.

Additionally, trenches have been installed to prevent hippos from entering because hippos invade the areas of the Karuma Hydropower Plant on the southern bank, which has a height difference of more than 50 meters, at night in search of food. Hippos living upstream or downstream of the current Karuma Bridge do not move inside the river around the Karuma Bridge, where the river flow is fast, but may move on land around the current Karuma Bridge.



Remarks: It shows the distribution of the animals (It does not show the density of the existence)

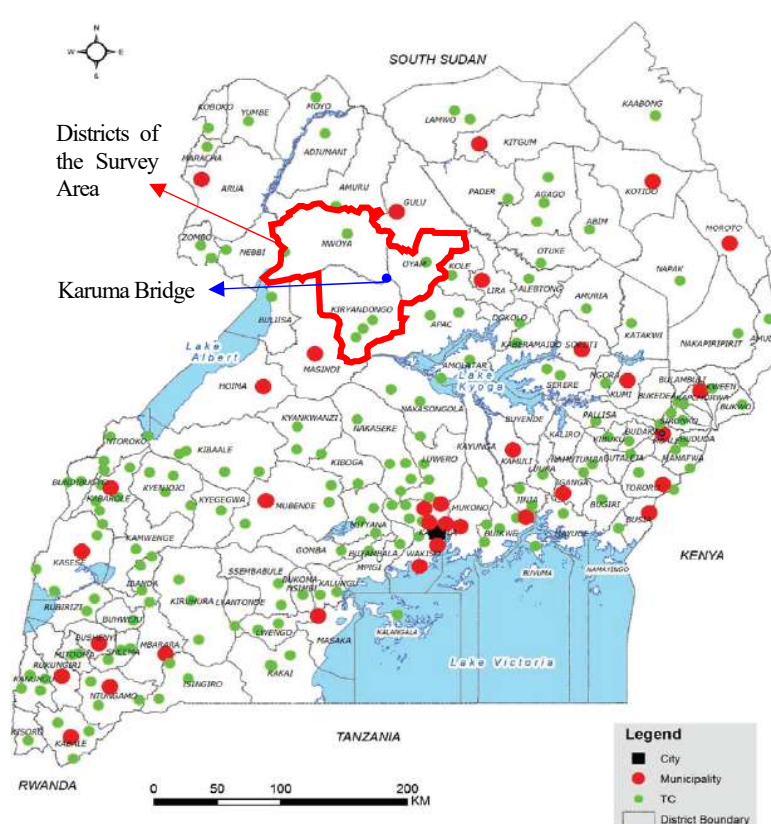
Source : JICA Survey Team based on the interview with MFNP and KWR

**Figure 4.1.13 Distribution of keystone species and Valuable species around the survey area**

## 4.2. Social Environment

### 4.2.1. Administration Boundaries

The existing Karuma Bridge is located in the northeastern part of Uganda, crossing the border between Kiryandongo and Nwoya districts (Figure 4.2.1). In addition, the new bridge is proposed to be constructed next to the existing one, will cross through the same districts. For the alternatives discussed later, some routes also cross Oyam District, which is adjacent to the above two districts. Therefore, the areas covered by this survey are shown in Table 4.2.1. However, because the area on the Nwoya District side is managed as Murchison Falls National Park, social condition surveys (interviews), Local Stakeholder Meetings, and Focus Group Discussions were conducted in Karuma Town Council and Diima Subcounty of Kiryandongo District and Kamdini Town Council of Oyam District.



Source: JICA Survey Team based on the National Population and Housing Census 2014 (Main Report).

**Figure 4.2.1 Administration Boundaries in Uganda and the Survey Area**

**Table 4.2.1 Administration Boundaries of the Survey Area**

Region	Sub-region	District	County/ Municipal County	Subcounty/ Town Council
Western	Bunyoro	Kiryandongo	Kibanda North	Karuma Town Council, Diima Subcounty
Northern	Acholi	Nwoya	Kibanda North	Koch-Goma Subcounty
Northern	Lango	Oyam	Oyam North	Kamdini Town Council

Source : JICA Survey Team

### 4.2.2. Land and population sizes

Table 4.2.2 shows the land and population sizes of the relevant districts. The total populations are 266,197 in Kiryandongo District, 133,504 in Nwoya District, and 383,644 in Oyam District. The population densities of the Kiryandongo and Nwoya districts are lower than those of entire Uganda, however, Oyam is slightly higher than that.

**Table 4.2.2 Area and Population in the Project Area**

Item	District	Value	Remark
Land Size (km <sup>2</sup> ) *1	Kiryandongo	3,595	[Total land area of Uganda] 200,523
	Nwoya	4,601	
	Oyam	2,190	
Population (persons) *2	Kiryandongo	Male: 132,822	[Uganda]



Item	District	Value	Remark
		Female: 133,375 Total: 266,197	Male: 16,897,849 Female: 17,736,801 Total: 34,634,650
	Nwoya	Male: 65,969 Female: 67,537 Total: 133,506	
	Oyam	Male: 187,121 Female: 196,523 Total: 383,644	
Population Density (person/km <sup>2</sup> ) <sup>*3</sup>	Kiryandongo	74	[Uganda] 173
	Nwoya	29	
	Oyam	175	

Source:

\*1: open AFRICA

(<https://africaopendata.org/dataset/size-of-uganda-districts-in-square-kilometers/resource/ec5795f2-fb79-4f23-91ea-bad356aae555>)

\*2: 2014 Census Population FIGURES BY DISTRICT (1969-2014), UBOS

\*3: National Population and Housing Census 2014 (Main Report)

#### 4.2.3. Family structure

While the average family size in Uganda is 4.6 persons/household, the values in the relevant 3 sub-regions, namely, Acholi, Lango, and Bunyoro are almost the same, specifically 4.2 or 4.9 persons/household (Table 4.2.3). In addition, they have almost the similar characteristic of entire Uganda of which gender ratio of household heads have a huge gap between male (68.8%) and female (31.2%).

**Table 4.2.3 Family Structure**

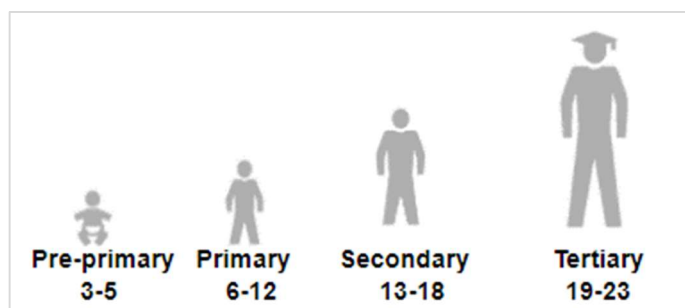
Sub-region	Average Number of Family Members in a Household (persons/household)	Gender of Household Heads	
		Male (%)	Female (%)
Acholi	4.2	64.9	35.1
Bunyoro	4.9	76.9	23.1
Lango	4.9	71.1	28.9
Entire Uganda	4.6	68.8	31.2

Source: Uganda National Household Survey Report 2019/2020 (UBOS):

[https://www.ubos.org/wp-content/uploads/publications/09\\_2021Uganda-National-Survey-Report-2019-2020.pdf](https://www.ubos.org/wp-content/uploads/publications/09_2021Uganda-National-Survey-Report-2019-2020.pdf)

#### 4.2.4. Education and Literacy

As shown in Figure 4.2.2, the age of schooling in Uganda is 3 years for pre-primary education, 7 years for primary education, 6 years for secondary education, and 3-5 years for post-secondary education. In terms of literacy rates for those aged 10 years and older by region, Lango and Bunyoro are roughly in line with the national average of 72.2%, while Acholi is slightly lower at 65.9% (Table 4.2.4).



Source: Education System, UNESCO (<http://uis.unesco.org/en/country/mg>)

**Figure 4.2.2 School Age by Education Level**

**Table 4.2.4 Literacy Rate in the Project Area**

Sub-region	Literacy (%)
Acholi	65.9
Bunyoro	75.0
Lango	71.4
Entire Uganda	72.2

Source: Education: A Means for Population Transformation (UBOS):[https://www.ubos.org/wp-content/uploads/publications/03\\_2018Education\\_Monograph\\_Report\\_Final\\_08-12-2017.pdf](https://www.ubos.org/wp-content/uploads/publications/03_2018Education_Monograph_Report_Final_08-12-2017.pdf)

#### 4.2.5. Health

Table 4.2.5 shows the number of health facilities in each district. There are 39 in Kiryandongo District, 23 in Nwoya District, and 47 in Oyam District. It easily can be observed that the facilities are in shortage in the said districts because the population size covered by each health facility is 6,825, 5,804, and 8,162 respectively, while the one in entire Uganda is 1,752.

**Table 4.2.5 Number of Health Facilities in each District**

District	Number of Health Facility				Population (b)	Population Size covered by a Health Facility* (c) = (b) / (a)
	Government	Private for Profit	Private for Non-Profit	Total (a)		
Kiryandongo	21	14	4	39	266,197	6,825
Nwoya	13	5	5	23	133,506	5,804
Oyam	28	15	4	47	383,644	8,162
Entire Uganda	3,134	2,795	1,009	6,937	12,159,530	1,752

Source: (a) National Health Facility Master List 2018, Division of Health Information, Ministry of Health in Uganda

(b) 2014 Census Population FIGURES BY DISTRICT (1969-2014), UBOS

#### 4.2.6. Employment, Income and Poverty

The average expenditure per household at the base year price of 2009/2010 is 339,263 UGX/month in entire Uganda, and it is the almost same value at 335,562 UGX/month in the Western Region where Bunyoro is in (Table 4.2.6). On the other hand, it is 230,448UGX/month in the North Region where Acholi and Lango are in.

The national poverty line in Uganda is 1.77 USD/day/person, and the population ratio to the said standard in entire Uganda is 20.3%. In this regard, Bunyoro is low, namely 9.8%, however, Lango is slightly higher, i.e., 23.4%. Regarding Acholi, it is 67.7% which is the highest value in the nation.

**Table 4.2.6 Average Expenditure and Poverty Line in the Project Area**

Item	Year	Region	Value	Remark
Average Expenditure (UGX/month)*	2019/2020	North Region (including Acholi and Lango)	230,448	Entire Uganda : 339,263
		Western Region (including Bunyoro)	335,562	
Population ratio under the National Poverty Line (%)	2019/2020	Acholi Sub-region	67.7	Entire Uganda : 20.3
		Bunyoro Sub-Region	9.8	
		Lango Sub-region	23.4	

\* The prices are shown at base year prices of 2009/2010.

Source: Uganda National Household Survey Report 2019/2020, UBOS

The labour population ratio of the entire Uganda is 52.2%, 3 sub-regions that are relevant to this project have almost the same standard, namely, 51 to 53% (Table 4.2.7). Regarding the unemployment rate, the values of Bunyoro and Lango are extremely higher, respectively 14.5 and 16.9%, while the entire Uganda is 8.8%.

**Table 4.2.7 Employment in the Project Area**

Sub-region	Labour Population Rate (aged 14 to 64) (%)	Unemployment Rate (%)		
		Male	Female	Total
Acholi	52.3	9.8	5.6	8.0
Bunyoro	51.0	16.4	10.9	14.5
Lango	53.8	18.7	13.7	16.9
Entire Uganda	52.2	8.7	8.9	8.8

Source: Uganda National Household Survey Report 2019/2020, UBOS

Uganda National Household Survey Report 2019/2020 (UBOS): [https://www.ubos.org/wp-content/uploads/publications/09\\_2021Uganda-National-Survey-Report-2019-2020.pdf](https://www.ubos.org/wp-content/uploads/publications/09_2021Uganda-National-Survey-Report-2019-2020.pdf)

#### 4.2.7. Culture

In Uganda, 3 sites are registered as world heritage by UNESCO (United Nations Educational, Scientific and Cultural Organization) (Table 4.2.8). All of them are located at more than 200 km away from the existing Karuma Bridge and are not within the range where the direct impact of the Project will be made (Figure 4.2.3).

**Table 4.2.8 World Cultural Heritage in Uganda**

No.	Category	Site Name	Registered Year
1	Cultural Heritage	Tombs of Buganda Kings at Kasubi	2001
2	Natural Heritage	Bwindi Impenetrable National Park	1994
3	Natural Heritage	Rwenzori Mountains National Park	1994

Source: World Heritage Conservation (UNESCO): <https://whc.unesco.org/en/statesparties/ug>



Source: JICA Survey Team

**Figure 4.2.3 Location of World Heritage Sites in Uganda**

According to the ESIA Report prepared in 2018 for this project, tribes such as Langi, Acholi, and Chope those who uses Paluo language occupied the lands surrounding the existing Karuma Bridge originally. After the commencement of the Karuma Hydropower Plant Project, the population inflow of construction workers from other areas of Uganda made the structure proportion of tribes in the village change temporarily. In this regard, however, Karuma Village Council members mentioned during the interview conducted by the JICA Survey Team that the number of construction workers remaining in Karuma Village after the said project is a few, and the structural proportion of the tribes has generally returned to the pre-project situation.

## CHAPTER 5 SCREENING AND SCOPING

### [Summary of the Chapter 5]

In this Chapter, screening is conducted accordance with Uganda laws such as “The National Environment (Environmental and Social Assessment) Regulations 2020 and JICA Guidelines for Environmental and Social Considerations 2010, and then scoping for the concluded route as a result of alternative analysis are described in the scoping matrix. The analysed 30 items are selected from relevant Ugandan laws and JICA guidelines. The impacted items, factors, degree of impacts are analysed in the scoping matrix. Based on the scoping analysis, the need for site surveys, impact forecasts and mitigation measures will be considered for impacted items.

#### 5.1. Screening

As mentioned in Chapter 2, implementation of ESIA is required in accordance with the National Environment Act (2019) in Uganda and JICA Guidelines for Environmental and Social Considerations 2010. Detailed reasons for necessity of ESIA is shown below.

##### 1) Screening in Accordance with Uganda Law

According to the National Environment Act (2019) following conditions for implementation of ESIA is described.

- i. Schedule 5 : 1(a) Construction of public roads not being community access roads, including (ii) Construction of flyovers
- ii. Schedule 10 : 1. Projects not listed in schedule 6 and planned to be located in or near environmentally sensitive areas such as (b) areas declared by national law as protected areas

Thus, regardless of whether the alignment passes through protected areas, it is necessary to prepare ESIAS (Environmental and Social Impact Assessment Statement) in accordance with condition in the schedule 5.

Although ESIAS was prepared in 2015 and approved by NEMA in 2016, the approval expired because the construction did not start within two years after the approval of ESIA. NEMA indicated that it is necessary to implement ESIA based on this act.

##### 2) Screening in Accordance with JICA Guidelines for Environmental and Social Considerations 2010

The project is classified as Category A because it falls under "projects located in or near sensitive areas" and requires the preparation of an environmental impact assessment in accordance with JICA Guidelines for Environmental and Social Considerations 2010.

#### 5.2. Scoping

##### 5.2.1. Scoping Matrix and Reasons

Target activities and main structures to be analysed are construction of bridge and approach road. The impacted items, factors, degree of impacts are shown in Table 5.2.1. This matrix is called “Leopold Scoping Matrix” and indicates the relationship between the impacted item and its factor as visually understandable. Additionally, the detailed impacts and reasons are compiled in Table 5.2.2.

Existing borrow pit, quarry site, batching plant site and base-camp site will be used under this project, thus new ESIA is not necessary for development such sites. However, if the Contractor develops new site, the Contractor shall obtain necessary environmental permission.

**Table 5.2.1 Scoping Matrix (Bridge and Approach Road(s))**

No	Affected Activities	Item to be surveyed	Pre/ During Construction Phase										Operation Phase		
	Impact Items based on the JICA Guidelines (Uganda Item)*1		Land acquisition and loss of properties including demolition of existing bridges	Change of land use plan, control of various activities by regulations for the construction	Reclamation of wetland, etc.	Deforestation	Alteration of the ground by cut land, filling, drilling, etc.	Operation of construction equipment and vehicles	Construction and existence of bridges, approach road and other related facilities	Traffic restriction in the construction area	Influx of construction workers, construction of base camp including storage	Development and operation of borrow pit and quarry*	Increase of through traffic and travelling speed	Appearance/Occupancy of roads and related building structures including embankment	Increasing influx of settlers
Pollution	1 Air pollution (Air quality)	✓						✓				✓	✓		
	2 Water pollution (Water)	✓					✓	✓			✓	✓			✓
	3 Waste	✓				✓	✓				✓				✓
	4 Soil contamination	✓					✓	✓			✓	✓			✓
	5 Noise and vibration	✓						✓				✓	✓		
	6 Ground subsidence														
	7 Odor	✓									✓				✓
	8 Sediment quality (same as No.4)	✓					✓	✓			✓	✓			✓
Natural Environment	9 Protected area (Ecological considerations)	✓				✓	✓	✓	✓		✓		✓	✓	✓
	10 Ecosystem (Ecological considerations)	✓				✓	✓	✓	✓		✓	✓	✓	✓	✓
	11 Hydrology (Water)	✓					✓		✓					✓	
	12 Topography and geology	✓					✓		✓			✓		✓	
Social Environment	13 Involuntary resettlement (Land acquisition and land use)	✓										✓			
	14 Poor Group (vulnerable group)	✓									✓	✓			
	15 Ethnic group (Indigenous peoples)	✓									✓	✓			
	16 Local economy such as employment and livelihood (Economic activities, opportunities for employment)	✓		✓							✓	✓			
	17 Land use and utilization of local resources (Resource efficiency)	✓		✓		✓	✓		✓		✓	✓			
	18 Water usage (Water)	✓					✓		✓						
	19 Existing social infrastructures and services (Social services and amenities)	✓					✓		✓	✓					
	20 Social institutions such as local decision-making institutions (Local communities)	✓									✓				
	21 Unequal distribution of positive and negative impacts of the Project (Opportunities for employment)	✓									✓				
Social	22 Local conflict of interests	✓									✓				
	23 Cultural heritage (Culture and heritage)	✓				✓	✓					✓			
	24 Landscape (Landscape)	✓				✓	✓		✓					✓	

	No	Affected Activities Impact Items based on the JICA Guidelines (Uganda Item)*1	Item to be surveyed	Pre/ During Construction Phase										Operation Phase		
				Land acquisition and loss of properties including demolition of existing bridges	Change of land use plan, control of various activities by regulations for the construction	Reclamation of wetland, etc.	Deforestation	Alteration of the ground by cut land, filling, drilling, etc.	Operation of construction equipment and vehicles	Construction and existence of bridges, approach road and other related facilities	Traffic restriction in the construction area	Influx of construction workers, construction of base camp including storage	Development and operation of borrow pit and quarry*	Increase of through traffic and travelling speed	Appearance/Occupancy of roads and related building structures including embankment	Increasing influx of settlers
	25	Gender (Gender)	✓									✓	✓			
	26	Rights of children (Vulnerable group)	✓									✓	✓			
	27	Infectious diseases	✓					✓				✓	✓		✓	
	28	Labor environment (including work safety) (Occupational health and safety)	✓									✓	✓			
	29	Accidents	✓						✓	✓	✓		✓			
Others	30	Cross boundary impacts and climate change (Climate change)	✓				✓		✓	✓			✓	✓+		

Note) ✓ : Some activities are factors of adverse impacts and it is necessary to conduct survey and analysis:

No mark: There are no activities which gives adverse impacts on the item, thus surveys and analysis is not necessary

\*1: Items to be surveyed and analyzed : Items are selected from JICA Guidelines for Environmental and Social Considerations 2010 and The National Environment (Environmental and Social Assessment) Regulations, 2020.

\*2: Existing borrow pit, quarry site, batching plant site and base-camp site will be used under this project, thus new ESIA is not necessary for development such sites. However, if the Contractor develops new site, the Contractor shall obtain necessary environmental permission.

Source: JICA Survey Team

**Table 5.2.2 Reasons of Scoping (Bridge and Approach Road(s))**

Area	No	Impacted Item (based on Uganda Items and JICA Guidelines) *1	Item to be surveyed	Expected Adverse Impacts at scoping stage		Reasons of the Rating
				Pre/ During Construction	Operation Phase	
Pollution	1	Air pollution	✓	✓	✓	<b>Construction phase:</b> Temporary negative impacts on dusts are expected due to operation of construction machines, equipment and facilities in the construction area and related sites such as borrow pits and quarry sites. <b>Operation phase:</b> Negative impact by the project is not expected since the construction and operation of new bridge does not increase traffic number because of the project. However, the natural increase of the traffic volume is expected, and the travelling speed will be increased, thus the updated traffic condition will be surveyed, and impact based on updated data will be forecasted and analysed.
	2	Water pollution	✓	✓	✓	<b>Construction phase:</b> Turbid water may be generated by earth works and excavation in the river where bridges and revetment are planned. Additionally, organic polluted water may be discharged with running off of rain fall from the base camp. And operation of borrow pits and quarries may generate turbid water. <b>Operation phase:</b> No impacts are expected due to lack of plans regarding service area and parking along the bridge and approach road. However, illegal dumping in the water and water pollution may increase in conjunction with increase in influx.
	3	Waste	✓	✓	✓	<b>Construction phase:</b> Construction waste such as waste soil and cutting trees are expected. Additionally, waste oil, domestic waste and night soil may be generated from the construction base camp. <b>Operation phase:</b> No impacts are expected due to no plans regarding service area and parking along the bridge and approach road. However, illegal dumping may increase in conjunction with increase in influx.
	4	Soil	✓	✓	✓	<b>Construction phase:</b> Excavated soil on the site may be polluted. Stored construction materials such as oil and chemicals may pollute the soil in the base camp. Leaking oil

Area	No	Impacted Item (based on Uganda Items and JICA Guidelines) *1	Item to be surveyed	Expected Adverse Impacts at scoping stage		Reasons of the Rating
				Pre/ During Construction	Operation Phase	
		contamination				from construction machines may cause soil contamination. <b>Operation phase:</b> No impacts are expected due to lack of plan regarding soil contamination. However, illegal dumping may cause soil contamination in conjunction with increase in influx.
	5	Noise and vibration	✓	✓	✓	<b>Construction phase:</b> Noise and vibration generation is expected due to operation of construction machines and equipment, and it may give impact to the animals and ecosystem in the project area. <b>Operation phase:</b> Negative impact by the project is not expected since the construction and operation of new bridge does not increase traffic number because of the project. However, the natural increase of the traffic volume is expected and the travelling speed will be increased. In addition, location of new bridge will be located approximately 40 m away from the current bridge, thus degree of noise should be analysed from the view of conservation of ecosystem and specific species. With regard to vibration during operation stage, it is not likely to give serious impacts by traffic since there are not any soft ground along the bridge and approach road.
	6	Ground subsidence				<b>Construction and operation phase:</b> Although earthworks such as creation of embankment and construction of bridge may be planned, soft ground which causes ground subsidence is not observed in the project area. And the large-scale extraction of underground water is not expected, therefore adverse impacts are not expected which causes ground subsidence.
	7	Odor	✓	✓	✓	<b>Construction Phase:</b> Bad odour may be caused by domestic waste and construction materials in the base camp. <b>Operation phase:</b> No impacts are expected since there is no plans regarding service and parking areas which generate solid and liquid wastes. However, illegal dumping may increase and cause bad odour in conjunction with increase in influx.
	8	Sediment quality (same as No.4)	✓	✓	✓	<b>Construction phase:</b> If the excavated soil in the project site is polluted and taken out to other areas, such polluted waste soil may give impacts on the sediment quality of the nearest river. Leaking oil and chemicals from the base camps give impacts on the sediment quality of the nearest river. <b>Operation phase:</b> Road operation which causes impacts on sediment quality is not expected. However, illegal dumping in the water may cause impact to the sediment in the river in conjunction with increase in influx.
Natural environment	9	Protected area	✓	✓	✓	<b>Construction phase:</b> The current and new alignment is passing through the edge of law-based natural protected areas such as Murchison Falls National Park (MFNP) and Karuma Wildlife Reserve (KWR) respectively. Construction activities such as cutting trees and construction noise & vibration may give impacts on ecosystem and some species which have feeding, roosting, migration areas in and near the project area. Turbid water generated from the construction area may give adverse impacts on aquatic fauna and flora. The driving of construction machines on the current national road and/or construction road may cause traffic accidents with wild animals. Invaders can bring alien species and carry out disturbances of local species. Additionally, construction workers and wild animals such as hippopotamus may have conflicts. Furthermore, new alignment may lead poachers in the MFNP and KWF and then some target species may have risks. <b>Operation phase:</b> An existence of bridge and traffic flow with noise & vibration may give adverse impacts to some species which has some important areas such as feeding, roosting and migration areas in and near the project area. The increase of travelling speed may cause traffic accidents with wild animals. In addition, illegal dumping may increase in conjunction with increase in influx. Furthermore, new alignment may lead poachers in the MFNP and KWF and then some target species may have risks.
	10	Ecosystem (including No.9 Ecosystem)	✓	✓	✓	<b>Construction phase:</b> MNFP is categorized as KBA and IBA. Construction activities such as cutting trees and construction noise & vibration may give impacts on ecosystem and some species which have feeding, roosting, migration areas in and near the project area. Turbid water generated from the construction area may give adverse impacts on aquatic fauna including fishes, amphibian and reptiles. The driving of construction machines on the current national road and/or construction road may cause traffic accidents (roadkill) with wild animals. Additionally, construction workers and wild animals such as hippopotamus may have conflicts.



Area	No	Impacted Item (based on Uganda Items and JICA Guidelines) *1	Item to be surveyed	Expected Adverse Impacts at scoping stage		Reasons of the Rating
				Pre/ During Construction	Operation Phase	
						<p>Operation of borrow pits and quarries may give impacts to surrounding ecosystem. The domestic waste in basecamp may give adverse impacts on wild animals. Construction of new construction roads could increase the influx of poachers. Invaders can bring alien species and carry out disturbances of local species. Furthermore, new alignment may lead poachers in the MFNP and KWF and then some target species may have risks.</p> <p><b>Operation phase:</b> Same as No.9 Protected area. An existence of structures such as bridge and approach road and traffic flow with noise and vibration may give adverse impacts on ecosystem in the project area.</p> <p>Construction of new construction roads could increase the influx of poachers.</p>
	11	Hydrology	✓	✓	✓	<p><b>Construction and Operation phase:</b> Construction of bridge and revetment may change the hydrological situation of the river.</p>
	12	Topography and geology	✓	✓	✓	<p><b>Construction and operation phase:</b> No impact is expected since any valuable topography and geological sites are not located in the project area. However, embankment of the bridge may cause slope failure. Additionally, soil erosion and slope failure may be caused in borrow pits and quarry sites.</p>
Social environment	13	Involuntary resettlement	✓	✓		<p><b>Pre-construction phase:</b> As the entire project affected area is on government land, no land acquisition or resettlements is required.</p> <p>Basically, the Project will use the existing borrow pit and quarry that were developed, and the new development, land acquisition, and resettlement will not be required for the Project. However, if there is a structure such as a residential house in the areas of borrow pit and quarry, the additional impact will be made.</p> <p><b>Operation phase:</b> No impact is expected because no activities which may give adverse impacts on this item is planned.</p>
	14	Poor Group	✓	✓		<p><b>Pre-construction phase:</b> As there are no people living in the project affected area, no direct impact from resettlement and land acquisition are expected. In addition, job opportunities as construction workers will be provided to the local people, so that they will get the positive impacts. However, if there are poor groups in the vicinity of the project affected area, indirect impacts caused by construction may occur.</p> <p><b>Operation phase:</b> No impact is expected because no activities which may give adverse impacts on this item is planned.</p>
	15	Ethnic group	✓	✓		<p><b>Construction phases:</b> As there are no people living in the project affected area, no direct impact from resettlement and land acquisition are expected. However, if there are ethnic minorities in the vicinity of the project affected area, indirect impacts caused by the construction may occur.</p> <p><b>Operation phase:</b> No impact is expected because no activities which may give adverse impacts on this item is planned.</p>
	16	Local economy such as employment and livelihood	✓	✓		<p><b>Construction phase:</b> As no people living in the project affected area, no adverse impact from resettlement and land acquisition are expected. However, some business such as shops and restaurants in the restricted area during construction may have temporary impacts when their access is disturbed. On the other hand, job opportunities such as construction workers and business chances will be increased.</p> <p><b>Operation phase:</b> There will be a positive impact on the local economy if the new Karuma Bridge becomes a tourist attraction and tourists etc. stay longer in the surrounding community.</p>
	17	Land use and utilization of local resources	✓	✓		<p><b>Pre-construction phase:</b> The land use in the project affected area is protected area, i.e., the MFNP and KWR. However, some local people fish in the Nile River, and it is likely to have impacts. The construction and existence of access road and bridge, as well as the traffic control, may disrupt such use of local resources. In addition, the influx of construction workers from outside of the project area may affect the above fishermen by catching fish, etc. without permission.</p> <p><b>Operation phase:</b> No impact is expected because no activities which may give adverse impacts on this item is planned.</p>
	18	Water usage	✓	✓		<p><b>Construction phase:</b> As no pilers of the new bridge will be constructed in the river and no works including blasting in the water is planned, there will be no adverse impact. However, if there are existing wells and irrigation canals, etc. along with the project affected area, the construction works may cause the disturbance of water use.</p> <p><b>Operation phase:</b> No impact is expected because no activities which may give adverse impacts on this item is planned.</p>

Area	No	Impacted Item (based on Uganda Items and JICA Guidelines) *1	Item to be surveyed	Expected Adverse Impacts at scoping stage		Reasons of the Rating
				Pre/ During Construction	Operation Phase	
	19	Existing social infrastructures and services	✓	✓		<b>Construction phase:</b> Any social infrastructures such as schools, hospitals/ clinics and meeting places are not observed in the project affected area. However, no trespassing in the project area, the construction of access road and bridge, and traffic control may temporarily impact use of the existing social infrastructures and services in the vicinity of the project affected area. <b>Operation phase:</b> No impact is expected because no activities which may give adverse impacts on this item is planned.
	20	Social institutions such as local decision making institutions	✓	✓		<b>Construction:</b> Influx of construction workers and related new settlers may give adverse impacts on social institutions. <b>Operation phase:</b> No impact is expected because no activities which may give adverse impacts on this item is planned.
	21	Unequal distribution of positive and negative impacts of the Project	✓	✓		<b>Construction phase:</b> As the Project will not cause any resettlement and land acquisition, no significant damage is expected. Local inhabitants and/or local authorities may request to ensure the equal job opportunities for construction workers. <b>Operation phase:</b> Misdistribution of benefit and damage caused by the bridge construction is not expected because benefits for construction of bridge provide fair benefits to inhabitants.
	22	Local conflict of interests (see No.21)	✓	✓		<b>Construction phase:</b> Local inhabitants and local authorities may request to ensure the equal job opportunities for construction workers. Local conflicts may be caused if such job opportunities do not provide fairly. Influx of construction workers and related new settlers may give adverse impacts on security situation and relationship with current inhabitants. <b>Operation phase:</b> No impact is expected (same as No.21 “Unequal distribution of benefit and damage”)
	23	Cultural heritage	✓	✓		<b>Construction Phase:</b> If there are cultural sites (including spiritual places and objects) and historical/ archaeological sites within the Project affected area, they may be affected by the construction works. <b>Operation phase:</b> No impact is expected because no activities which may give adverse impacts on this item is planned.
	24	Landscape	✓	✓	✓	<b>Construction and operation phase:</b> There are not any law-based protected areas regarding landscape nearby project area, however the alignment is passing through MFNP and KWR where the tourists enjoy natural landscape, and some adverse impacts are expected during and after construction of bridge and approach road due to tree cutting, alternation of land and appearance of structures.
	25	Gender	✓	✓		<b>Construction phase:</b> Potential risk of sexual crimes will be increased if the population influx as construction workers from outside of the local community is caused. <b>Operation phase:</b> No impact is expected because no activities which may give adverse impacts on this item is planned.
	26	Right of children	✓	✓		<b>Construction phase:</b> According to the Uganda National Household Survey (2019/2020), a statistical report prepared by UBOS, approximately 18% of children between the ages of 5 and 17 are engaged in child labor in Uganda. Therefore, there is a possibility that child labours may be hired to do simple works on construction and/ or quarry sites. <b>Operation phase:</b> No impact is expected because no activities which gives adverse impacts on this item is planned.
	27	Infectious diseases	✓	✓	✓	<b>Construction phase:</b> Infectious diseases such as Sexual Transmitted Diseases (STDs) are possible to be spread due to the influx of construction workers. Furthermore, alteration to ground by cut land and filling may trigger the formation of habitats for mosquitoes that possibly transmit malaria. <b>Operation phase:</b> Insufficient drainage maintenance may provide a habitat of carrier mosquito.
C	28	Labor environment	✓	✓		<b>Construction phase:</b> Construction work environment needs to be considered in accordance with relevant laws and regulations Uganda. <b>Operation phase:</b> No impact is expected because no activities which may give adverse impacts on this item is planned.
						<b>Construction phase:</b> Accidents related to the construction of access road and bridge,

Area	No	Impacted Item (based on Uganda Items and JICA Guidelines) *1	Item to be surveyed	Expected Adverse Impacts at scoping stage		Reasons of the Rating
				Pre/ During Construction	Operation Phase	
	29	Accidents	✓	✓		and the operation of quarry site and/or borrow pits, as well as traffic accidents related to the operation of construction vehicles may increase. In the traffic-controlled area of construction works, ordinary vehicles can cause traffic accidents. <b>Operation phase:</b> On the Karuma Bridge and approach road, traffic accidents are expected to be reduced compared to the current situation due to improved alignment, although passing speed will increase, On the other hand, implementation of safety measures such as traffic speed limits is expected to further reduce accidents.
	30	Cross boundary impacts and climate change	✓	✓	✓	<b>Construction phase:</b> Operation of construction machines and construction of structures generates GHGs. <b>Operation phase:</b> Although the road length will be slightly extended, the traveling speed will increase due to the improvement of the road alignment and gentle slope, hence it is predicted that there may be a slight change in the amount of GHGs generated during operation.

Note) ✓: Some activities are factors of adverse impacts and it is necessary to conduct survey and analysis:

No mark: There are no activities which gives adverse impacts on the item, thus surveys and analysis is not necessary

\*1: Items to be surveyed and analysed : Items are selected from JICA Guidelines for Environmental and Social Considerations 2010 and The National Environment (Environmental and Social Assessment) Regulations, 2020.

\*2: Existing borrow pit, quarry site, batching plant site and base-camp site will be used under this project, thus new ESIA is not necessary for development such sites. However, if the Contractor develops new site, the Contractor shall obtain necessary environmental permission.

Source: JICA Survey Team

## 5.2.2. Baseline Survey and Forecast Methodology

The expected baseline survey and analysis methodologies are shown below.

**Table 5.2.3 Baseline Survey and Analysis Methodology**

Category	No.	Impacted Item on JICA Guidelines and Uganda	Survey Item and Methodology	Forecast Methodology
Pollution	1	Air pollution	(1) Site measurement: 4 points (2) Item: 1) TSP, 2)PM10, 3)PM2.5, 4)Carbon dioxide (CO <sub>2</sub> ), 5)Carbon monoxide (CO), 6)Hydrocarbons, 7)Nitrogen oxides (NO <sub>x</sub> ), 8)Nitrogen dioxide (NO <sub>2</sub> ), 9)Sulphur dioxide (SO <sub>2</sub> ), 10)Sulphur trioxide (SO <sub>3</sub> ), 11)Smoke, 12)Soot (3) Methodology: follow relevant regulations in Uganda, if any (4) Frequency: One time (in dry season) Note: Collection of Secondary data, if any	Quantitative forecast Puff Model Or refer to other examples
	2	Water pollution	(1) Site measurement (3 points at proposed bridge point and each bridge (up/down stream) x <b>2 seasons (rainy and dry season)</b> = 6 measurements) WQ-1: Upstream of Karuma bridge, WQ-2: At current Karuma Bridge (2) Item: 1)BOD, 2)temperature, 3)E-coli form, 4)Total dissolved solids, 5)Total hardness(as CaCO <sub>3</sub> ), 6)Aluminium (Al), 7)Chloride (Cl), 8)Total Iron (Fe), 9)Sodium (Na), 10)Sulphate (SO <sub>4</sub> ), 11)Zinc (Zn), 12)Magnesium (Mg), 13)Calcium (as Ca), 14)Potassium (K), 15)Colour (TCUa), 16)Turbidity (NTU), 17)pH, 18)Conductivity (µS/cm), 19) Dissolved Oxygen (3) Methodology: follow relevant regulations in Uganda, if any (4) Frequency: Twice (rainy and dry season) Note: Secondary data collection, if any	Qualitative / Quantitative forecast
	3	Waste	(1) Site survey: Inquire of location of the registered/designated land fill site near project site. (2) Item: Summary of the site (3) Methodology: Interview and visual observation (4) Frequency: Once Note: Secondary data collection, if any	Qualitative forecast
	4 and	Soil contamination Sedimentation quality	(1) Site Survey: Excavation point 2 points SQ-1: South side on the alignment, SQ-2: North side on the alignment	Qualitative forecast

Category	No.	Impacted Item on JICA Guidelines and Uganda	Survey Item and Methodology	Forecast Methodology
	8		(2) Item: 1) Cadmium, 2) Hexavalent chromium, 3) Mercury, 4) Lead, 5) Arsenic, 6) Cyanide, 7) Selenium, 8) Fluorine, 9) Boron (3) Methodology: follow relevant regulations in Uganda, if any (4) Frequency: Once Note: Secondary data collection, if any	
	5	Noise and Vibration	(1) Site measurement: 7 points for Noise, 2 points for vibration (2) Item Ambient Noise: $L_{Aeq}$ Continuous 24hr/weekday, traffic volume and speed Ambient Vibration: 24hr/weekday (3) Methodology: follow relevant regulations in Uganda, if any (4) Frequency: Once (in dry season, if possible) Note: Secondary data collection, if any	Quantitative forecast
	6	Ground subsidence	Not required.	-
	7	Odor	(1) Site survey: location of the base camp and Karuma TC. (2) Item: Condition of odour (3) Methodology: On-site survey (4) Frequency: Once (in dry season, if possible)	Qualitative forecast
Natural environment	9	Protected area	(1) Site survey: 500m each alongside of the bridge and approach road. Bird survey area is surveyed within 1km by using a telescope by point census. *Geographic map, River distribution map, vegetation map are surveyed for 5km range each from the bridge and approach road	Qualitative forecast
	10	Ecosystem	(2) Item: Fauna and flora, ecosystem, valuable species such as listed species on IUCN list Fauna: mammals, birds, reptiles, amphibians, aquatic life, insects Flora: Land plants and aquatic plants Especially following valuable species listed up from IUCN Red list shall be surveyed on their habitats such as feeding area, roosting area, breeding area and migration routes for 1) African Elephant, 2) Hippopotamus, 3) Buffalo and 4) Nile Crocodile (3) Methodology a) Fauna: On site survey (Transect Survey and other necessary method such as geometry survey, drone survey and fixed-point camera observation for mammals, if necessary, Trace survey, interview survey, Point Census for Birds) b) Flora: On site survey (Transect Survey and other methodology) The observed coordinates for all observed IUCN species shall be recorded. c) home range survey for valuable species (methodology as shown in a) d) Preparation of maps regarding with habitat category 1) Geographic map: On site survey, literature survey (geographic map, satellite photo/ aerial photo etc.) 2) River distribution map (basin area): On site survey, literature survey (geographic map, satellite photo/ aerial photo etc.) 3) Vegetation map *1: On site survey, literature survey (geographic map, satellite photo/ aerial photo etc.) Remarks: Legends are classified by tropical high forest, woodland, bushland, grassland, seasonally wet grasslands, permanent wetlands (papyrus (including other sedges, reeds, and floating plants)), farmland, built up areas. *1 vegetation map are surveyed for 5km range each from the bridge and approach road. When creating a vegetation map within a 500m range, prepare a cross-sectional vegetation map by setting a quadrat for each classification of vegetation. (4) Frequency: One time (In dry and rainy seasons (Twice) but it must cover migration season of birds) Note: Secondary data collection, if any. Interview with wildlife specialists such as Makerere Univ., and/or UWA	
	11	Hydrology	Refer to hydrology survey results by JICA Survey Team (JST) (Flooding record survey, Hydrologic analysis)	
	12	Topography and geology	Refer to Topography and geology survey by JST (topographic and geological survey)	
So	13	Involuntary resettlement	Not required. (But if land acquisition and resettlement for the development of new quarry	Not required. (Qualitative forecast)

Category	No.	Impacted Item on JICA Guidelines and Uganda	Survey Item and Methodology	Forecast Methodology
			and/or borrow pit sites are required, the additional surveys are necessary.)	
	14	Poverty group	Refer to the result of survey on No. 17 Local economy such as employment and livelihood	Qualitative forecast
	15	Ethnic group	(1) Site Survey: Karuma TC, Diima SC, and Kamdini SC (2) Item: Census, tribe, and religion (3) Method: Social condition survey through interviews (250 samples) (4) Frequency: Once Note: Secondary data collection, if any	Qualitative forecast
	16	Local economy such as employment and livelihood	(1) Site Survey: Karuma TC, Diima SC, and Kamdini SC (2) Item: Census, income, expenditure, education, occupation, literacy, etc. (3) Method: Social condition survey through interviews (250 samples) and collection of statistical data (4) Frequency: Once Note: Secondary data collection, if any	Qualitative forecast
	17	Land use and utilization of local resources	(1) Site Survey: in/around MFPN and KWR (2) Item: Agricultural land use, fishing point, etc. (3) Method: Visual observation, interviews and collection and/or updating of the land use map (4) Frequency: Once Note: Secondary data collection, if any	Qualitative forecast
	18	Water usage	(1) Site survey: 500m range along the alignment and bridge (2) Item: - Clarification of river water utilization and well points - Water quality of underground water (pH, BOD, Total Coliform, Conductivity, Temperature and water level of well) (3) Methodology: Visual Survey and water quality analysis (4) Frequency: twice ( <b>Rainy and Dry Season, if there are any well in the 500 m range from project area</b> ) Note: Secondary data collection, if any	Qualitative forecast
	19	Existing social infrastructures and services	(1) Site survey: 500m range along the alignment and bridge (2) Item: Distribution of hospital, school, religious place, community centre, bus stop (bus terminal), etc. (3) Methodology: Visual observation, interviews and confirmation on map (4) Frequency: Once Note: Secondary data collection, if any	Qualitative forecast
	20	Social institutions such as social infrastructure and local decision-making institutions	(1) Site survey: 500m range along the alignment and bridge (2) Item: Distribution of houses, hospital, school, religious place, community centre, etc. (3) Methodology: Visual observation, interviews and confirmation on map (4) Frequency: Once Note: Secondary data collection, if any	Qualitative forecast
	21	Unequal distribution of benefit and damage	(1) Site survey: Karuma TC, Diima SC, and Kamdini SC (2) Item: Inhabitants preference during public project (3) Methodology: Interview by local representatives and/or collection of opinion in stakeholder meetings (4) Frequency: Once	Qualitative forecast
	22	Local conflict of interests	Refer to the result of survey on No. 21 Unequal distribution of benefit and damage	Qualitative forecast
	23	Cultural heritage	(1) Site survey: 500m range along the alignment (2) Item: Distribution of cultural sites (including spiritual places and objects) and historical/ archaeological sites (3) Methodology: Interview and confirmation on site (including test pit excavation) (4) Frequency: Once Note: Secondary data collection, if any	Qualitative forecast
	24	Landscape	(1) Site survey: Inquire major site seeing points (2) Item: View and factor(s) of landscape (3) Methodology: Taking photograph with geotag (4) Frequency: Once (in Dry Season, if possible)	Photomontage
	25	Gender	(1) Site survey: Karuma TC, Diima SC, and Kamdini SC (2) Item: Current issues observed regarding gender gaps (3) Methodology: Interview with relevant organizations and collection of opinions in stakeholder meetings	Qualitative forecast

Category	No.	Impacted Item on JICA Guidelines and Uganda	Survey Item and Methodology	Forecast Methodology
			(4) Frequency: once Note: Secondary data collection, if any	
	26	Right of children	(1) Site survey: Karuma TC, Diima SC, and Kamdini SC (2) Item: Problems regarding children's right (3) Methodology: Interviews with relevant organizations and collection of opinions in stakeholder meetings (4) Frequency: once Note: Secondary data collection, if any	Qualitative forecast
	27	Infectious diseases	(1) Site survey: Karuma TC, Diima SC, and Kamdini SC (2) Item: Number of patients and mortal case of infection diseases (3) Methodology: Interview with relevant organizations and/or refer to social condition surveys (4) Frequency: Once Note: Secondary data collection, if any	Qualitative forecast
	28	Labor environment	(1) Site survey: Surrounding area of the existing Karuma bridge (2) Item: accident during construction (3) Methodology: Interview with relevant organizations and/or observation at construction area (4) Frequency: once Note: Confirmation of laws, regulations in Uganda and IFC standards regarding labours	Qualitative forecast
Others	29	Accident	(1) Site survey: Surrounding area of the existing Karuma bridge (2) Item: number and reasons of traffic accidents (3) Methodology: Interviews with police office and local authorities (4) Frequency: once Note: Secondary data collection, if any	Qualitative forecast
	30	Cross boundary impacts and climate change	Refer to Traffic forecast survey result by the JST (Number of construction machines, Traffic forecast survey result, emissions Intensity etc.)	Quantitative forecast (based on the length of approach road and bridge)

Note) Rating:

Note) ✓: Some activities are factors of adverse impacts and it is necessary to conduct survey and analysis:

No mark: There are no activities which gives adverse impacts on the item, thus surveys and analysis is not necessary

\*1: Items to be surveyed and analysed : Items are selected from JICA Guidelines for Environmental and Social Considerations 2010 and The National Environment (Environmental and Social Assessment) Regulations, 2020 (schedule 2).

\*2: Existing borrow pit, quarry site, batching plant site and base-camp site will be used under this project, thus new ESIA is not necessary for development such sites. However, if the Contractor develops new site, the Contractor shall obtain necessary environmental permission.

Source: JICA Survey Team

## CHAPTER 6      IMPACT      AND      RISK      ASSESSMENT      AND MITIGATION MEASURE

### [Summary of the Chapter 6]

Based on the scoping analysis, this chapter presents the results of the baseline surveys for negatively impacted items, impact forecasts, consideration of the need for mitigation measures and the impact evaluations. The items covered include 5 pollution items such as air quality, water quality, noise and vibration, three natural environment items such as flora and fauna, 17 social items such as the poverty group and cultural heritage, and 2 other items such as global warming. For air quality (PM, NO<sup>2</sup>, SO<sup>2</sup>, etc.), noise and vibration (construction noise and vibration, traffic noise and vibration during service) and water quality (turbid water during construction), a quantitative predictive analysis was carried out to compare with Ugandan and international standards.

No significant impacts are predicted for any of these items and negative impacts are expected to be minimized through the implementation of general mitigation measures.

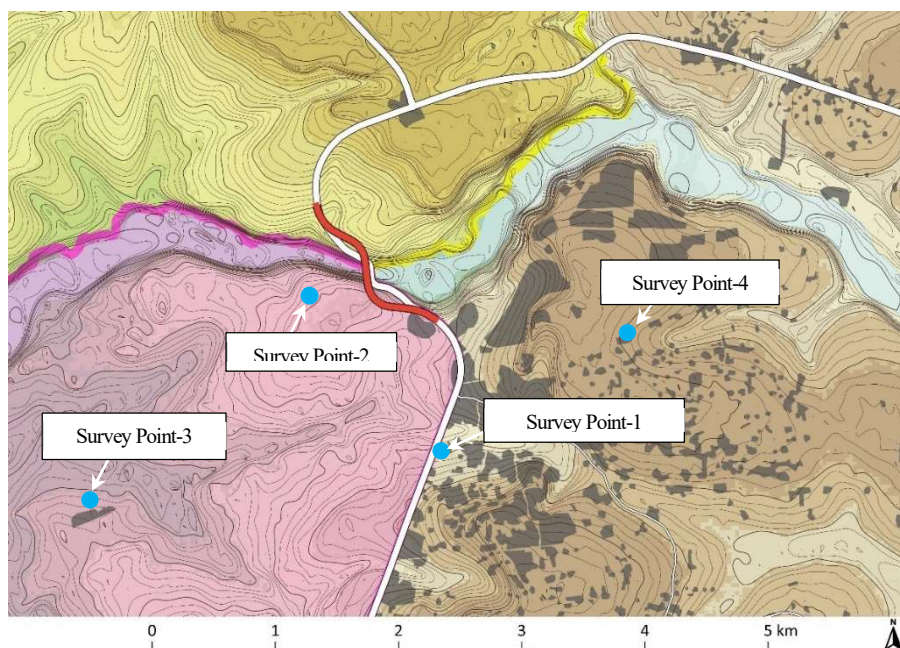
### 6.1.      **Pollution**

#### 6.1.1.      **Air Pollution**

##### (1)      Result of Baseline Survey

##### 1)      Survey Point

In order to obtain the ambient air quality status, air measurement was carried out at 4 points shown in Figure 6.1.1.



Source: JICA Survey Team

Note: Air-1: 36N 415989.39 m E, 246481.68 m N, Air-2: 36N 414980.01 m E, 247690.21 m N  
Air-3: 36N 413217.40 m E, 246128.63 m N, Air-4: 36N 417499.59 m E, 247407.36 m N

**Figure 6.1.1 Air Measurement Locations**



## 2) Result of Measurement

The measured data for air quality is shown in the next table.

Measured values on PM10, PM2.5, CO, NO2, SO2 and CO2 satisfied the Ugandan standards.

**Table 6.1.1 Monitoring Date of Air Quality (February 3<sup>rd</sup> – 6<sup>th</sup>, 2024)**

Parameter Location (measured date)		PM <sub>10</sub> (particulate matters 10µm) Average for 24hrs [µg/m <sup>3</sup> ]	PM <sub>2.5</sub> (particulate matters 2.5µm) Average for 24hrs [µg/m <sup>3</sup> ]	CO (Carbon Monoxide) Average for 24hrs [ppm]	NO <sub>2</sub> (Nitrogen Dioxide) Average for 24hrs [ppm]	SO <sub>2</sub> (Sulphur Dioxide) Average for 24hrs [ppm]	CO <sub>2</sub> (Carbon Dioxide) Average for 24hrs [ppm]
Air-1 (February 4 <sup>th</sup> , 2024) Along Kampala-Gulu Highway, on the Kiryandongo side (Approximately 1.5km from the existing Karuma Bridge site)		26	21	1.10	0.0025	<0.01	<0.001
Air-2 (February 5 <sup>th</sup> , 2024)*4 Within Karuma Wildlife reserve (Approximately 500m from the existing Karuma Bridge site)		23	19	1.08	<0.01	<0.01	<0.001
Air-3 (February 6 <sup>th</sup> , 2024)*4 Within Karuma Wildlife reserve close to the Sino Hydro Power outflow (Approximately 1.1km from the existing Karuma Bridge site)		25	20	1.04	<0.01	<0.01	<0.001
Air-4 (February 3 <sup>rd</sup> , 2024) Awoo cell, Central ward, Karuma Town Council, Kiryandongo district (Approximately 1.0km from the existing Karuma Bridge site)		25	22	1.06	<0.01	<0.01	<0.001
Standard	Uganda Standards*1	60µm /m <sup>3</sup> (24 hrs)	35µm /m <sup>3</sup> (24 hrs)	7mg/m <sup>3</sup> (24 hrs) (Converted value: 6ppm)	50µm /m <sup>3</sup> (24 hrs) (Converted value: 0.026ppm)	20µm /m <sup>3</sup> (24 hrs) (Converted value: 0.008ppm)	60µm /m <sup>3</sup> (24 hrs)
	IFC Standards *2	150µm /m <sup>3</sup> (24hrs)	75µm /m <sup>3</sup> (24hrs)	Not Specified	200µm /m <sup>3</sup> (1hrs) (converted value 0.1ppm)	125µm /m <sup>3</sup> (24hrs) (converted value 0.05ppm)	Not Specified
Reference Standard	Japanese Standards*3	SPM 0.10mg/m <sup>3</sup> (24hrs) (converted value 100µm /m <sup>3</sup> )	-	10 ppm (24hrs)	0.04-0.06ppm (24hrs)	0.04ppm (24hrs)	Not Specified

Source: \*1: The National Environment (Air Quality Standards) Regulations (NEMA, 2024)

\*2: Environmental, Health, and Safety General Guidelines (IFC, April 30<sup>th</sup>, 2007)

\*3: Environmental Quality Standards in Japan - Air Quality 1973

Note: \*4: In Air-2 and Air-3, the monitoring was conducted 12 hours from 7:00 am to 7:00pm.

Air-1: 36N 415989.39 m E, 246481.68 m N

Air-2: 36N 414980.01 m E, 247690.21 m N

Air-3: 36N 413217.40 m E, 246128.63 m N

Air-4: 36N 417499.59 m E, 247407.36 m N

## (2) Potential Impacts

### 1) During Construction

Temporary negative impacts on air quality are expected due to operation of construction machines and equipment.

### 2) After Construction

Negative impact by the project is not expected since the construction and operation of new bridge does not increase traffic number. However, the natural increase in traffic number in

the future is expected and travelling speed will be increased, thus the updated traffic condition will be surveyed, and impact based on updated data will be forecasted and analysed.

### (3) Impact Forecast

#### 1) During Construction

Exhaust gases, including CO, NO<sub>2</sub>, SO<sub>2</sub> and PM, are discharged from construction machines and may cause impact on the nearby residential area. However, this adverse impact is not serious because of the following reasons:

- Operation time is within a limited duration and only at daytime.
- The potential for dust generation is generally limited to occur most frequently during periods of high winds or extreme dry periods.
- Earthworks section and number of construction machines are limited so that the contribution of the air contaminant emissions during construction is likely to represent a very small fraction.
- Residential area is not observed near the construction area.

#### 2) After Construction

##### a) Location of Forecast Point and Traffic Volume

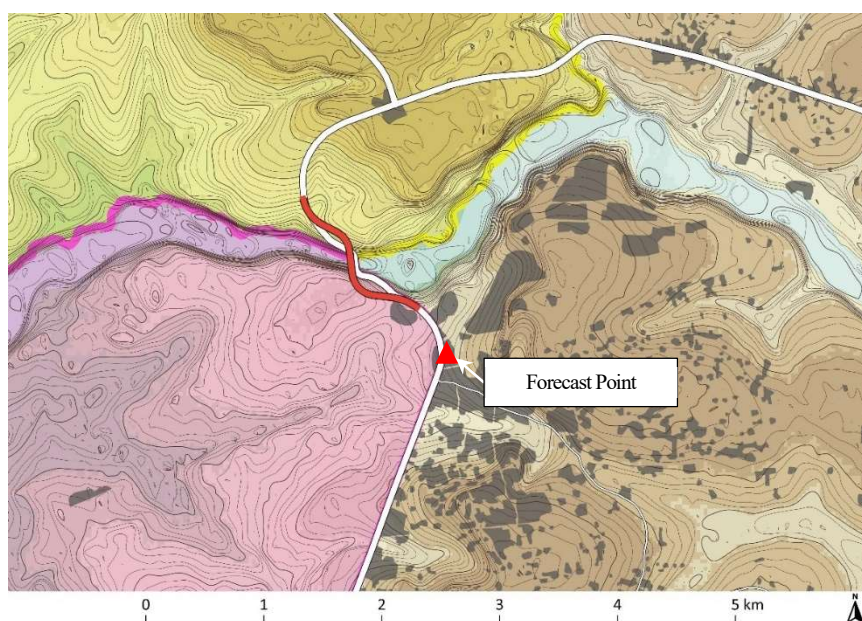
Natural increase of traffic volume will give a degree of adverse impacts on air quality.

The Puff model, which is widely used in the analysis of air pollution in Japan, is adopted for quantitative analysis in this case. Forecast point at the boundary of ROW is selected for the prediction of air pollution. The traffic volumes at each section are shown in Table 6.1.2, and the location of forecasts are shown in Figure 6.1.2.

**Table 6.1.2 Traffic Volume at Forecasted Points after Construction**

Location	Traffic Volume/ Average Speed	Future's Traffic Volume
		With Project Case (2030) Number a day
Along Kampala-Gulu Highway	Small	2,508
	Large	1,728
	Total	4,236
	Design Speed (km/h)	40 km

Source: JICA Survey Team



Source: JICA Survey Team

**Figure 6.1.2 Air and Noise and Vibration Forecast Locations**

b) Result of Forecast

[Methodology of the Air Quality Forecast]

The Puff model is used to predict the road-contributed density. The formulation of the Puff model does not include wind velocity; it means that the baseline data for daily average wind speed with direction for 365 days are not necessary. In the remote area in Uganda, such statistical data is not available. Additionally in general, the result of analysis by the Puff model is safer side than plume model.

Followings are formulation of puff model methodology. It does not include a parameter regarding wind speed.

$$C(x, y, z) = \frac{Q}{(2\pi)^{3/2} \cdot \alpha^2 \cdot \gamma} \left\{ \frac{1 - \exp\left(-\frac{\ell}{t_0^2}\right)}{2\ell} + \frac{1 - \exp\left(-\frac{m}{t_0^2}\right)}{2m} \right\}$$

$$\ell = \frac{1}{2} \cdot \left\{ \frac{x^2 + y^2}{\alpha^2} + \frac{(z - H)^2}{\gamma^2} \right\}, \quad m = \frac{1}{2} \cdot \left\{ \frac{x^2 + y^2}{\alpha^2} + \frac{(z + H)^2}{\gamma^2} \right\}$$

$C(x, y, z)$  : Forecasted value at the point  $(x, y, z)$   
 $Q$  : Emission volume from the pollution source (ml/s or mg/s)  
 $H$  : Height of emission source (m)  
 $\sigma_{y, z}$  : Horizontal and vertical diffusion width (m)  
 $x$  : Leeward distance (m)  
 $y$  : Horizontal distance perpendicular to the X axis (m)  
 $z$  : Vertical distance perpendicular to the X axis (m)  
 $t_0$  : Time equivalent to initial diffusion width (s)  
 $\alpha, \gamma$  : Coefficient for diffusion width

[Result of Forecast on the Air Quality]

The result of quantitative forecast is shown below. Forecasted values on PM10, CO, NO2 and SO2 satisfy the adopted Ugandan standard level.

**Table 6.1.3 Result of Quantitative Forecast on Air Quality after Construction**

Point		Forecast Point-1 ROW Boundary (15m from the centreline)		Standard (☐: Adopted standard)		
Parameter		Background (BG)	Forecasted Value with BG	Uganda*1	IFC*2	Japanese*3
PM <sub>10</sub> (μg/m <sup>3</sup> )	Average for 24hrs	26	26.0322	<b>60 μg/m<sup>3</sup> (24hrs)</b>	150 μg/m <sup>3</sup> (24hrs)	Converted value: 107 μg/m <sup>3</sup> (24hrs)
CO (ppm)	Average for 24hrs	1.1	1.1038	<b>7 mg/m<sup>3</sup> (24hrs)</b> (Converted value: 6 ppm)	Not Specified	10ppm (24hrs)
NO <sub>2</sub> (ppm)	Average for 24hrs	0.0025	0.0031	<b>50 μg/m<sup>3</sup> (24hrs)</b> (Converted value: 0.026ppm)	200 μg/m <sup>3</sup> (1hr) (Converted value:0.1ppm)	0.04-0.06ppm (24hrs)
SO <sub>2</sub> (ppm)	Average for 24hrs	<0.001	≤0.00102	<b>20 μg/m<sup>3</sup> (24hrs)</b> (0.008ppm)	125 μg/m <sup>3</sup> (24hrs) (Converted value: 0.05ppm)	0.04ppm (24hrs)

Source: JICA Survey Team

Note:\*1: The National Environment (Air Quality Standards) Regulations (NEMA, 2024)

\*2: Environmental, Health, and Safety General Guidelines (IFC, April 30<sup>th</sup>, 2007)

\*3: Environmental Quality Standards in Japan - Air Quality 1973

☐: Adopted Standard

(4) Mitigation Measures

1) During Construction

It is expected that the degree of impacts such as dust from construction area is not serious. However, appropriated mitigation measures shall be implemented as shown below:

- ✓ Water sprinkling shall be carried out on earth construction road and construction yard near the residential area. Additionally, surface treatment of the earth road should be considered if required.
- ✓ Periodical cleaning shall be done on paved road used as construction road.

2) After Construction

- ✓ The forecasted values are not exceeding Ugandan Standards, thus mitigation measures are not required.

(5) Evaluation

1) During Construction

Exhaust gases and dusts are generated during construction. However, the adverse impact is not serious because the residential area is away from the major earthwork area. Furthermore, mitigation measures such as sprinkling water and surface treatment is implemented when there is impaction of dust on the nearest residential and commercial areas.

2) After Construction

Air quality density will increase after construction due to the natural increase in traffic number in the future. However, air quality values on PM10, CO, NO2 and SO2 will increase

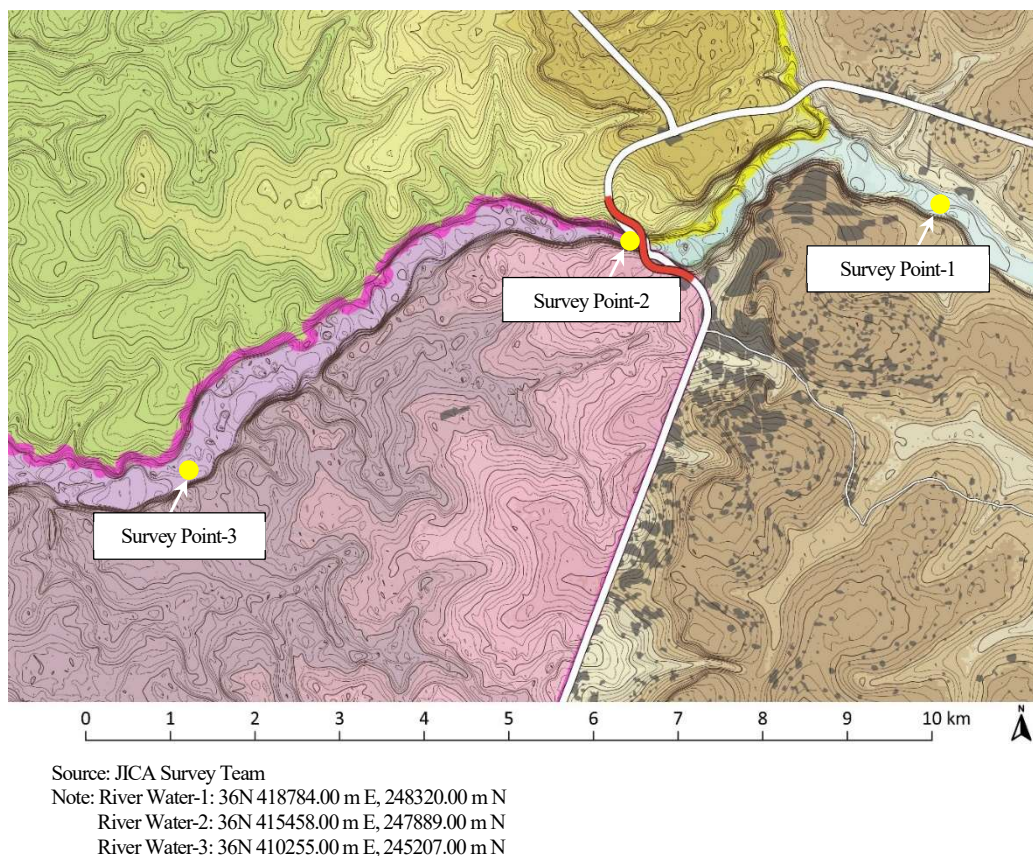
slightly, and these forecasted values satisfy the relevant standards values. Thus, it is evaluated that the project does not give serious impacts on air quality.

### 6.1.2. Water Quality

#### (1) Result of Baseline Survey

##### 1) Survey Points

Three (3) measurement points for water quality are shown in Figure 6.1.3.



**Figure 6.1.3 River Water Quality Sampling Points**

##### 2) Result of Measurement

The measured data for water quality is shown in Table 6.1.4.

pH, Turbidity, Total Dissolved Solids, Suspended Solids (SS), Biochemical Oxygen Demand (BOD), Conductivity and E-Coliform satisfy the Uganda and Japanese standards. However, only Dissolved Oxygen at Survey Point-2 during rainy season survey is below Japanese standards.

This may be due to the fact that floating plants, such as water hyacinths, which are carried downstream from the upstream during the rainy season due to increased flow, stay and flourish on the surface of the Karuma Dam embankment, suppressing photosynthesis in the water and releasing water with low DO concentration into the downstream portion of the dam.

**Table 6.1.4 Monitoring Date of River Water Quality (Nov. 22<sup>nd</sup>, 2023 and Feb. 5<sup>th</sup>, 2024)**

Location \ Parameter		pH [no unit]	Turbidity [NTU]	Total Dissolved Solids [mg/l]	SS (Suspended Solids) [mg/l]	BOD (Biochemical Oxygen Demand) [mg/l]	Conductivity [μS/cm]	Dissolved Oxygen [mg/l]	E-coli form [CFU/100 ml]
River Water-1 River Nile at Upstream of Karuma HPP Dam Site	Rainy Season (November. 22 <sup>nd</sup> , 2023)	6.5	4.2	75	13	3.0	107	5.5	210
	Dry Season (February. 5 <sup>th</sup> , 2024)	7.4	3.1	86	17	2.0	123	7.0	310
River Water-2 River Nile at Karuma Bridge	Rainy Season (November. 22 <sup>nd</sup> , 2023)	6.9	5.1	72	9	3.8	103	1.8 (exceeding)	340
	Dry Season (February. 5 <sup>th</sup> , 2024)	7.5	4.3	85	10	3.0	122	4.8	133
River Water-3 River Nile at Outlet of the Karuma HPP	Rainy Season (November. 22 <sup>nd</sup> , 2023)	6.7	4.8	73	12	5.0	104	2.8	45
	Dry Season (February. 5 <sup>th</sup> , 2024)	7.0	4.7	86	15	3.0	123	4.0	21
Standard	Uganda*1	5.5-9.5	25	1,500	NA	NA	2,500	NA	NA
Reference Standard	Japan*2	6.5-8.5	NA	NA	100	8	NA	≥2	NA

Source: \*1: Draft Portable waters standards as per the Uganda draft standard for portable water 2014 (Untreated/Natural portable Water Limits)

\*2: Ministry of Environment in Japan (River Water Quality / Category D River)

Note: River Water-1: 36N 418784.00 m E, 248320.00 m N

River Water-2: 36N 415458.00 m E, 247889.00 m N

River Water-3: 36N 410255.00 m E, 245207.00 m N

## (2) Potential Impacts

### 1) During Construction

Turbid water may be generated by earthworks and unpaved area. Additionally, organic polluted water may be discharged from the base camp.

### 2) After Construction

Basically, no impacts are expected due to lack of plans regarding service area and parking along the bridge and approach road.

## (3) Impact Forecast

### 1) During Construction

Forecasted result on turbid water generated by earthworks during construction is shown in Table 6.1.5. With regards to the impacts on organic polluted water from the base camp, such impact will be avoided and /or mitigated by appropriate management.

**Table 6.1.5 Forecasted Impacts Regarding Water Quality During Construction**

Impacts	Parameter	Forecast Condition	Forecasted Impacts	Standard (□: Adopted standard)	
				Uganda	Japan
Impacts on earthwork and unpaved area	Run off turbid water from unpaved area after raining	Unpaved area max. 40,000 m <sup>2</sup>	Current SS: 10 mg/l Forecasted SS: 10.10mg/l (* 1.01% increase)	NA	100

Source: \*1: Draft Portable waters standards as per the Uganda draft standard for portable water 2014 (Untreated/Natural portable Water Limits)

\*2: Ministry of Environment in Japan (River Water Quality / Category D River)

## 2) After Construction

No adverse impacts are expected due to no-activities which discharges polluted water from project facilities. However, continuous management and control on prevention of the illegal dumping into the river shall be conducted as a mitigation measures.

## (4) Mitigation Measures

### 1) During Construction

- ✓ Turbid water from unpaved construction area shall be treated in sedimentation pond and discharged into the river, if required.
- ✓ Waste oil of construction machines shall be stored and disposed through a licensed agent.
- ✓ Construction machines shall be maintained so as not to leak oil in the base camp site and construction site.
- ✓ Sanitation facilities at base camps and construction yard shall be provided. Also, the location of camps should avoid water sources such as springs and wells.
- ✓ Domestic wastewater and night soil from base camp shall be treated and discharged to designated site and facilities.
- ✓ Septic tank for portable toilet and temporary toilet in the construction area and yard shall be used.

### 2) After Construction

Any mitigation measures are not required as no impacts are expected.  
Although the impact is not expected, illegal dumping in the rivers shall be monitored.

## (5) Evaluation

During construction, turbid water is caused by construction in the area. However, forecasted impact by the project is only 1%. In addition, there is no construction work in the river. Thus, it is assumed that such negligible impacts will not cause significant impacts in the downstream.

Additionally, organic polluted water from labor camp site will be managed by contractor under observation of supervision consultant and the proponent. Thus, the impacts are prevented appropriately. Therefore, it is unlikely to give significant impacts on water quality during and after construction.

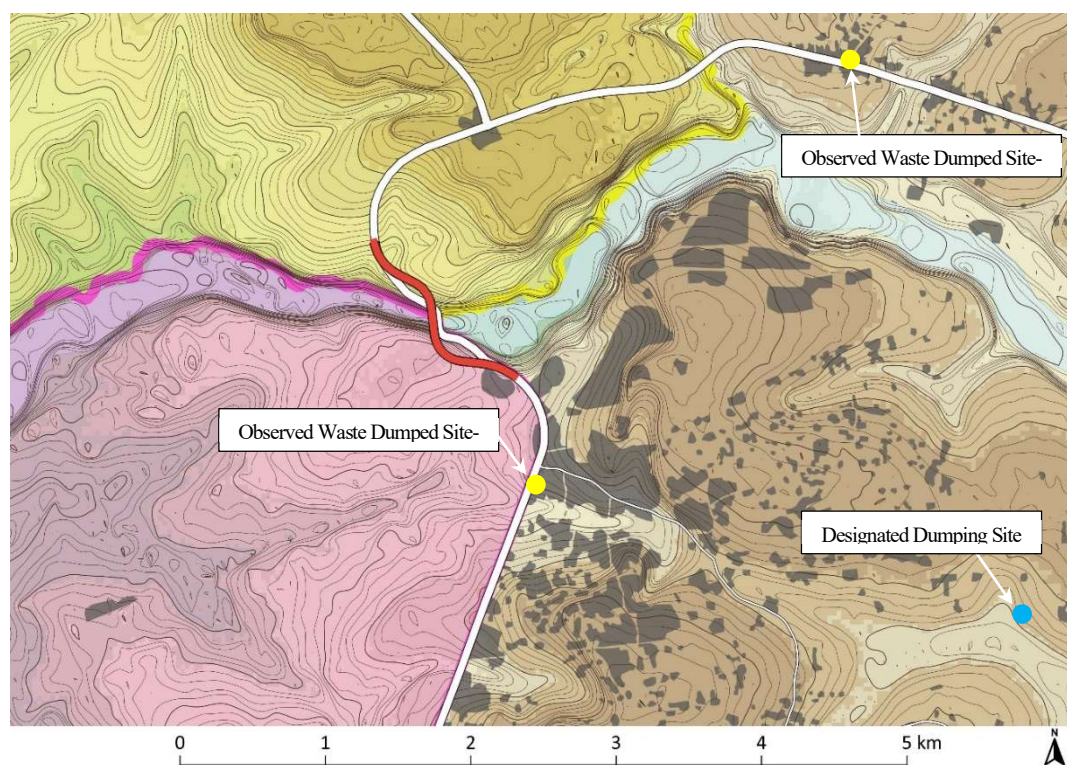


### 6.1.3. Waste

#### (1) Result of Baseline Survey

According to interviews with villagers, in the project area such as in Karuma TC and Kamdini SC, domestic waste management is either waste disposal into a compost pit, burned, or buried. The wastes are collected by designated *tuku tuku* operators and transported and disposed to the designated dumping site as shown in the Figure 6.1.4. However, the currently some wastes are illegally left along the road or illegally burned or dumped in the backyard of household randomly. Some identified illegal waste dumping site are also shown in the Figure 6.1.4. The observed condition of designated dumping site and illegal dumped wastes are shown in Table 6.1.6.

Sewage and night soil is treated through septic tank and pit latrines. With regard to construction waste, such as waste soil, it is generally disposed of in the designated site such as borrow pit. For the concrete and cut trees, these can be used as construction materials in general. However, the cut trees inside of the MNFP and KWR are managed by UWA and mainly used as manure.



Source: JICA Survey Team

**Figure 6.1.4 Location Map of the Designated Dumping Site and Observed Waste Dumped Site Near the Project Area**

**Table 6.1.6 Current Condition of the Designated Dumping Site and Observed Waste Dumped Site Near the Project Area**

	
Designated Dumping Site	Designated Dumping Site
	
Designated Dumping Site	Designated Dumping Site
	
Observed Waste Dumped Site-1	Observed Waste Dumped Site-2

Source: JICA Survey Team

## (2) Potential Impacts

### 1) During Construction

Construction waste, such as waste soil and cut trees, is expected. Additionally, domestic waste and night soil may be generated from the construction base camp.

### 2) After Construction

No impacts are expected due to lack of plans regarding service and parking areas along the bridge and approach road.



### (3) Impact Forecast

#### 1) During Construction

The estimated waste volume for each item is shown below.

**Table 6.1.7 Estimated Waste in the Project Area during Construction**

Type of Waste		Estimated Generated Volume
1. Waste soil from earthwork	Cutting Section	25,781 m <sup>3</sup> / 3 years
	(Embankment) Reuse Volume	(-24,868) m <sup>3</sup> / 3 years
	Total	913 m <sup>3</sup> / 3 years
2. Cut trees <sup>Note1)</sup>		12,202 m <sup>3</sup> / 3 years
3. Domestic Waste from the Construction Camp	Domestic Solid Waste <sup>Note2)</sup>	260.6 ton/ 3 years
	Waste Water <sup>Note3)</sup>	21,900 kl/ 3 years
	Night Soil <sup>Note4)</sup>	547.5 ton/ 3 years

Note 1) Number of cut trees is 6,215 trees (DBH (Diameter at Breast Height=0.5m x Height 10m)

Note 2): 1.19 kg waste/person x number of labour 200/day in the camp site x 3 years = 260.6 ton for 3 years construction.

Note 3): 100 wastewater/person x number of labour 200/day in the camp site x 3 years = 21,900 kl for 3 years construction.

Note 4): 2.5 kg night soil / person x number of labour 200/day in the camp site x 3 years = 547.5 ton for 3 years construction.

Excavated soil regarding earthwork, cutting trees in the affected area and domestic waste from camp site are major wastes during construction. Excavated soil at pillars and cutting soil is estimated as app. 25,781 m<sup>3</sup>. 24,868 m<sup>3</sup> is reused as material for embankment, thus totally 913m<sup>3</sup> is generated as waste soil.

Cut trees are estimated at approx. 12,202 m<sup>3</sup>, and domestic waste, wastewater and night soil generated at the base camp for workers have an estimated volume of 260.6 tons/ 3 years, 21,900 kl /3 years and 547.5 tons /3 years respectively.

#### 2) After Construction

Since no offices and parking areas are planned for this project, in general, no waste is generated after construction. Thus, it is not likely to give adverse impacts on waste.

### (4) Mitigation Measures

#### 1) During Construction

##### **Construction waste (waste soil, cut trees and waste oil, hazardous material)**

- ✓ Waste soil from the cutting section is reused for embankment material for road section. However, Waste soil shall be disposed at the designated site, if such waste soil is generated from the construction area.
- ✓ Cut trees are used as manure, building materials and for other purposes.
- ✓ Waste oil from the construction machines is collected and disposed through a licensed agent.
- ✓ Waste chemicals and hazardous materials are stored at base camp site and disposed through a licensed agent.

##### **Domestic waste and night soil from base camp and offices**

- ✓ Domestic solid waste is collected and disposed at the nearest designated disposal site.
- ✓ Domestic wastewater and night soil shall be treated through septic tank or/and portable toilet and discharged into the natural stream or/and collected and disposed through a licensed agent.

2) After Construction

Although the impact is basically not expected, illegal dumping in the rivers shall be monitored.

(5) Evaluation

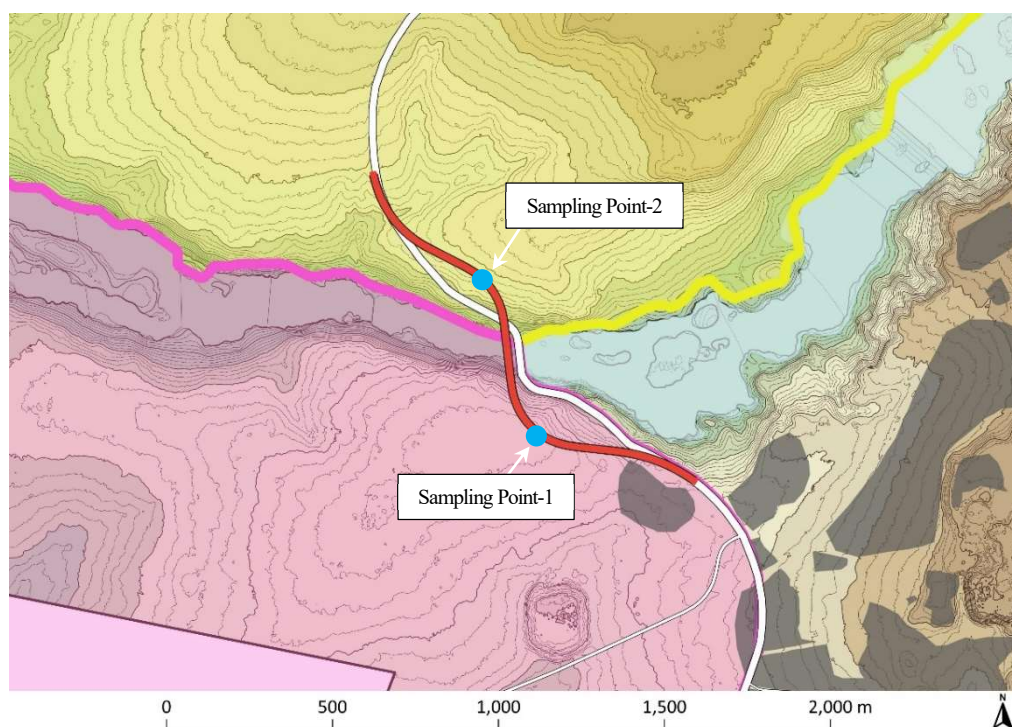
All construction waste and domestic waste generated are reused and/or disposed of following the implementation of mitigation measures. Thus, it is not likely to cause significant impacts on waste management.

#### 6.1.4. Soil Contamination and Sedimentation Quality

(1) Result of Baseline Survey

Soil sampling has been conducted at the point shown in Figure 6.1.5. The point is on the planned route and possibly excavated area for cutting. Because excavated soil may be polluted already.

Based on the result of the analysis shown in Table 6.1.8, all analysed indicators do not exceed standard values in Japan.



Source: JICA Survey Team

Note: SQ-1: 36N 415544.25 m E, 247670.03 m N, SQ-2: 36N 415360.41 m E, 248154.99 m N

**Figure 6.1.5 Soil Quality Sampling Points**

**Table 6.1.8 Result of Soil Analysis (November.12<sup>th</sup>, 2023)**

Item	Unit	Result		Referred Standard
		SQ-1	SQ-2	Japanese Standard*1
Arsenic	ppm (mg/kg)	<0.001	<0.001	150
Selenium	ppm (mg/kg)	<0.001	<0.001	150
Cyanide	ppm (mg/kg)	0	0	50
Hexavalent Chromium	ppm (mg/kg)	3.66	5.12	250
Mercury	ppm (mg/kg)	<0.001	<0.001	15
Fluorine	ppm (mg/kg)	1.2	2.2	4000
Boron	ppm (mg/kg)	0.23	1.66	4000
Lead	ppm (mg/kg)	0	0	150
Cadmium	ppm (mg/kg)	0	0	150

Note) \*1: Japanese Standard: Environmental Quality Standards for Soil Pollution, Ministry of Environment/1991

SQ-1: 36N 415544.25 m E, 247670.03 m N, SQ-2: 36N 415360.41 m E, 248154.99 m N

Source: JICA Survey Team

## (2) Potential Impacts

### 1) During Construction

Excavated soil on the site may be polluted. Stored construction materials, such as oil and chemicals, may pollute soil in the base camp. Leaking oil from construction machines may cause soil contamination.

### 2) After Construction

No impacts are expected as there is no plan regarding soil contamination. However, illegal dumping may cause soil contamination in conjunction with increase in influx.

## (3) Impact Forecast

### 1) During Construction

The estimated volume of waste soil from the project area is shown below. A total of 25,781 m<sup>3</sup> of waste soil is generated from excavation at pillars and cutting section. 24,868 m<sup>3</sup> is reused as material for embankment, thus totally 913m<sup>3</sup> is generated as waste soil from the project.

It is expected that excavated soil is not polluted since the current surface soil is not polluted. However, if soil is necessary to be brought to the project site from outside area, it may have a risk the soil is polluted and cause soil contamination.

**Table 6.1.9 Estimated Waste in the Project Area During Construction**

Type of Waste		Estimated Generated Volume
1. Waste soil from earthwork	Cutting Section	25,781 m <sup>3</sup> / 3 years
	(Embankment) Reuse Volume	(-24,868) m <sup>3</sup> / 3 years
	Total	913 m <sup>3</sup> / 3 years

Source: JICA Survey Team

In addition, risk such as leaking oil from construction machines may occur in the base camp site. Thus, appropriated mitigation measures are required.

### 2) After Construction

No impacts are expected as there is no plan regarding soil contamination.

(4) Mitigation Measures

1) During Construction

- ✓ Excavated soil shall be analysed, and it shall be confirmed if the quality is below standard values. Polluted soil shall be used as construction material or disposed/ or stored at the designated site after treatment if excavated soil is polluted.
- ✓ If soil is necessary to be brought from the outside of the project area, it shall be inspected not polluted before carrying into the project area.
- ✓ Construction machines shall be maintained so as not to leak oil in the base camp site.
- ✓ Waste oil of the construction machines is collected and disposed through a licensed agent.
- ✓ Waste chemical and hazardous material are stored at the base camp site and disposed through a licensed agent.

2) After Construction

Although not expected to have an impact, borrow soil from outside the project area for maintenance will be inspected for contamination before being brought into the project area.

(5) Evaluation

It is expected that the soil generated in the project area is not polluted based on soil analysis, thus soil contamination is not caused due to construction soil. However, construction soil generated in the project area after excavation and brought from outside is tested and confirmed during construction.

Leaking oil from construction machines and waste oil storage in the base camp may give negative impacts on the surrounding soil. However, appropriate management and implementation of mitigation measures minimize such risks.

6.1.5. Noise and Vibration

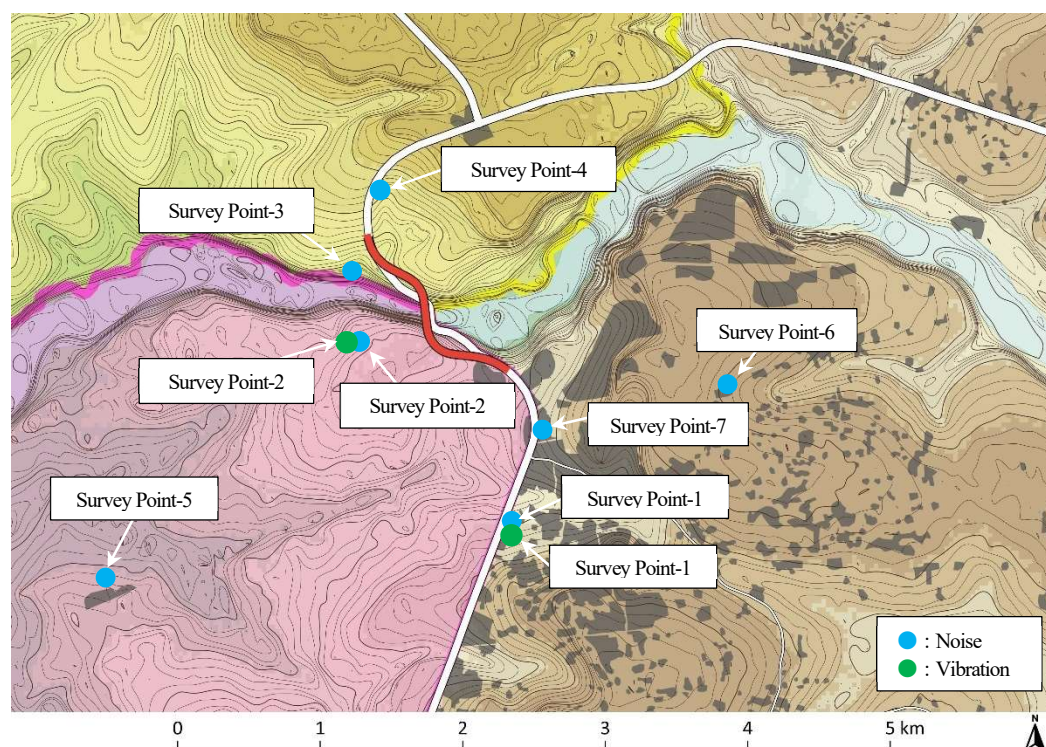
(1) Result of Baseline Survey

1) Noise

a) Survey Point

Baseline measurements have been conducted at 7 points as shown in Figure 6.1.6.

In order to obtain the ambient noise and vibration measurement is conducted along planned bridge and approach road to grasp the current situation.



Source: JICA Survey Team

Note: Noise-1: 36N 415989.39 m E, 246481.68 m N, Noise-2: 36N 415007.65 m E, 247706.28 m N,

Noise-3: 36N 415014.99 m E, 248164.53 m N, Noise-4: 36N 415030.66 m E, 248700.26 m N

Noise-5: 36N 413323.90 m E, 246064.13 m N, Noise-6: 36N 417469.93 m E, 247383.99 m N

Noise-7: 36N 417469.93 m E, 247383.99 m N

Vibration-1: 36N 415989.39 m E, 246481.68 m N, Vibration-2: 36N 414966.31 m E, 247722.91 m N

**Figure 6.1.6 Noise and Vibration Measurement Locations**

#### **b) Result of Measurement**

The range of value is 33 - 76 dB(A) in the daytime and 42 – 69 dB(A) in the night, respectively.

The monitoring results at six (6) sites in the project area meet Uganda's environmental standards. However, one site (Noise-7) exceeds the standard because it is a site where restaurants, stores, and bars are located, and economic activities are active from early morning to late at night.



**Table 6.1.10 Monitoring Date for Noise (February 3<sup>rd</sup> – 15<sup>th</sup>, 2024)**

Location		Survey Date	Daytime 6:00-22:00 dB(A)	Nighttime 22:00-6:00 dB(A)
Noise-1	Along Kampala-Gulu Highway, on the Kiryandongo side of the Bridge (Approximately 1.5km from the existing Karuma Bridge site)	February 4 <sup>th</sup> , 2024	57	50
Noise-2	Within Karuma wildlife reserve (Approximately 500m from the existing Karuma Bridge site)	February 5 <sup>th</sup> , 2024	33	Not measured*1
Noise-3	Close to the upstream side of River Nile, within Karuma Wildlife Reserve in Nwoya District. (Approximately 250m from the existing Karuma Bridge site)	February 8 <sup>th</sup> , 2024	50	Not measured*1
Noise-4	Along Kampala-Gulu Highway, on the Oyam-Nwoya side of Bridge (Approximately 400m from the existing Karuma Bridge site)	February 7 <sup>th</sup> , 2024	56	47
Noise-5	Within Karuma Wildlife reserve close to the outflow area (Sino Hydro control station) (Approximately 1.1km from the existing Karuma Bridge site)	February 6 <sup>th</sup> , 2024	48	Not measured*1
Noise-6	Point lies within the Awoo community. (Approximately 1.0km from the existing Karuma Bridge site)	February 3 <sup>rd</sup> , 2024	56	42
Noise-7	The point lies within the main Karuma trading centre approximately 5 meters from the Kampala-Gulu Highway	February 15 <sup>th</sup> , 2024	76 (exceeding)*2	69 (exceeding)*2
Standard	Ugandan Standards	Any building used as hospital, convalescence home, home for the aged, sanatorium and institutions of higher learning, conference rooms, public library, environmental or recreational sites.	45	35
		Residential buildings	50	35
		Mixed residential (with some commercial and entertainment)	55	45
		Residential + industry or small-scale production+ Commercial)*3	60	50
		Industrial	70	60
		Construction Site (Commercial)	75	50
	IFC Standards Daytime: 7:00-22:00 Nighttime: 22:00-7:00	Residential Area	55	45
		Commercial Area*3	70	70
Reference Standard	Japanese Standards	Along the trunk road	70	65

Source: JICA Survey Team

\*1: Baseline measurements were conducted only in daytime inside of Karuma Wildlife Reserve.

\*2: Both Baseline of daytime and nighttime exceeding Ugandan Standard therefore IFC Standard is applied. However, daytime value is exceeding IFC Standard as well.

\*3: The project area along side of the road is classified as “Commercial Area” as the project area is mixture of commercial area, industrial area and residential area.

Uganda: The National Environment (Noise and Vibrations Standards and Control) Regulations (2003)

IFC Standard: Environmental, Health, and Safety (EHS) Guidelines Noise Management (April 2007)

Japan: Ministry of Environment (1998) Environmental Standards for Noise

Note: Noise-1: 36N 415989.39 m E, 246481.68 m N, Noise-2: 36N 415007.65 m E, 247706.28 m N

Noise-3: 36N 415014.99 m E, 248164.53 m N, Noise-4: 36N 415030.66 m E, 248700.26 m N

Noise-5: 36N 413323.90 m E, 246064.13 m N, Noise-6: 36N 417469.93 m E, 247383.99 m N

Noise-7: 36N 417469.93 m E, 247383.99 m N

## 2) Vibration

### a) Survey Point

The 2 survey points for vibration are shown in Figure 6.1.6.

## b) Result of Measurement

There are no vibration standard prescripts in Uganda, thus the Japanese vibration standards along the trunk road have been applied on this ESIA. All monitored vibration levels have met the Japanese standard values.

**Table 6.1.11 Monitoring Date for Vibration (February 4<sup>th</sup> – 5<sup>th</sup>, 2024)**

Location		Survey Date	Daytime 7:00-20:00 dB	Nighttime 20:00-7:00 dB
Vibration-1	Along Kampala Gulu Highway (Approximately 1.5km from the existing Karuma Bridge site)	February 4 <sup>th</sup> , 2024	43	36
Vibration-2	Within Karuma wildlife reserve (Approximately 500m from the existing Karuma Bridge site)	February 5 <sup>th</sup> , 2024	30	Not measured*1
Standard	Ugandan Standards	Residential, Institutional, Educational	-	-
		Industrial, Commercial	-	-
	IFC Standards (International Finance Corporation)	Residential Area	-	-
		Commercial Area	-	-
Reference Standard	Japanese Standards Daytime: 7:00 - 20:00 Nighttime: 20:00 - 7:00	Residential Area	65	60
		Commercial and Industrial Area*2	70	65

Source: JICA Survey Team

\*1: Baseline measurements were conducted only in daytime inside of Karuma Wildlife Reserve.

\*2: The project area along side of the road is classified as "Commercial and Industrial Area" as the project area is mixture of commercial area, industrial area and residential area.

Uganda: The National Environment (Noise and Vibrations Standards and Control) Regulations (2003)

IFC Standard: Environmental, Health, and Safety (EHS) Guidelines Noise Management (April 2007)

Japan: Ministry of Environment (1998) Environmental Standards for Noise

Note: Vibrataion-1: 36N 415989.39 m E, 246481.68 m N, Vibrataion-2: 36N 414966.31 m E, 247722.91 m N

## (2) Potential Impacts

### 1) During Construction

Noise and vibration generation is expected due to operation of construction machines and equipment.

### 2) After Construction

Noise and vibration generation is expected due to driving of vehicles.

## (3) Impact Forecast

### 1) During Construction

#### A) Noise

##### a) Forecast Methodology

The noise during construction is coming from the operation of construction machines. The maximum noise level is to be generated by construction equipment of dump truck, backhoe, and bulldozers operating simultaneously for earthwork. The noise level assessment during construction will consider the sound level in different distances from the origins. Decay Formula Equation will be used in this assessment, which will be done on a spare basis, as the Equation (1).

$$L_{p2} = L_{p1} - 8 - 20 \log(r_2/r_1) \dots \dots \dots (1)$$

When

$L_{p1}$  = Sound level at distance  $r_1$  from the origin

$L_{p2}$  = Sound level at distance  $r_2$  from the origin (forecasted value)

$r_1, r_2$  = Distance from the origin at sound level  $L_{p1}$  and  $L_{p2}$

#### b) Forecast Point and Forecasted Value

Quantitative forecast is conducted at the boundary of ROW 15m away from the centerline in front of the nearest commercial and residential area as shown in Figure 6.1.2.

The forecasted value is 76 dB(A) at ROW boundary. Since the baseline value is already exceeding the Uganda Standard for Construction Noise. Thus, Japanese standard has been applied. The forecasted values do not exceed the Japanese standards value for construction noise.

**Table 6.1.12 Forecast Results for Construction Noise**

Location	Forecast Point	Construction Activities and Related Machines	Sound Level at the Forecast Point from the Noise Source dB(A)	Background Level dB(A)	Forecasted Value with BG dB(A) (Increased Value)	Standard Value
Noise Forecast -1	Boundary of ROW (15m from the centreline)	Earth Work (dump truck, backhoe, and bulldozers)	63	76	76 (+0 dB)	The National Environment (Noise and Vibrations Standards and Control) Regulations (2003) *1 Construction Noise 06:00-22:00 daytime Commercial: 75 dB(A) 22:00-06:00: nighttime Commercial: 50 dB(A)  However, the baseline is already exceeding Uganda Standard for Construction Noise. Thus, Japanese standard has been applied. Japanese Construction Noise Standards 07:00-19:00: 85 dB(A)

Source: JICA Survey Team

### B) Vibration

#### a) Forecast Methodology

The vibration during construction is coming from the operation of construction machines. The maximum vibration level is to be generated by construction equipment of dump truck, backhoe, and bulldozers operating simultaneously for earthwork.

The vibration level assessment during construction will consider vibration level in different distances from the origins. Decay Formula Equation will be used in this assessment, which will be done on a spare basis, as the Equation (1).

$$L_{vr} = L_{vr0} - 15\log_{10}(r/r_0) - 8.68\alpha(r-r_0) \dots \dots \dots (1)$$

When

$L_{vr0}$  = Vibration level at distance  $r_0$  from the origin (vibration at reference point) (dB)

$r$  = Distance from vibration source to forecast point (m)

$r_0$  = Distance from vibration source to the reference point (m)

$\alpha$  = Friction damping coefficient (0.01-0.04)

#### b) Forecast Point and Forecasted Value

Quantitative forecast is conducted at the boundary of ROW 15m away from the centreline in front of the nearest commercial and residential area shown in Figure 6.1.2.

The forecasted values are 52dB, and these values satisfy the Japanese Construction Vibration Standard of 75 dB in the daytime.

**Table 6.1.13 Forecast Results for Construction Vibration**

Location	Forecast Point	Construction Activities and Related Machines	Sound Level at the Forecast Point from the Noise Source dB(A)	Background Level dB	Forecasted value with BG dB (Increased Value)	Standard Value
Noise Forecast -1	Boundary of ROW (15m from the centreline)	Earth Work (dump truck, backhoe, and bulldozers)	51	43	52 (+9 dB)	Uganda does not have any standard for construction vibration. Thus, Japanese standard has been applied. Japanese Construction Vibration Standards 07:00-19:00:75 dB

Source: JICA Survey Team

## 2) After Construction

### A) Noise

#### a) Methodology and Forecast Points

The ASJ-2013 model in Japan is used for quantitative traffic noise forecast. Traffic number in the future (2030) is shown in Table 6.1.2.

Forecast point is same as the prediction point of air pollution. The locations of forecasts are shown in Figure 6.1.2.

#### b) Result of Forecast

The result of quantitative forecast is shown in Table 6.1.14. The forecasted values at the boundary of ROW are 76 dB(A) in the daytime / 70 dB(A) in the nighttime respectively.

Since the baseline value is already exceeding the Uganda Standard. Thus, IFC standard has been applied. However, daytime background level is exceeding IFC Standard, therefore, the within increase of 3dB from the background levels will be referred in accordance with the Environmental, Health, and Safety (EHS) Guidelines Noise Management (April 2007).

Based on the results of the forecast, all forecasted values satisfy IFC standards.

**Table 6.1.14 Forecasted Noise After Construction (2030)**

Location	Time Zone	Noise Level dB(A)				Standard Value
		Baseline Level	Forecasted Value	Forecasted Value with BG	Adopted Standard (IFC Standard*1)	
Forecast -1	Boundary of ROW (15m from the centreline)	Daytime 6:00-22:00	76	60	76	79*2
		Nighttime 22:00-6:00	69	60	70	70

Note) \*1: IFC Standard: Environmental, Health, and Safety (EHS) Guidelines Noise Management (April 2007)

\*2: Noise impacts should not exceed the levels presented in the standard value, or result in a maximum increase in background levels of 3 dB at the nearest receptor location off-site  
Source: JICA Survey Team

## B) Vibration

### a) Methodology and Forecast Points

The formulation, which has been developed by the Ministry of Land, Infrastructure, Transport and Tourism in Japan, is used for quantitative traffic vibration forecast. Traffic number in the future (2030) is shown in Table 6.1.2.

Forecast point is same as the prediction point of air pollution and noise. The locations of forecasts are shown in Figure 6.1.2.

### b) Forecast Point and Forecasted Value

The result of the quantitative forecast is shown in Table 6.1.15. The forecasted values at the boundary of ROW are 45 dB in the daytime / 41 dB in the nighttime respectively.

With regard to the applied standard value, Japanese traffic vibration standard is adopted since there are no standard values on traffic vibration in Uganda. Based on the result of the forecast, all forecasted values satisfy Japanese standards.

**Table 6.1.15 Forecasted Vibration After Construction (2030)**

Location		Time Zone	Vibration Level dB				Standard Value
			Baseline Level	Forecasted value	Forecasted Value with BG	Adopted Standard (Japanese Standard)	
Forecast -1 Along the Kampala-Arua Road	Boundary of ROW (15m from the centerline)	Daytime 7:00-20:00	43	40	45	70	Uganda does not have any standard for vibration, thus Japanese standard has been applied in this ESIA.  Japanese Standard*1 07:00-20:00 daytime Commercial / Industrial: 70 dB 20:00-07:00 Commercial / Industrial: 65 dB
		Nighttime 20:00-7:00	36	40	41	65	

Note) \*1: Article 16 Paragraph 1 Vibration Regulation Law in Japan (1977)  
Source: JICA Survey Team

## (4) Mitigation Measures

### 1) During Construction

Forecasted values satisfy the standard values, thus mitigation measures are not required in general. However, the following mitigation measures shall be done to minimize forecasted adverse impacts.

- Construction activities and operation of construction machines shall be limited in the daytime.
- Construction machines shall be well-maintained and checked every day.
- Information disclosures, such as construction schedule and activities, shall be carried out in advance to the surrounding communities, if the residential area is located near construction area.

2) After Construction

Forecasted values satisfy the standard value, thus mitigation measures are not required in general. However, the following mitigation measures shall be implemented to minimize noise and vibration impacts from the vehicles.

- Uganda government shall control the driving speed on the road (UNRA requests to police department regarding strict speed control).

(5) Evaluation

1) During Construction

As mentioned in the previous article, Ugandan standard on the noise has been applied and Japanese standard has been referred for construction noise. For construction vibration, Japanese standard has been applied for the project.

Although the predicted construction noise results exceed the Ugandan standard, there is little impact from the project and the project meets the Japanese standard. In addition, the predicted vibration levels meet the Japanese standard, so no mitigation measures are required. However, implementation of further mitigation measures would minimize impacts. In addition, due to the limited construction period and time, the level of impact is assessed to be within acceptable limits for the residents.

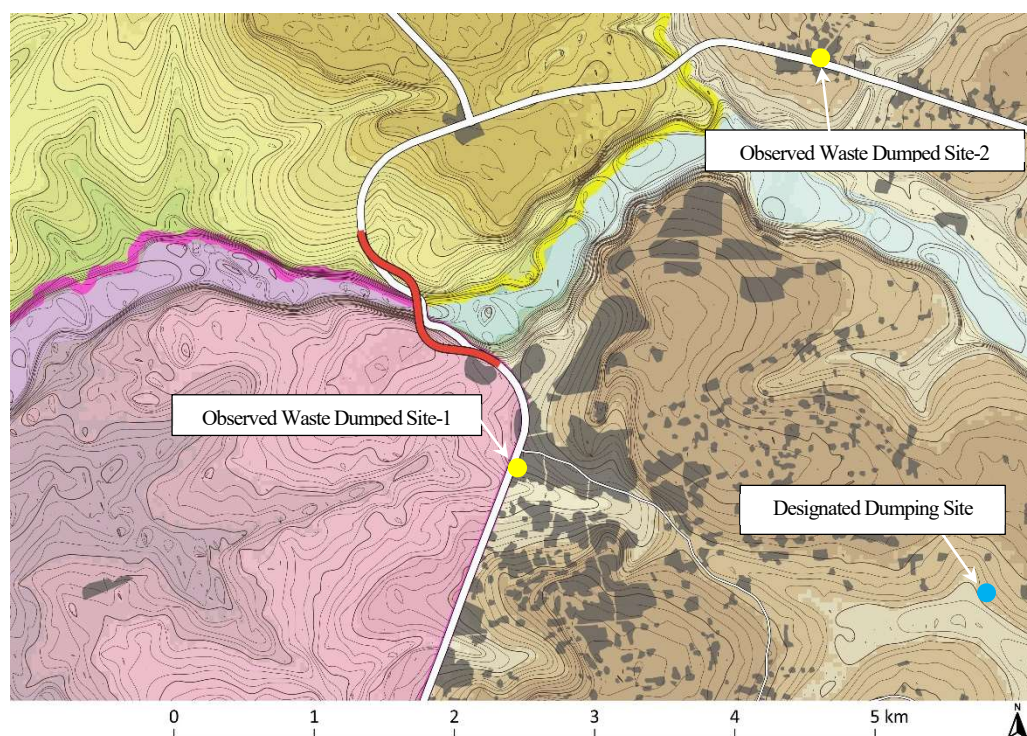
2) After Construction

As the result of the quantitative analysis on the project case, all forecasted values are not exceeding the noise and vibration standard levels. Thus, it is unlikely to cause serious impacts on the project area.

6.1.6. **Odour**

(1) Result of Baseline Survey

According to interviews with villagers, in the project area such as in Karuma TC and Kamdini SC, domestic waste management is either waste disposal into a compost pit, burned, or buried. The wastes are collected by designated *tuku tuku* operators and transported and disposed to the designated dumping site as shown in the Figure 6.1.4. Therefore, bad odour may be caused around the dumping site. However, the currently some wastes are illegally left along the road or illegally burned or dumped in the backyard of household randomly apart from the designated dumping site. Therefore, some locations near such illegal dumping site are currently causing bad odour. Some identified illegal dumping site are also shown in the Figure 6.1.4.



Source: JICA Survey Team

**Figure 6.1.7 Location Map of the Designated Dumping Site and Observed Waste Dumped Site Near the Project Area**



**Table 6.1.16 Current Condition of the Designated Dumping Site and Observed Waste Dumped Site Near the Project Area**

	
Designated Dumping Site	Designated Dumping Site
	
Designated Dumping Site	Designated Dumping Site
	
Observed Waste Dumped Site-1	Observed Waste Dumped Site-2

Source: JICA Survey Team

## (2) Potential Impacts

### 1) During Construction

Bad odour may be caused by domestic waste and construction materials in the base camp.

### 2) After Construction

No impacts are expected due to lack of plans regarding service and parking areas which generate solid and liquid wastes. However, illegal dumping may increase and cause bad odour in conjunction with increase in influx.

(3) Impact Forecast

1) During Construction

Putrid odour may be caused by domestic waste and night soil in the construction base camp. In addition, surrounding area of illegal dumping site will have bad odour if waste are not appropriately managed or dumped in the designated site.

Additionally, the smell of oil and chemicals may be generated from workshop and storage if such materials are leaking or not managed appropriately.

2) After Construction

Basically, there is no impact expected. However, mitigation measures are necessary because as the illegal dumping may increase and cause bad odour in conjunction with increase in influx.

(4) Mitigation Measures

1) During Construction

- ✓ Domestic waste from base-camp and accommodation shall be stored properly by separated garbage boxes.
- ✓ Domestic solid waste is collected and disposed at the nearest designated disposal site.
- ✓ Domestic wastewater and night soil shall be treated through septic tank or/and portable toilet and discharged into the natural stream or/and collected and disposed through a licensed agent.
- ✓ Waste oil of the construction machines is collected and disposed through a licensed agent.
- ✓ Waste chemical and hazardous material are stored at the base camp site and disposed through a licensed agent.

2) After Construction

Although the impact is not expected, appropriate waste management and periodical monitoring is recommended by local government.

(5) Evaluation

All construction waste and domestic waste generated are managed and disposed of following the implementation of mitigation measures, thus they are not likely to cause significant impacts regarding bad odour.

## 6.2. Natural Environment

### 6.2.1. Ecosystem and Protected Area

#### (1) Result of Baseline Survey

##### 1) Survey Item and Survey Dates

Surveys of flora and fauna around the project area, including the protected area, were conducted twice, once during the rainy season (November 2023) and once during the dry season (February 2024), in order to identify the species that appear in each season. The survey covered fauna (mammals, birds, amphibians, reptiles, insects, fish, plankton, and benthos) and flora.

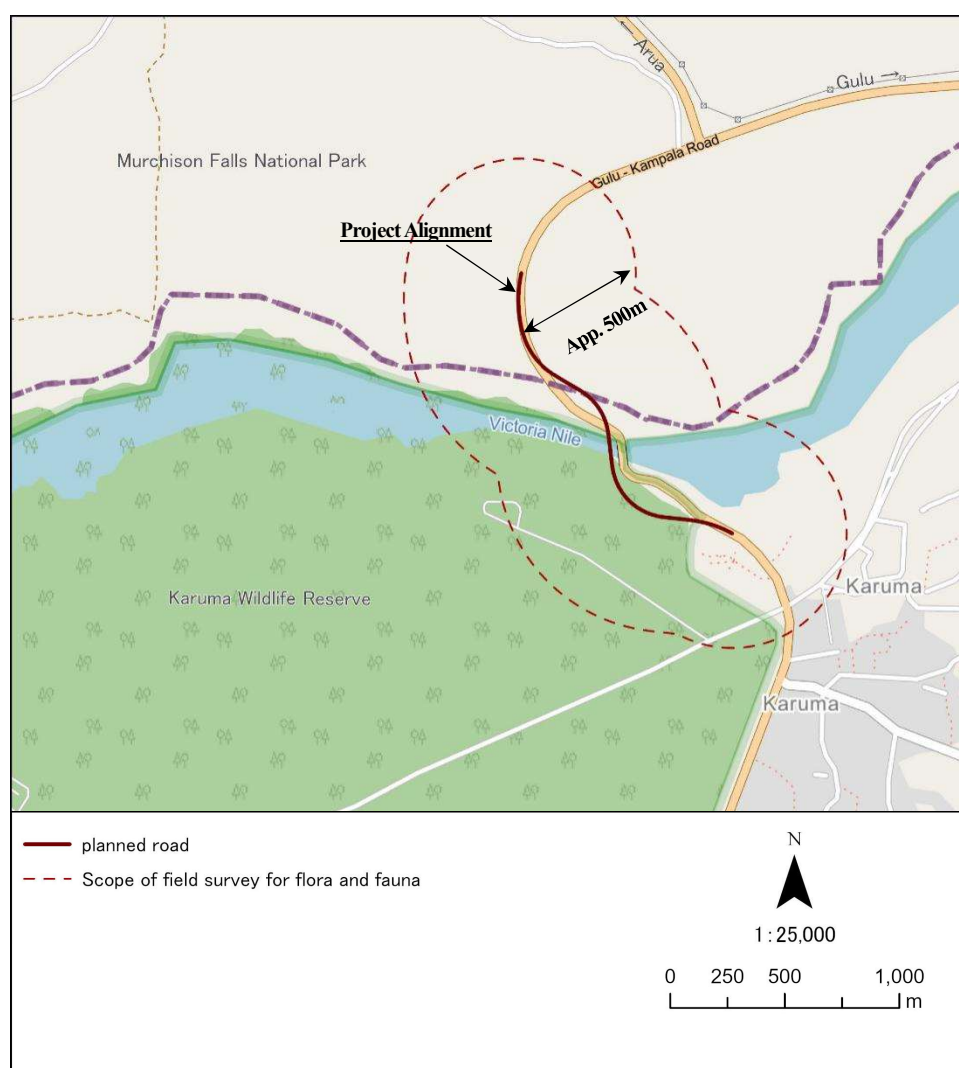
**Table 6.2.1 Surveyed Items and Survey Dates on Faunas and Floras**

Item			Survey Date	
			Rainy Season (Nov 2023)	Dry Season (Feb 2024)
1	Terrestrial Survey	Mammals	6 <sup>th</sup> -8 <sup>th</sup>	5 <sup>th</sup>
2		Birds	6 <sup>th</sup> -9 <sup>th</sup>	4 <sup>th</sup> – 5 <sup>th</sup>
3		Amphibians	6 <sup>th</sup> -9 <sup>th</sup>	4 <sup>th</sup> – 5 <sup>th</sup>
4		Reptiles	6 <sup>th</sup> -9 <sup>th</sup>	4 <sup>th</sup> – 5 <sup>th</sup>
5		Insects (Dragonfly and Butterfly)	13 <sup>th</sup> -15 <sup>th</sup>	4 <sup>th</sup> – 5 <sup>th</sup>
6	Aquatic Survey	Floras and Vegetation	13 <sup>th</sup> -15 <sup>th</sup>	4 <sup>th</sup> – 5 <sup>th</sup>
7		Fishes	13 <sup>th</sup> -15 <sup>th</sup>	4 <sup>th</sup> – 5 <sup>th</sup>
8		Phytoplankton	13 <sup>th</sup> -15 <sup>th</sup>	5 <sup>th</sup>
9		Zooplanktons	13 <sup>th</sup> -15 <sup>th</sup>	5 <sup>th</sup>
10		Benthos	13 <sup>th</sup> -15 <sup>th</sup>	5 <sup>th</sup>

Source: JICA Survey Team

##### 2) Survey Area

As shown in Figure 6.2.1, the survey area was basically 500m on both sides from the centre line of the road and the bridge. However, for valuable species of large mammals that would be representative of the study area, their area of activity was surveyed beyond these areas to contribute to forecasts and evaluations.



**Figure 6.2.1 Survey Area of Ecosystem, Flora and Fauna**

### 3) Survey Result (Identified Species)

#### a) Mammals

Sixteen species of mammals were identified. Four of these species are categorized high on the IUCN Red List: African Savanna Elephant, Hippopotamus, African buffalo, and Patas monkey.

The list of identified species is shown below.

**Table 6.2.2 The List of Identified Species (Mammals)**

No	Common Name	Scientific Name	IUCN status	Uganda List
1	Marsh mongoose	Atilax paludinosus	LC	
2	Vervet monkey	Chlorocebus pygerythrus	LC	
3	Black and White Colobus Monkey	Colobus guereza	LC	
4	Patas monkey	Erythrocebus patas	NT	
5	Hippopotamus	Hippopotamus amphibius	VU	VU B2b(iii)c(iv)
6	Waterbuck	Kobus ellipsiprymnus	LC	
7	Uganda Kob	Kobus kob	LC	
8	African Savanna Elephant	Loxodonta africana	EN	CR A4a
9	Aardvark	Orycteropus afer	LC	
10	Oribi	Ourebia ourebi	LC	







No	Common Name	Scientific Name	IUCN status	Uganda List
11	Olive baboon	<i>Papio anubis</i>	LC	
12	Common Warthog	<i>Phacochoerus africanus</i>	LC	
13	Common duiker	<i>Sylvicapra grimmia</i>	LC	
14	<b>African Buffalo</b>	<b><i>Syncerus caffer</i></b>	<b>NT</b>	
15	Bushbuck	<i>Tragelaphus scriptus</i>	LC	
16	Striped Ground Squirrel	<i>Xerus erythropus</i>	LC	

Note) IUCN Red List Category: Extinct (EX), Extinct in the Wild (EW), Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT), Least Concern (LC), Data Deficient (DD), Not Evaluated (NE), Blank: Not Applicable  
Source: JICA Survey Team

Results of the field surveys and biology of the threatened species (IUCN high-categorized species) are shown in Table 6.2.3. The locations where these species were identified and the locations where mammals are supplementing with salt (Salt Lick Site) that are important for mammals are shown in Figure 6.2.2.

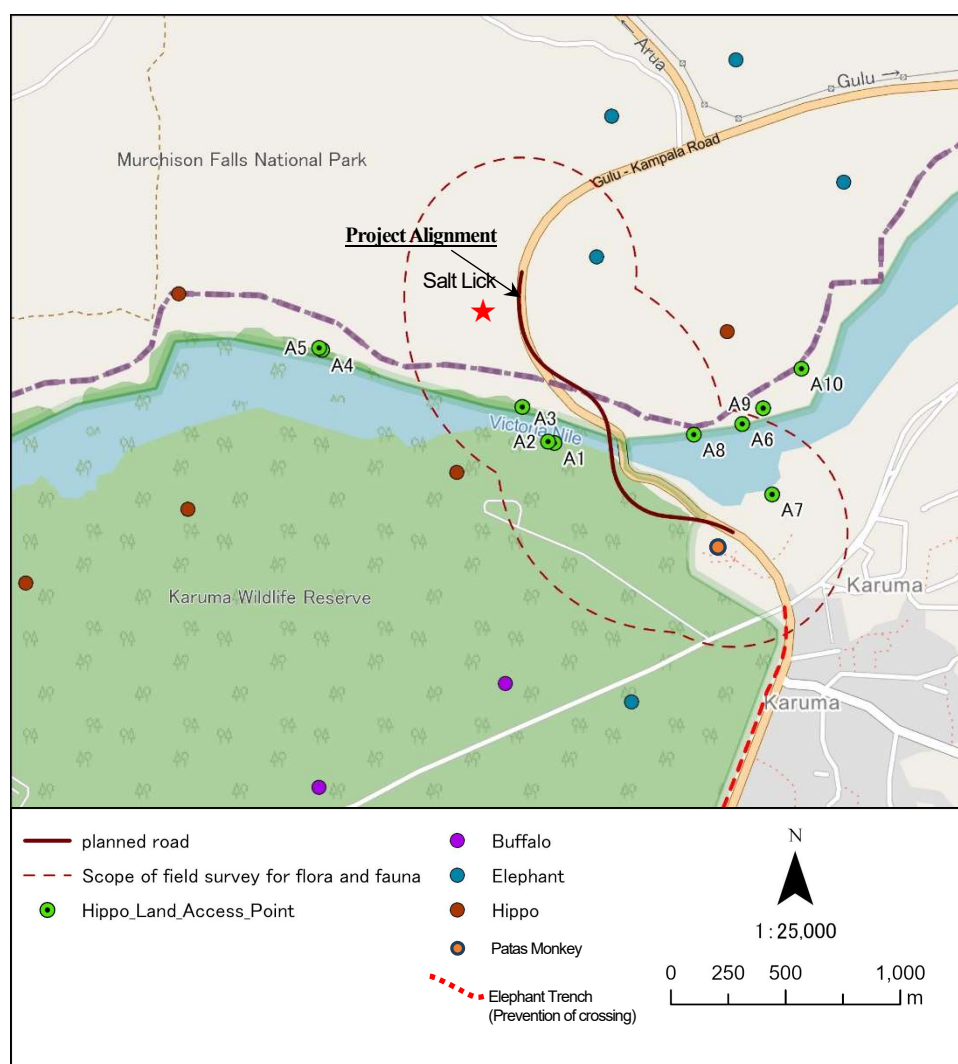
**Table 6.2.3 Results of the Field Surveys and Biology of the Threatened Species (Mammals)**

Common Name	Photo	IUCN Category	Results of the Field Surveys and Biology
Patas Monkey		NT	<p>【Biology】 They are found in Acacia shrublands and savannas, and tend to live on the ground. At night, they rest on shrubs and form flocks consisting of one male and several females. They feed on leaves, grass buds, flowers, fruits, resins, mushrooms, insects, birds and their eggs, and reptiles. They mate during the rainy season and have one young. Males reach sexual maturity at 4 years of age, and females have their first litter between 1.5 and 3.5 years of age.</p> <p>【Results of Field Surveys】 During the field survey, the species was observed moving while foraging in the forests around the UWA office on the south bank of the Nile River. According to UWA staff, the species forages while moving around forests and grasslands on the south and north banks of the river.</p>
Hippopotamus		VU	<p>【Biology】 They live in flocks of 10 to 20 females and young, but may form flocks of 100 to 150 during the dry season. Males live alone, or dominant males form territories around the flock. They live in the water during the day and come ashore at night to feed. They are phytophagous, eating 30-40 kilograms of grasses, roots, and leaves over a 4-6 hour period during the night. The mating season lasts 2 - 3 days. Gestation period is 210 - 240 days. They give birth to one young at a time, mainly in the water. Males reach sexual maturity at 5 years old and females at about 4 years old. Average lifespan is about 30 years.</p> <p>【Results of Field Surveys】 During the field survey, onshore access points were identified in the Nile River approximately 300 m downstream and 400 m upstream from the proposed new bridge. In addition, nighttime foraging traces (feces and footprints) were observed in the continuous onshore area from the access points. It was suggested that during the daytime, they stay in slower-flowing areas of the Nile River, and during the nighttime, they move up to several kilometres from the access points and forage for food. On the other hand, the area around the bridge location of the project is a rocky area where the riverbank is steep, and the flow velocity is high. Hippopotamuses are not likely to inhabit the area and move within the river. In the past, hippopotamuses were found in the centre of Karuma TC, but in 2023, a trench was constructed at the boundary of the protected area to prevent animal damage, and their habitat is now limited to the Nile River coast and within the protected area.</p>
African Elephant Savanna Elephant		EN	<p>【Biology】 They inhabit savannas and forests, living in an area of 100 - 3,700 square kilometres of activity. They form flocks of at least 3-10 females and young. Males leave the flock at 12-16-year-old and live alone or in loosely connected groups of young males only. They prefer to bathe in water and rub their bodies against rocks and trees after bathing in mud. They are mostly phytophagous, drinking 100 to 300 liters of water per day. When water is scarce during the dry season, they search for water by digging with their tusks and forelimbs in dry riverbeds. Their reproductive mode is viviparous. The mating interval is 16 weeks. During the breeding season, males fight each other over females in heat. Gestation period is 22 months, and one young is born at a time. The interval between births is 4 - 9 years. The lactation period is 2 - 3 years. Females reach sexual maturity at 10 years of age and have their first litter at 15-18 years of age. Lifespan is 60 - 80 years.</p> <p>【Results of Field Surveys】 During field surveys, their footprints and feces have been observed on the south and northeast banks of the Nile River. In addition, during interviews with UWA staff, they are often observed crossing the road around the Arua-Gulu junction on the north bank. It was inferred that individual elephants or herds of elephants were crossing the road and moving through the forest, eating crops in the east direction or descending into the Nile River for water. On the south bank, the establishment of trenches has limited their area of activity to mainly within the protected area.</p>

Common Name	Photo	IUCN Category	Results of the Field Surveys and Biology
African Buffalo		NT	<p>【Biology】 They live in savannas, swamps, floodplains, and grasslands in herds of 100 or more, sometimes as large as 1,000 to 2,000 individuals. Older individuals occasionally leave the herd and live alone. They feed at dusk and spend the day drinking water and bathing in mud at water holes. Males reach sexual maturity at 4-6 years of age and females at about 5 years of age, and they mate during the rainy season. Gestation period is 11.5 months. The average lifespan in the wild is 11 years.</p> <p>【Results of Field Surveys】 During the field survey, the species was found to be moving and foraging over a wide area on the southern bank of the Nile River. As with other species, their areas of activity have been restricted to the protected area due to the establishment of trenches.</p>

Note) IUCN Red List Category: Extinct (EX), Extinct in the Wild (EW), Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT), Least Concern (LC), Data Deficient (DD), Not Evaluated (NE), Blank: Not Applicable

Source: JICA Survey Team

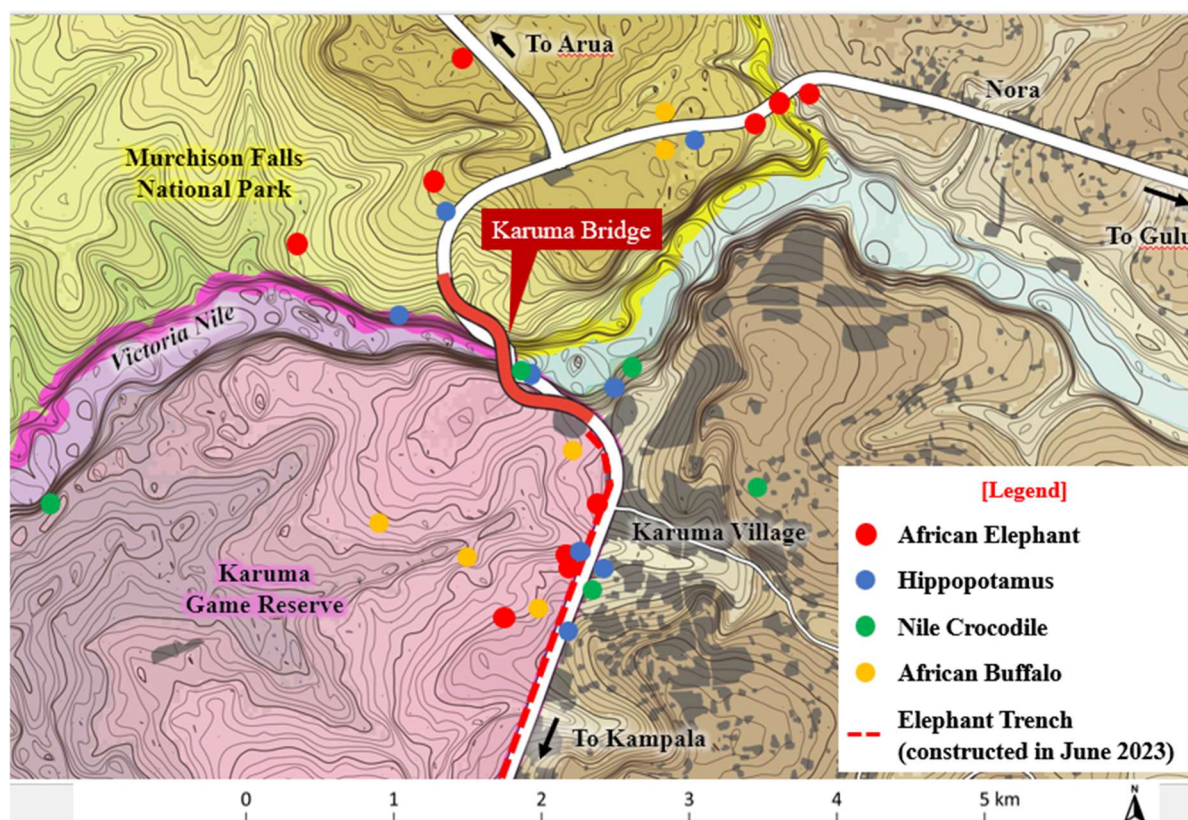


Source: JICA Survey Team

**Figure 6.2.2 Locations where Threatened Species (Mammals) were Identified, and Salt Lick Site**

According to interviews with residents during the local stakeholder meetings, African savanna elephants, hippopotamuses, Nile crocodiles, and African buffaloes were observed at the sites shown in Figure 6.2.3. These are not considered to be indicative of distributional characteristics, as most of the sightings were made by residents while traveling along the roads. In June 2023, a 2m wide and 2m deep trench was installed by the UWA at the boundary between the Kalma Wildlife Reserve and the main road to prevent animals from entering the

road, and after June 2023, the above-mentioned large mammals cannot move from the reserve side to residential and agricultural areas in Karuma TC.



Source: JICA Survey Team (Interviewed by residents during local stakeholder meeting: November 2023)

**Figure 6.2.3 Location of Large Mammal Sightings(2018~2023)**

#### b) Birds

117 species of birds were identified. Three of them, Crowned Eagle, Bateleur, and Martial Eagle, are categorized high on the IUCN Red List.

The list of identified species is shown in Table 6.2.4.

**Table 6.2.4 The List of Identified Species (Birds)**

No	Common Name	Scientific Name	IUCN status	Uganda List	Type
1.	Greater Cormorant	<i>Phalacrocorax Carbo</i>	DD		R
2.	Long-Tailed Cormorant	<i>Microcarbo Africanus</i>	DD		R
3.	African Darter	<i>Anhinga Rufa</i>	LC	VU	R
4.	Squacco Heron	<i>Ardeola Ralloides</i>	DD		R
5.	Cattle Egret	<i>Bubulcus Ibis</i>	DD		R
6.	Little Egret	<i>Egretta Garzetta</i>	DD		R
7.	Grey Heron	<i>Ardea Cinerea</i>	DD		R
8.	Abdins Storm	<i>Ciconia Abdinii</i>	DD		M
9.	Marabou Stork	<i>Leptoptilos Crumeniferus</i>	LC		R
10.	Open-Bill Stork	<i>Anastomus Lamelligerus</i>	LC		R
11.	Hadada Ibis	<i>Bostrychia Hagedash</i>	DD		R
12.	Black-Shouldered Kite	<i>Elanus Caeruleus</i>			R
13.	Black Kite	<i>Mihus Migrans</i>			M
14.	African Fish Eagle	<i>Haliaeetus Vocifer</i>	DD		R
15.	Palm-Nut Vulture	<i>Gypohierax Angolensis</i>	DD		R
16.	Western Banded Snake Eagle	<i>Circaetus Cinerascens</i>			R
17.	Bateleur	<i>Terathopius Ecaudatus</i>	EN		R
18.	African Harrier Hawk	<i>Polyboroides Typus</i>			R
19.	Grasshopper Buzzard	<i>Butastur Rufipennis</i>			M
20.	Lizard Buzzard	<i>Kaupifalco Monogrammicus</i>	DD		R



No	Common Name	Scientific Name	IUCN status	Uganda List	Type
21.	Common Buzzard	<i>Buteo Buteo</i>			M
22.	Wahlberg, S Eagle	<i>Hieraetus Wahlbergi</i>			R
23.	Martial Eagle	<i>Polemaetus Bellicosus</i>	EN		R
24.	Crowned Eagle	<i>Stephanoetus Coronatus</i>	NT	ENC2a(i)	R
25.	Grey Kestrel	<i>Falco Ardosiaceus</i>	DD		R
26.	Helmeted Guineafowl	<i>Numida Meleagris</i>			R
27.	Rock Pratincole	<i>Glareola Nuchalis</i>	LC	VU	R
28.	Wood Sandpiper	<i>Tringa Glareola</i>	DD		M
29.	Common Sandpiper	<i>Actitis Hypoleucos</i>	DD		M
30.	African Green-Pigeon	<i>Treron Calvus</i>	DD		R
31.	Blue-Spotted Wood Dove	<i>Turtur Afer</i>	DD		R
32.	Vinaceous Dove	<i>Streptopelia Vinacea</i>			R
33.	White-Crested Turaco	<i>Tauraco Leucolophus</i>			R
34.	Black-Billed Wood Dove	<i>Turtur Tympanistria</i>	DD		R
35.	Tambourine Dove	<i>Turtur Tympanistria</i>			R
36.	Levaillant's Cuckoo	<i>Clamator Levaillantii</i>			M
37.	Ring-Necked Dove	<i>Streptopelia Capicola</i>	DD		R
38.	Klaas' Cuckoo	<i>Chrysococcyx Klaas</i>	DD		R
39.	White-Browed Coucal	<i>Centropus Superciliosus</i>			R
40.	African Palm Swift	<i>Cypsiurus Parvus</i>	DD		R
41.	Grey-Headed Kingfisher	<i>Halcyon Leucocephala</i>			R
42.	Woodland Kingfisher	<i>Halcyon Senegalensis</i>	DD		M
43.	Striped Kingfisher	<i>Halcyon Chelicuti</i>	DD		R
44.	African Pygmy Kingfisher	<i>Ispidina Picta</i>			R
45.	Red-Throated Bee-Eater	<i>Merops Bulocki</i>	DD		R
46.	African Grey Hornbill	<i>Lophoceros Nasutus</i>			R
47.	Black-And-White Casqued Hornbill	<i>Bycanistes Subcylindricus</i>			R
48.	Yellow-Rumped Tinkerbird	<i>Pogoniulus Bilineatus</i>	DD		R
49.	Yellow-Fronted Tinkerbird	<i>Pogoniulus Chrysocomus</i>			R
50.	Spot-Flanked Barbet	<i>Tricholaema Lachrymosa</i>			R
51.	Common Sand Martin	<i>Riparia Riparia</i>			M
52.	Angola Swallow	<i>Hirundo Angolensis</i>	DD		R
53.	Barn Swallow	<i>Hirundo Rustica</i>			M
54.	Yellow Wagtail	<i>Motacilla Flava</i>	DD		M
55.	African Pied Wagtail	<i>Motacilla Agoump</i>	DD		R
56.	Flappet Lark	<i>Mirafra Rufocinnamomea</i>			R
57.	Little Greenbul	<i>Eurillas Virens</i>	DD		R
58.	Common Bulbul	<i>Pycnonotus Barbatus</i>			R
59.	White-Browed Scrub-Robin	<i>Cercotrichas Leucophrys</i>			R
60.	Whinchat	<i>Saxicola Rubetra</i>	DD		M
61.	Eurasian Reed Warbler	<i>Acrocephalus Scirpaceus</i>	DD		M
62.	Red-Faced Cisticola	<i>Cisticola Erythrops</i>	DD		R
63.	Whistling Cisticola	<i>Cisticola Lateralis</i>	DD		R
64.	Rattling Cisticola	<i>Cisticola Chiniana</i>	DD		R
65.	Croaking Cisticola	<i>Cisticola Natalensis</i>	DD		R
66.	Tawny-Flanked Prinia	<i>Prinia Subflava</i>			R
67.	Buff-Bellied Warbler	<i>Phylloscopus Pulchella</i>	DD		R
68.	Yellow-Breasted Apalis	<i>Apalis Flavida</i>			R
69.	Grey-Backed Camaroptera	<i>Camaroptera Brachyura</i>			R
70.	Green Crombec	<i>Sylvietta Virens</i>			R
71.	Willow Warbler	<i>Phylloscopus Trochilus</i>	DD		M
72.	Grey-Capped Warbler	<i>Eminia Lepida</i>	DD		R
73.	African Grey Flycatcher	<i>Bradornis Microrhynchus</i>			R
74.	Grey Tit- Flycatcher	<i>Myioparus Plumbeus</i>			R
75.	Grey-Headed Batis	<i>Batis Orientalis</i>	DD		R
76.	Western Black-Headed Batis	<i>Batis Erlangeri</i>	DD		M
77.	Scarlet-Chested Sunbird	<i>Chalcomitra Senegalensis</i>	DD		R
78.	Common Wattle-Eye	<i>Platysteira Cyanea</i>	DD		R
79.	Olive-Bellied Sunbird	<i>Cinnyris Chloropygius</i>			R
80.	Variable Sunbird	<i>Cinnyris Venustus</i>	DD		R
81.	Northern Yellow White-Eye	<i>Zosterops Senegalensis</i>	DD		R
82.	Sulphur-Breasted Bush-Shrike	<i>Cholorophoneus Sulfureopectus</i>			R
83.	Black-Crowned Tchagra	<i>Tchagra Senegalus</i>	DD		R
84.	Northern Puffback	<i>Dryocopus Gambensis</i>	DD		R
85.	Green Headed Sunbird	<i>Deleornis Fraseri</i>			R
86.	Tropical Boubou	<i>Laniarius Aethiopicus</i>	DD		R
87.	Brubru	<i>Nilus Afer</i>	DD		R
88.	Fork-Tailed Drongo	<i>Dicrurus Adsimilis</i>			R
89.	Beautiful Sunbird	<i>Cinnyris Pulchellus</i>	DD		R
90.	Ruppell's Starling	<i>Lamprolornis Purpureoptera</i>			R
91.	Violet-Backed Starling	<i>Cinnyricinclus Leucogaster</i>			M

No	Common Name	Scientific Name	IUCN status	Uganda List	Type
92.	Little Weaver	<i>Ploceus Luteolus</i>			R
93.	Black-Necked Weaver	<i>Ploceus Nigricollis</i>	DD		R
94.	Spectacled Weaver	<i>Ploceus Ocularis</i>			R
95.	Black-Headed Weaver	<i>Ploceus Cucullatus</i>			R
96.	Yellow-Backed Weaver	<i>Ploceus Melanocephalus</i>			R
97.	House Sparrow	<i>Cinnyris Pulchellus</i>	DD		R
98.	Northen Grey Headed Sparrow	<i>Passer Griseus</i>			R
99.	Chestnut Crowned Sparrow Weaver	<i>Plocepasser Superciliosus</i>	DD		R
100.	Village Weaver	<i>Ploceus Cucullatus</i>			R
101.	Red-Cheeked Cordon-Bleu	<i>Uraeginthus Bengalus</i>	DD		R
102.	Bronze Mannikin	<i>Spermestes Cucullata</i>			R
103.	Pin-Tailed Whydah	<i>Vidua Macroura</i>			R
104.	Cardinal Quelea	<i>Quelea Cardinalis</i>	DD		R
105.	Yellow-Fronted Canary	<i>Canary Crithagra Mozambica</i>			R
106.	Crimson-Rumped Waxbill	<i>Estrilda Rhodopyga</i>			R
107.	Magpie Mannikin	<i>Spermestes Fringilloides</i>			R
108.	Tawny Eagle	<i>Aquila Rapax</i>			R
109.	Yellowbill	<i>Ceuthmochares Aereus</i>	DD		R
110.	Diedricks Cuckoo	<i>Chrysococcyx Caprius</i>			R
111.	African Hoopoe	<i>Upupa Africana</i>			R
112.	Greater Cormorant	<i>Phalacrocorax Carbo</i>	DD		R
113.	Long-Tailed Cormorant	<i>Microcarbo Africanus</i>	DD		R
114.	African Darter	<i>Anhinga Rufa</i>	LC	VU	R
115.	Squacco Heron	<i>Ardeola Ralloides</i>	DD		R
116.	Cattle Egret	<i>Bubulcus Ibis</i>	DD		R
117.	Little Egret	<i>Egretta Garzetta</i>	DD		R



Note-1) IUCN Red List Category: Extinct (EX), Extinct in the Wild (EW), Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT), Least Concern (LC), Data Deficient (DD), Not Evaluated (NE), Blank: Not Applicable


Note-2) Type: R (Resident Species), M (Migratory Species)

Source: JICA Survey Team

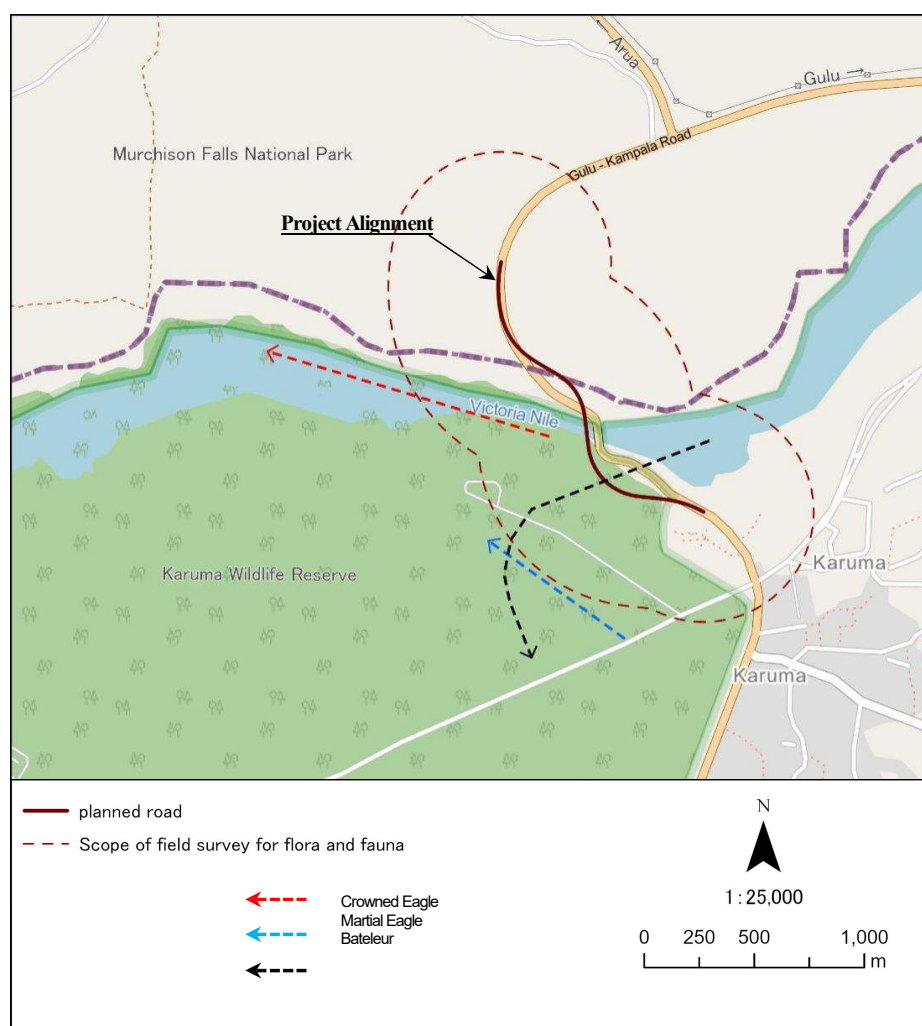
Results of the field surveys and biology of the threatened species (IUCN high-categorized species) are shown in Table 6.2.5. The locations where these species were identified are shown in Figure 6.2.4.

**Table 6.2.5 Results of the Field Surveys and Biology of the Threatened Species (Birds)**

Common Name	Photo	IUCN Category	Results of the Field Surveys and Biology
Bateleur		EN	<p>【Biology】 The species is about 55-70 cm long and feeds on a variety of small mammals, birds, and reptiles, as well as dead meat, insects, and birds' eggs. They are found in sub-Saharan Africa, with the exception of the Congo Basin in central Africa and the Lope-Ocanda rainforest. Breeding season varies by region: September to May in West Africa, December to August in South Africa, and throughout the year in East Africa. They require savannas and forests when breeding. They nest in large trees on hillsides and plains. One egg is laid at a time, and it takes 90 to 125 days for the hatchlings to leave the nest.</p> <p>【Results of Field Surveys】 During the field survey, this species moved along the river from the east side, passing the planned route location from east to west before flying away to the south. No nesting sites were observed within the survey area. This suggested that the species is using the area around the project area as a feeding ground or part of its range of activities.</p>
Martial Eagle		EN	<p>【Biology】 It is found in grasslands, savannas, and open forests interspersed with thickets in sub-Saharan Africa, and in semi-deserts in the Republic of South Africa. They feed mainly on mammals, birds, and reptiles weighing 1 to 5 kilograms, but may feed on animals weighing up to 35 kilograms. They nest in trees or on steel pylons using branches and other materials and lay one egg. Hatchlings leave the nest more than 90 days after hatching.</p> <p>【Results of Field Surveys】 During the field survey, this species flew from southwest to northwest approximately 500 m outside the project area. No nesting sites were observed within the survey area. This suggested that the species is using the area around the project area as a feeding ground or part of its range of activities.</p>

Common Name	Photo	IUCN Category	Results of the Field Surveys and Biology
Crowned Eagle		NT	<p>【Biology】 Total length of 80-98 cm, they feed mainly on small mammals and are also known to prey on large ungulates. They are found in sub-Saharan Africa and in the eastern region of southern Africa, mainly in riparian forests and woodlands. They breed once every two years, with each breeding cycle lasting 500 days. Breeding occurs almost all year round, but the peak of spawning is from July to November. After breeding, they build nests 12 to 45 meters above the ground. They lay one to two eggs at a time, and their young leave the nest at 90 to 115 days of age.</p> <p>【Results of Field Surveys】 During the field survey, a low-flying (passing) behaviour was observed along the south bank of the Nile River from approximately 200 m outside the proposed alignment toward the downstream (west side) of the river. No nesting sites were observed within the survey area. This suggested that the species is using the area around the project area as a feeding ground or part of its range of activities.</p>

Source: JICA Survey Team



Source: JICA Survey Team

**Figure 6.2.4 Locations where Threatened Species (Birds) were Observed**

### c) Amphibians and Reptiles

Seven species of amphibians and Six species of reptiles were identified. Of these species, Central Africa Rock Python is categorized high on the IUCN Red List.

The list of identified species is shown below.

**Table 6.2.6 The list of Identified Species (Amphibians and Reptiles)**


No	Common Name	Scientific Name	IUCN status	Uganda List
1.	Eastern Groove-crowned Bullfrog	<i>Hoplobatrachus occipitalis</i>	LC	
2.	Kivu Reed	<i>Hyperolius kivuensis</i>	LC	
3.	Common Reed Frog	<i>Hyperolius viridiflavus</i>	LC	
4.	Dwarf Puddle Frog	<i>Phrynobatrachus mababiensis</i>	LC	
5.	Natal Puddle Frog	<i>Phrynobatrachus natalensis</i>	LC	
6.	Anchieta's Rocket Frog	<i>Ptychadena anchietae</i>		
7.	Mascarene Rocket Frog	<i>Ptychadena mascareniensis</i>	LC	DD
8.	Red-Headed Rock Agama	<i>Agama agama</i>	LC	
9.	Nile Crocodile	<i>Crocodylus niloticus</i>	LC	
10.	Jameson's Mamba	<i>Dendroaspis jamesoni</i>		
11.	Central African Rock Python	<i>Python sebae</i>	NT	
12.	Striped Skink	<i>Trachylepis striata</i>	LC	DD
13.	Nile Monitor	<i>Varanus niloticus</i>	LC	

Note) IUCN Red List Category: Extinct (EX), Extinct in the Wild (EW), Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT), Least Concern (LC), Data Deficient (DD), Not Evaluated (NE), Blank: Not applicable.

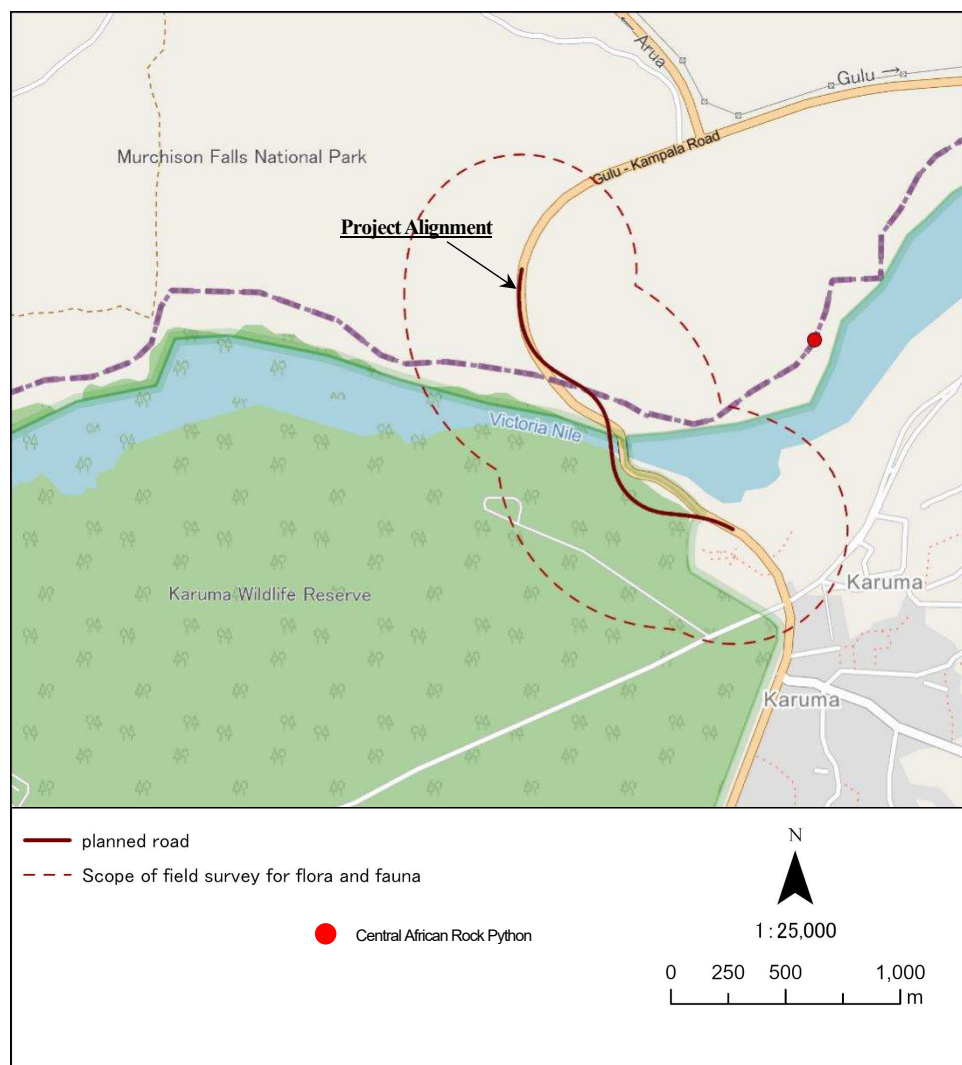
Source: JICA Survey Team

Results of the field surveys and biology of the threatened species (IUCN high-categorized species) are shown in Table 6.2.7. The locations where these species were identified are shown in Figure 6.2.5.

**Table 6.2.7 Results of the Field Surveys and Biology of the Threatened Species (Reptiles)**

Common Name	Photo	IUCN Category	Results of the Field Surveys and Biology
Central African Rock Python		EN	<p><b>【Biology】</b> Found in sub-Saharan Africa. Lives on land, in water and on trees from night to sunrise. They are animalivores, eating small mammals, birds, lizards, and frogs when young, and adults also eat large birds. They are oviparous, laying 16 to 100 eggs in termite mounds or in holes dug by other animals and incubating them for 90 days.</p> <p><b>【Results of Field Surveys】</b> During the field survey, a sighting was reported by a UWA staff member on the east side of the north bank of the Nile River, approximately 1 km from the proposed alignment.</p>

Source: JICA Survey Team



Source: JICA Survey Team

**Figure 6.2.5 Location where Threatened Species (Reptiles) was Observed**

d) Insects (Dragonflies and Butterflies)

112 species of insects were identified, none of which are categorized high on the IUCN Red List. The list of identified species is shown below.

**Table 6.2.8 The lists of Identified Species (Insects)**

No		Common Name	Scientific name	IUCN Status	Uganda List
1	Dragonfly	Asian Pintail	<i>Acisoma panorpoides</i>	LC	
2		Red Groundling	<i>Brachythemis lacustris</i>	LC	
3		Banded Groundling	<i>Brachythemis leucosticta</i>	LC	
4		Common Pond Damsel	<i>Ceragrion glabrum</i>	LC	
5		Broad Scarlet	<i>Crocothemis erythraea</i>	LC	
6		Common Threadtail	<i>Elatoneura glauca</i>	LC	
7		Common Tigertail	<i>Ictinogomphus ferox</i>	LC	
8		Eastern Blacktail	<i>Nesciothemis farinosa</i>	LC	
9		Julia Skimmer	<i>Orthetrum julia</i>	LC	
10		Epaulet Skimmer	<i>Orthetrum chrysostigma</i>	LC	
11		Lucia Widow	<i>Palpopleura lucia</i>	LC	
12		Glistening Demoiselle	<i>Phaon iridipennis</i>	LC	
13		Violet Dropwing	<i>Trithemis annulata</i>	LC	
14		Red-veined Dropwing	<i>Trithemis arteriosa</i>	LC	
1	Butterfly		<i>Acraea acerata</i>		
2			<i>Acraea alicia</i>		
3			<i>Acraea egina</i>		

No	Common Name	Scientific name	IUCN Status	Uganda List
4	White-barred Wizard	<i>Acraea encedon</i>	LC	
5		<i>Acraea eponina</i>		
6	Natal Acraea	<i>Acraea natalica</i>	LC	
7	Wandering Donkey Acraea	<i>Acraea neobule</i>	LC	
8		<i>Acraea pharsalus</i>		
9		<i>Acraea pseudogina</i>		
10		<i>Acraea zetes</i>		
11	Layman	<i>Amauris albimaculata</i>	LC	
12	Amauris niavius	<i>Amauris niavius</i>	LC	
13		<i>Amauris tartarea</i>	LC	
14		<i>Ariadne enotrea</i>		
15		<i>Aterica galene</i>		
16		<i>Bicyclus mandanes</i>		
17	Black-haired Bush Brown	<i>Bicyclus safitza</i>	LC	
18		<i>Bicyclus vulgaris</i>		
19	African Joker	<i>Byblia anvatara</i>	LC	
20	Scarce Forest Charaxes	<i>Charaxes etesipe</i>	LC	
21		<i>Charaxes fulvescense</i>		
22		<i>Charaxes numenes</i>		
23		<i>Charaxes tiridates</i>		
24	Common Pearl Charaxes	<i>Charaxes varanes</i>	LC	
25	Plain Tiger	<i>Danaus chrysippus</i>	LC	
26		<i>Euphaedra Medon</i>		
27	Golden Piper	<i>Eurytela dryope</i>	LC	
28	Yellow-banded Evening Brown	<i>Gnophodes betsimena</i>	LC	
29	Guinea-fowl Butterfly	<i>Hamanumida daedalus</i>	LC	
30		<i>Henotesia perspicua</i>		
31	Variable Diadem	<i>Hypolimnas anthedon</i>	LC	
32		<i>Hypolimnas salmacis</i>		
33		<i>Junonia chorimene</i>		
34	Dark Blue Pansy	<i>Junonia oenone</i>		
35		<i>Junonia sophia</i>		
36		<i>Junonia stygia</i>		
37	Soldier Pansy	<i>Junonia terea</i>	LC	
38		<i>Junonia westermanni</i>		
39	Twilight Brown	<i>Melanitis leda</i>	LC	
40		<i>Mesoxantha ethosea</i>		
41	Scalloped False Sailor	<i>Neptidopsis ophione</i>	LC	
42	Original Club Sailer	<i>Neptis melicerta</i>	LC	
43		<i>Neptis metella</i>		
44	Spotted Sailor	<i>Neptis saclava</i>	LC	
45	Serene Sailor	<i>Neptis serena</i>	LC	
46		<i>Neptis strigata</i>		
47	Mother-of-pearl	<i>Protonotomorphia parhassus</i>	LC	
48		<i>Salvia occidentalis</i>		
49	Blue Monarch	<i>Tirumala petiverana</i>	LC	
50		<i>Ypthima albida</i>		
51	African Ringlet	<i>Ypthima asterope</i>	LC	
52		<i>Ypthimomorphia itonia</i>		
53	Albatross White	<i>Appias sabina</i>	LC	
54	Pioneer White	<i>Belenois aurota</i>	LC	
55	Calypso Caper White	<i>Belenois calypso</i>	LC	
56	African Caper White	<i>Belenois creona</i>	LC	
57		<i>Belenois solilucis</i>		
58	False Dotted Border	<i>Belenois thysa</i>	LC	
59	African Migrant	<i>Catopsilia florella</i>	LC	
60	Red Tip	<i>Colotis antevippe</i>	LC	
61	Scarlet Tip	<i>Colotis danae</i>	LC	
62		<i>Colotis eucharis</i>		
63	African Small White	<i>Dixeia charina</i>	LC	
64		<i>Dixeia orbona</i>		
65	Ant-heap Small White	<i>Dixeia pigea</i>	LC	
66	Vine-leaf Vagrant	<i>Eronia cleodora</i>		
67	Broad-bordered Grass Yellow	<i>Eurema brigitta</i>	LC	
68	Grass Yellow	<i>Eurema hecabe</i>	LC	
69		<i>Leptosia nupta</i>	LC	
70		<i>Leptosia wigginsii</i>		
71		<i>Mylothris continua</i>	LC	
72	Large Vagrant	<i>Nepheronia argia</i>	LC	
73	Common Hairtail	<i>Anthene definita</i>	LC	
74		<i>Anthene schoutedeni</i>		
75	African Babul Blue	<i>Azamas jesus</i>	LC	
76	White-tipped Blue	<i>Eicochrysops hippocrates</i>	LC	
77	Common Smoky Blue	<i>Euchrysops malathana</i>	LC	
78	Grass Jewel	<i>Freyeria trochylus</i>	LC	



No	Common Name	Scientific name	IUCN Status	Uganda List
79	Lang's Short-tailed Blue	<i>Leptotes pirithous</i>	LC	
80		<i>Pentila pauli</i>		
81		<i>Tixentius cretosus</i>		
82	African Grass Blue	<i>Zizeeria knysna</i>	LC	
83	Gaika Blue	<i>Zizula hylax</i>	LC	
84		<i>Acleros ploetzi</i>		
85		<i>Coeliades forestans</i>		
86		<i>Eagris lucetia</i>		
87		<i>Eretis lugens</i>		
88		<i>Metisella midas</i>		
89	Black-branded Swift	<i>Pelopidas mathias</i>	LC	
90		<i>Sarangesa maculata</i>		
91	Mountain Sandman	<i>Spialia spio</i>	LC	
92	Small Striped Swordtail	<i>Graphium policenes</i>	LC	
93		<i>Papilio Chrapkowskoides</i>		
94		<i>Papilio cynorta</i>		
95	Flying Handkerchief	<i>Papilio dardanus</i>	LC	
96	Citrus Swallowtail	<i>Papilio demodocus</i>	LC	
97	Narrow Green-banded Swallowtail	<i>Papilio nireus</i>	LC	
98		<i>Papilio phorcas</i>		

Note) IUCN Red List Category: Extinct (EX), Extinct in the Wild (EW), Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT), Least Concern (LC), Data Deficient (DD), Not Evaluated (NE), "Blank" Not Applicable

Source: JICA Survey Team

#### e) Fishes

Since the capture and collection of fish is prohibited in the protected area, the species inhabiting the study area were identified mainly through interviews with fishermen.

As a result of the interviews, 20 species were identified. Of these, one species, Elephant Snout (Scientific Name: *Mormyrus niloticus*) is categorized high on the IUCN Red List.

The list of identified species is shown below.

**Table 6.2.9 The lists of Identified Species (Fishes)**


	Common Name	Scientific Name	IUCN Status	Uganda List
1	Nile Perch	<i>Lates niloticus</i>	LC	
2		<i>Protopterus aethiopicus</i>	LC	
3		<i>Barbus jacksonii</i>		
4		<i>Rastrinebola argentea</i>		
5		<i>Labeo forskalii</i>	LC	
6		<i>Barbus bynni</i>	LC	
7		<i>Clarius casonii</i>		
8	African Catfish	<i>Clarias gariepinus</i>	LC	
9	African Butter Catfish	<i>Schilbe mystus</i>	LC	
10		<i>Oreochromis leucostictus</i>	LC	
11		<i>Oreochromis niloticus</i>	LC	
12		<i>Tilapia zillii</i>		
13	Elephant Snout	<i>Mormyrus niloticus</i>	NT	
14		<i>M. Kannume</i>		
15	Longnose Stonebasher	<i>Gnathonemus longibarbis</i>	LC	
16		<i>Macusenius grahami</i>		
17		<i>Petrocephalus catostoma</i>		
18		<i>Synodontis afrofisheri</i>		
19	Lake Victoria Squeaker	<i>Synodontis victoriae</i>	LC	
20		<i>Lates niloticus</i>	LC	

Note) IUCN Red List Category: Extinct (EX), Extinct in the Wild (EW), Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT), Least Concern (LC), Data Deficient (DD), Not Evaluated (NE), "Blank" Not Applicable

Source: JICA Survey Team

Results of the field surveys and biology of the threatened species (IUCN high-categorized species) are shown in Table 6.2.10.

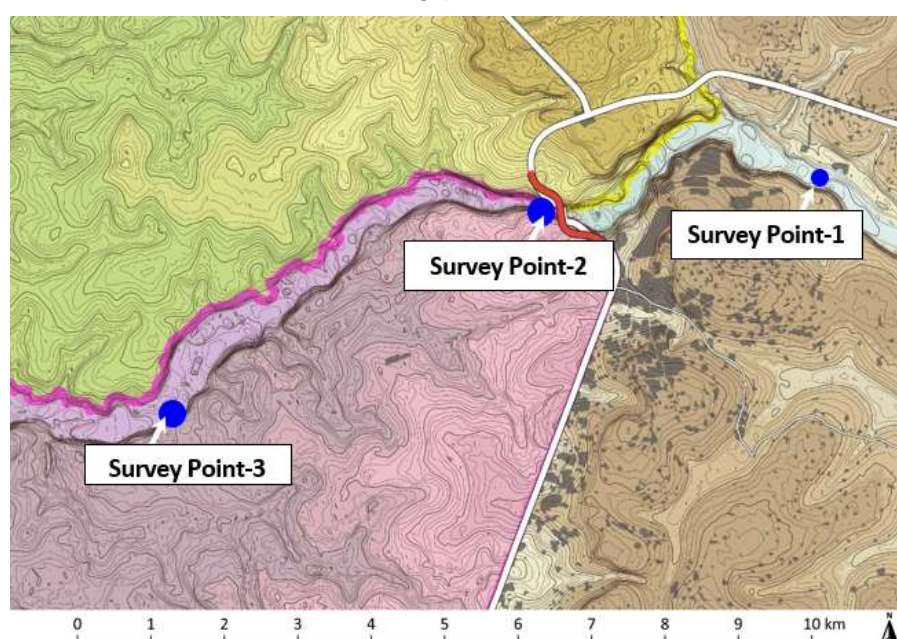
**Table 6.2.10 Results of the Field Surveys and Biology of the Threatened Species (Fishes)**

Common Name (Scientific Name)	Photo	IUCN Category	Results of the Field Surveys and Biology
Elephant Snout ( <i>Mommyrus niloticus</i> )		EN	<p>【Biology】 This species is a genus of ray-finned fish in the family Mommyridae. They are weakly electric, enabling them to navigate, to find their prey, and to communicate with other electric fish.</p> <p>【Results of Field Surveys】 During the field survey, interviews with registered fishermen (Karuma Fisheries Association) confirmed that the fish was caught at least 2 km downstream from the current Karuma Bridge.</p>

Source: JICA Survey Team

#### f) Plankton and Benthos

Surveys of phytoplankton, zooplankton, and benthos were conducted at three sites on the Nile River shown in Figure 6.2.6 (Point-1: Karuma Dam Tunnel outlet, Point-2: upstream of Karuma Dam, Point-3: current Karuma Bridge).



Source: JICA Survey Team

**Figure 6.2.6 Locations of the Surveys (Plankton and Benthos)**

#### i. Results of the Survey

##### 【Phytoplankton】

Twenty species of phytoplankton were identified. Of these, Cyanobacteria accounted for 9 species, followed by Chlorophyta (7 species). The high Cyanobacteria abundance is likely due to the dam. The next highest abundance of Chlorophyta indicates that the water quality in the study area is clear and free of pollution sources. Green algae are also suitable as a food for fish.

**Table 6.2.11 The Lists of Identified Species (Phytoplankton)**

No	Phylum	Class	Order	Family	Genus	Scientific Name	Survey Point		
							1	2	3
1	Cyanobacteria	Cyanophyceae	Oscillatoriales	Oscillatoriaceae	Oscillatoria	<i>Oscillatoria sp</i>	+	+	+
2			Chroococcales	Microcystaceae	Microcystis	<i>Microcystis sp</i>	+	+	+
3			Nostocales	Rivulariaceae	Calothrix	<i>Calothrix sp</i>	+	+	+
4			Oscillatoriales	Oscillatoriaceae	Lyngbya	<i>Lyngbya sp</i>	+	+	+
5		Zygnemmatophyceae	Desmidiaceae			<i>Desmidium sp</i>	+	+	+
6			Nostocales	Nostocaceae	Anabaena	<i>Anabaena sp</i>	+	+	+
7					Tolypothrix	<i>Tolypothrix sp</i>	+	+	

No	Phylum	Class	Order	Family	Genus	Scientific Name	Survey Point		
							1	2	3
8		Zygnematomyceae	Zygnematales	Zygnemataceae	Spirogyra	<i>Spirogyra sp</i>	+	+	+
9		Zygnematomyceae	Desmidiaceae	Desmidiaceae	Micrasterias	<i>Micrasteria sp</i>	+	+	+
10	Chlorophyta	Ulvophyceae	Cladophorales	Cladophoraceae	Cladophora	<i>Cladophora sp</i>	+	+	+
11		Chlorophyceae	Sphaeropleales	Scenedesmeceae	Westella	<i>Westella sp</i>			+
12		Ulvophyceae	Ulotrichales	Ulotrichaceae	Ulothrix	<i>Ulothrix sp</i>	+	+	+
13		Trebouxiophyceae	Chlorellales	Chlorellaceae	Chlorella	<i>Chlorella sp</i>	+	+	+
14		Chlorophyceae	Oedogoniales	Oedogoniaceae	Oedogonium	<i>Oedogonium sp</i>	+	+	+
15		Zygnematomyceae	Zygnematales	Zygnemataceae	Zygnema	<i>Zygnema sp</i>			+
16						<i>Microspore sp</i>	+	+	+
17	Rhodophyta	Floriophyceae	Hildenbrandiales	Hildenbrandiaceae	Hildenbrandia	<i>Hildenbrandia sp</i>	+	+	+
18	Ochrophyta	Chrysophyceae	Chromulinales	Chromulinaceae	Uroglena	<i>Uroglena sp</i>	+	+	+
19	Euglenozoa	Euglenoidea	Euglenales	Phacaceae	Phacus	<i>Phacus sp</i>	+	+	+
20	Heterokonta	Bacillariophyceae	pennales	Diatomaceae	Synedra	<i>Synedra sp</i>			

Source: JICA Survey Team

### 【Zooplankton】

Ten species of zooplankton were identified, consisting of eight species of rotiferas and two species of Arthropods. The dominance of rotiferas indicates that the natural environment is healthy and that food for fish larvae is abundant.

**Table 6.2.12 The lists of Identified Species (Zooplankton)**

No	Phylum	Class	Order	Family	Genus	Scientific Name	Sampling Point		
							1	2	3
1	Rotifera	Monogononta	Ploima	Brachionidae	Brachionus	<i>Brachionus sp</i>	+	+	+
2						<i>Ascomopha sp</i>	+	+	+
3		Monogononta	Ploima	Euchlanidae	Euchlanis	<i>Euchlanis sp</i>	+	+	+
4				Proalidae	Proales	<i>Proales sp</i>	+	+	+
5				Brachionidae	Keratella	<i>Keratella sp</i>	+	+	+
6				Trichocercidae	Trichocerca	<i>Trichocerca sp</i>	+	+	+
7				Synchaetidae	Polyarthra	<i>Polyarthra sp</i>	+	+	+
8				Lecanidae	Lecane	<i>Lecane sp</i>	+	+	+
9	Arthropoda	Copepoda	Cyclopoida	Cyclopidae	Cyclops	<i>Cyclops sp</i>	+	+	+
10		Branchiopoda	Anomopoda	Bosminidae	Bosmina	<i>Bosmina sp</i>	+	+	+

Source: JICA Survey Team

### 【Benthos】

Seven species of benthos were identified. The most common macroinvertebrate was mosquito larvae. This indicates the threat of transmission of infectious diseases such as malaria, which is transmitted by mosquitoes, to nearby mammals, birds, and reptiles.

**Table 6.2.13 The lists of Identified Species (Benthos)**

No	Phylum	Class	Order	Family	Genus	Scientific Name	Sampling Point		
							1	2	3
1	Arthropoda	Insecta	Coleoptera	Hydrophilidae	Hydrophilus	<i>Hydrophilus triangularis</i>	+		+
2	Arthropoda	Insecta	Diptera	Chironomidae		<i>Chironomid larvae</i>	+	+	
3	Arthropoda	Insecta	Odonata			<i>Odonata larvae</i>	+	+	+
4						<i>Water snails</i>	+	+	+
5	Annelida	Clitellata	Opisthopora			<i>Earth Worms</i>	+	+	+
6	Arthropoda	Insecta	Hemiptera	Corixidae	Corixa	<i>Corixa punctata (Water boatman)</i>	+	+	+
7	Arthropoda	Insecta	Diptera	Culicidae		<i>Mosquito larvae</i>	+	+	+

Source: JICA Survey Team

- g) Flora  
i. Vegetation

【Survey Area and Points】

The basic scope of the flora survey was 250 m on both sides from the centre line of the road and the bridge for the vegetation survey, and approximately 500m from the centre line for the survey of other valuable species. Within this survey area, quadrat surveys were conducted at the 55 points shown in Figure 6.2.7 to classify the vegetation within the survey area.



Figure 6.2.7 Locations of Quadrat Surveys

【Results of Survey】

The vegetation based on the results of the quadrat survey are shown in Figure 6.2.8. The communities in the affected area are also shown in Table 6.2.14.

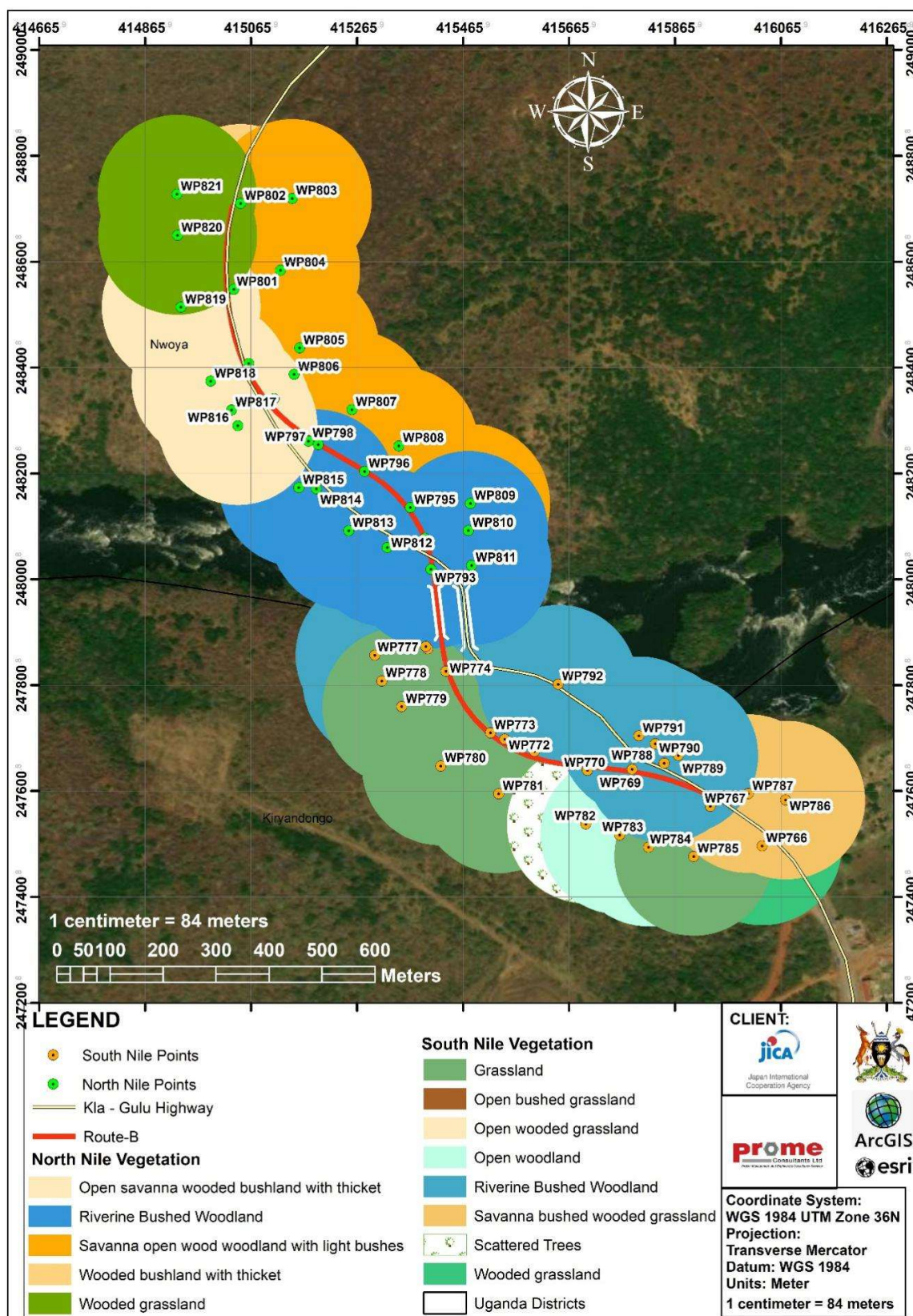
The vegetation affected by the road and bridge construction are: Savanna Bushed Wooded Grassland, Riverine Bushed Woodland, and Grassland on the south bank of the Nile River; and Riverine Bushed Woodland and Open Savanna Wooded Bushland with thicket on the north bank.

**Table 6.2.14 Vegetation in the Affected Area**

Range		Vegetation	Common Species	Reference Quadrat
Beginning	End			
0+200	0+300	Savanna Bushed Wooded Grassland	Albizia zygia, Margaritaria dioscoidea, Vepris nobilis, Achyranthes aspera, Panicum maximum	WP766
0+300	0+800	Riverine Bush Bushed Woodland	Vepris nobilis, Justicia scakens, Combretum molle, Adenia cissamperos	WP769
0+800	1+060	Grassland	Grewia mollis, Combretum molle, Vachellia hockii, Maytenus senegalensis, Combretum collinum, Panicum maximum, Hoslundia opposita	WP774
1+120	1+550	Riverine Bushed Woodland	Combretum molle, Albizia coriaria Ziziphus abyssinica, Harrisonia abyssinica, Lannea schimperi, Ziziphus pubescens, Lantana camara	WP795
1+550	1+900	Open Savanna Wooded Bushland with thicket	Combretum collinum, Sporobolus pyramidalis Hyparrhenia fillipendula, Ziziphus abyssinica, Grewia mollis Brachiaria brizantha, Brachiaria comata	WP818

Source: JICA Survey Team





Source: JICA Survey Team

Figure 6.2.8 Map of Vegetation Classification



## ii. Plant Species (Flora and Threatened Species)

### 【Results of Survey】

548 species of flora were identified. Two species of these, African Mahogany (scientific name: *Khaya senegalensis*) and Iroko (scientific name: *Milicia excelsa*), are categorized high on the IUCN Red List. The list of identified plant species is shown in Table 6.2.15.

**Table 6.2.15 The lists of Identified Species (Flora)**

No	Family	Common Name	Scientific name	Type	Red List Status	Uganda List
1	Acanthaceae		<i>Acanthus polystachys</i>	Shrub		
2	Acanthaceae		<i>Acanthus pubescens</i>	Shrub		
3	Acanthaceae		<i>Asystasia gangetica</i>	Herb		
4	Acanthaceae		<i>Asystasia mysorensis</i>	Herb		
5	Acanthaceae		<i>Blepharis maderaspatensis</i>	Herb		
6	Acanthaceae		<i>Dyschoriste nagchana</i>	Herb		
7	Acanthaceae		<i>Dyschoriste perrottetii</i>	Herb		
8	Acanthaceae		<i>Dyschoriste radicans</i>	Herb		
9	Acanthaceae		<i>Hypoestes aristata</i>	Herb	LC	
10	Acanthaceae		<i>Hypoestes forskalii</i>	Herb		
11	Acanthaceae		<i>Justicia exigua</i>	Herb		
12	Acanthaceae		<i>Justicia flava</i>	Herb		
13	Acanthaceae		<i>Justicia ladanoides</i>	Herb		
14	Acanthaceae		<i>Justicia pingua</i>	Herb		
15	Acanthaceae		<i>Justicia scadens</i>	Herb		
16	Acanthaceae		<i>Justicia unyolensis</i>	Herb		
17	Acanthaceae		<i>Nelsonia smithii</i>	Herb		
18	Acanthaceae		<i>Ruellia patula</i>	Herb	LC	
19	Acanthaceae		<i>Thunbergia alata</i>	Climber		
20	Acanthaceae		<i>Brilliantaisia lamium</i>	Herb	LC	
21	Acanthaceae		<i>Dicliptera laxata</i>	Herb		
22	Acanthaceae		<i>Hygrophila auriculata</i>	Herb	LC	
23	Acanthaceae		<i>Hygrophila cataractae</i>	Herb		
24	Acanthaceae		<i>Hygrophila uliginosa</i>	Herb	LC	
25	Acanthaceae		<i>Hypoestes triflora</i>	Herb		
26	Acanthaceae		<i>Thunbergia fasciculata</i>	Climber		
27	Amaranthaceae		<i>Achyranthes aspera</i>	Herb		
28	Amaranthaceae		<i>Alternanthera pungens</i>	Herb		
29	Amaranthaceae		<i>Amaranthus lividus</i>	Herb		
30	Amaranthaceae		<i>Cyathula achyranthoides</i>	Herb		
31	Amaranthaceae		<i>Pandiatia angustifolia</i>	Herb		
32	Amaranthaceae		<i>Pandiatia carsonii</i>	Herb	LC	
33	Amaranthaceae		<i>Pupalia lappacea</i>	Herb	LC	
34	Amaranthaceae		<i>Aerva lanata</i>	Herb		
35	Amaranthaceae		<i>Alternanthera sessilis</i>	Herb	LC	
36	Amaranthaceae		<i>Amaranthus dubius</i>	Herb		
37	Amaranthaceae		<i>Amaranthus spinosus</i>	Herb		
38	Amaranthaceae		<i>Cyathula prostrata</i>	Herb		
39	Amaranthaceae		<i>Gomphrena celosioides</i>	Herb		
40	Amaranthaceae		<i>Psilotrichum elliotii</i>	Herb		
41	Anacardiaceae		<i>Lannea schimperi</i>	Tree		
42	Anacardiaceae		<i>Ozoroa insignis</i>	Tree	LC	
43	Anacardiaceae		<i>Pseudospondias microcarpa</i>	Tree	LC	
44	Anacardiaceae		<i>Rhus natalensis</i>	Shrub	LC	
45	Anacardiaceae		<i>Rhus Vulgaris</i>	Shrub		
46	Annonaceae		<i>Annona senegalensis</i>	Tree	LC	
47	Annonaceae		<i>Monanthes buchananii</i>	Shrub		
48	Anthericaceae		<i>Anthericum cameronii</i>	Herb	LC	
49	Anthericaceae		<i>Anthericum subpetiolatum</i>	Herb		
50	Apiaceae	Centella	<i>Centella asiatica</i>	Herb	LC	
51	Apiaceae		<i>Hydrocotyle ranunculoides</i>	Herb	LC	
52	Apiaceae		<i>Steganotaenia araliacea</i>	Shrub	LC	
53	Apocynaceae	Num-num	<i>Carissa spinarum</i>	Shrub	LC	
54	Apocynaceae		<i>Ectadiopsis oblongifolia</i>	Herb		
55	Apocynaceae		<i>Gomphocarpus physocarpus</i>	Shrub		
56	Apocynaceae	Trellis-vine	<i>Pergularia daemia</i>	climber	LC	
57	Apocynaceae		<i>Secamone africana</i>	climber		
58	Apocynaceae		<i>Secamone punctulata</i>	Climber		
59	Apocynaceae		<i>Tabernaemontana pachysiphon</i>	Tree	LC	
60	Apocynaceae		<i>Thevetia peruviana</i>	Shrub		
61	Araceae		<i>Pistia stratiotes</i>	Herb		
62	Araliaceae		<i>Polyscias fulva</i>	Tree	LC	
63	Arecaceae		<i>Borassus aethiopicum</i>	Tree	LC	

No	Family	Common Name	Scientific name	Type	Red List Status	Uganda List
64	Arecaceae	Dattier du Senegal	<i>Phoenix reclinata</i>	Tree	LC	
65	Aristolochiaceae		<i>Aristolochia elegans</i>	Herb		
66	Aristolochiaceae		<i>Aristolochia bracteolata</i>	Climber		
67	Asclepiadaceae		<i>Leptadenia hastata</i>	Climber		
68	Asclepiadaceae		<i>Pentarrhinum insipidum</i>	Climber		
69	Asclepiadaceae		<i>Cynanchum polyanthum</i>	Climber		
70	Asparagaceae		<i>Asparagus africanus</i>	Shrub		
71	Asparagaceae		<i>Asparagus flagellaris</i>	Shrub		
72	Asparagaceae		<i>Sansevieria dawei</i>	Herb		
73	Asparagaceae		<i>Sansevieria nilotica</i>	Herb		
74	Asphodelaceae		<i>Bulbine abyssinica</i>	Herb		
75	Asteraceae		<i>Acmella caulirhiza</i>	Herb	LC	
76	Asteraceae		<i>Aspilia africana</i>	Herb		
77	Asteraceae		<i>Aspilia kotschy</i>	Herb		
78	Asteraceae		<i>Berkheya spekeana</i>	Herb		
79	Asteraceae		<i>Bidens pilosa</i>	Herb		
80	Asteraceae		<i>Blumea alata</i>	Herb		
81	Asteraceae		<i>Bothriocline longipes</i>	Shrub		
82	Asteraceae		<i>Chromolaena odorata</i>	Shrub		
83	Asteraceae		<i>Conyza floribunda</i>	Herb		
84	Asteraceae		<i>Conyza sumatrensis</i>	Herb		
85	Asteraceae		<i>Conyza tigrensis</i>	Herb		
86	Asteraceae		<i>Crassocephalum vitellinum</i>	Herb		
87	Asteraceae		<i>Dicoma anomala</i>	Herb		
88	Asteraceae		<i>Echinops amplexicaulis</i>	Herb		
89	Asteraceae		<i>Erlangea tomentosa</i>	Herb		
90	Asteraceae	Bungbungit	<i>Ethulia conyzoides</i>	Herb	LC	
91	Asteraceae		<i>Guizotia scabra</i>	Herb		
92	Asteraceae		<i>Melanthera scandens</i>	Herb		
93	Asteraceae		<i>Microglossa pyrifolia</i>	Shrub		
94	Asteraceae		<i>Microglossa afzelii</i>	Shrub		
95	Asteraceae		<i>Synedrella nodiflora</i>	Herb		
96	Asteraceae		<i>Tridax procumbens</i>	Herb		
97	Asteraceae		<i>Vernonia adoensis</i>	Shrub		
98	Asteraceae		<i>Vernonia amygdalina</i>	Tree		
99	Asteraceae		<i>Vernonia auriculifera</i>	Shrub	LC	
100	Asteraceae		<i>Vernonia biafrae</i>	Herb		
101	Asteraceae		<i>Vernonia campania</i>	Herb		
102	Asteraceae		<i>Vernonia cinerea</i>	Herb		
103	Asteraceae		<i>Vernonia lasiopus</i>	Shrub	LC	
104	Asteraceae		<i>Vernonia smithiana</i>	Shrub		
105	Asteraceae		<i>Acmella oleracea</i>	Herb		
106	Asteraceae		<i>Ageratum conyzoides</i>	Herb		
107	Asteraceae		<i>Blumea crispata</i>	Shrub		
108	Asteraceae		<i>Chrysanthellum americana</i>	Herb		
109	Asteraceae		<i>Chrysanthellum indicum</i>	Herb		
110	Asteraceae		<i>Crassocephalum bojeri</i>	Herb		
111	Asteraceae		<i>Crassocephalum montuosum</i>	Herb		
112	Asteraceae		<i>Crassocephalum rubens</i>	Herb		
113	Asteraceae		<i>Eclipta alba</i>	Herb	LC	
114	Asteraceae		<i>Eclipta prostrata</i>	Herb	LC	
115	Asteraceae		<i>Elephantopus scaber</i>	Herb		
116	Asteraceae		<i>Emilia coccinea</i>	Herb		
117	Asteraceae		<i>Emilia juncea</i>	Herb		
118	Asteraceae		<i>Enhydra fluctuans</i>	Herb		
119	Asteraceae		<i>Galinsoga parviflora</i>	Herb		
120	Asteraceae		<i>Launaea rarifolia</i>	Herb		
121	Asteraceae		<i>Sonchus schweinfurthii</i>	Herb		
122	Asteraceae		<i>Sphaeranthus suaveolens</i>	Herb	LC	
123	Asteraceae		<i>Targetes minuta</i>	Herb		
124	Asteraceae		<i>Vernonia perrottetii</i>	Herb		
125	Azollaceae		<i>Azolla pinnata</i>	Mosses	LC	
126	Basseraeae		<i>Basella alba</i>	Climber		
127	Bignoniaceae	Sausage Tree	<i>Kigelia africana</i>	Tree	LC	
128	Bignoniaceae		<i>Markhamia lutea</i>	Tree	LC	
129	Bignoniaceae	African Tulip Tree	<i>Spathodea campanulata</i>	Tree	LC	
130	Bignoniaceae		<i>Stereospermum kunthianum</i>	Tree	LC	
131	Boraginaceae		<i>Cordia monoica</i>	Shrub	LC	
132	Boraginaceae		<i>Cynoglossum lanceolatum</i>	Herb		
133	Capparaceae		<i>Cadaba farinosa</i>	Shrub	LC	
134	Capparaceae		<i>Crateva adansonii</i>	Tree	LC	
135	Capparidaceae		<i>Capparis elaeagnoides</i>	Climber		
136	Capparidaceae		<i>Capparis erythrocarpos</i>	Shrub		
137	Capparidaceae		<i>Capparis fascicularis</i>	Climber	LC	

No	Family	Common Name	Scientific name	Type	Red List Status	Uganda List
138	Capparidaceae		<i>Capparis subtomentosa</i>	Shrub		
139	Capparidaceae		<i>Capparis tomentosa</i>	Shrub		
140	Capparidaceae		<i>Maerua angolensis</i>	Shrub	LC	
141	Capparidaceae		<i>Maerua duchesnei</i>	Shrub	LC	
142	Capparidaceae		<i>Maerua oblongifolia</i>	Shrub		
143	Capparidaceae		<i>Maerua triphylla</i>	Shrub	LC	
144	Caryophyllaceae		<i>Drymaria cordata</i>	Herb		
145	Celastraceae		<i>Cassine aethiopica</i>	Shrub	LC	
146	Celastraceae	Angle-stem Spikethorn	<i>Maytenus heterophylla</i>	Shrub	LC	
147	Celastraceae		<i>Maytenus senegalensis</i>	Shrub		
148	Celastraceae		<i>Maytenus undata</i>	Shrub	LC	
149	Clusiaceae		<i>Psorospermum febrifugum</i>	Shrub	LC	
150	Colchicaceae		<i>Gloriosa simplex</i>	Herb		
151	Colchicaceae		<i>Gloriosa superba</i>	Herb	LC	
152	Combretaceae		<i>Combretum aculeatum</i>	Shrub	LC	
153	Combretaceae		<i>Combretum adenogonium</i>	Tree	LC	
154	Combretaceae		<i>Combretum collinum</i>	Tree	LC	
155	Combretaceae		<i>Combretum comosum</i>	Shrub		
156	Combretaceae		<i>Combretum molle</i>	Tree	LC	
157	Combretaceae		<i>Terminalia glaucescens</i>	Tree	LC	
158	Commelinaceae	Day Flower	<i>Commelina benghalensis</i>	Herb	LC	
159	Commelinaceae		<i>Commelina capitata</i>	Herb		
160	Commelinaceae	White Mouth Dayflower	<i>Commelina erecta</i>	Herb	LC	
161	Commelinaceae		<i>Cyanotis flexuosa</i>	Herb		
162	Commelinaceae		<i>Cyanotis foecunda</i>	Herb		
163	Commelinaceae		<i>Cyanotis lanata</i>	Herb	LC	
164	Commelinaceae		<i>Floscopa glomerata</i>	Herb	LC	
165	Commelinaceae		<i>Murdannia simplex</i>	Herb	LC	
166	Commelinaceae		<i>Commelina africana</i>	Herb	LC	
167	Commelinaceae	Climbing Dayflower	<i>Commelina diffusa</i>	Herb	LC	
168	Connaraceae		<i>Agelaea pentagyna</i>	Climber		
169	Convolvulaceae		<i>Astipomoa malvaceae</i>	Herb		
170	Convolvulaceae		<i>Dichondra micrantha</i>	Herb	LC	
171	Convolvulaceae		<i>Dichondra repens</i>	Herb		
172	Convolvulaceae		<i>Evolvulus alsinoides</i>	Herb		
173	Convolvulaceae		<i>Ipomoea biflora</i>	climber		
174	Convolvulaceae	Mile a minute vine	<i>Ipomoea cairica</i>	Climber	LC	
175	Convolvulaceae		<i>Ipomoea eriocarpa</i>	Climber		
176	Convolvulaceae		<i>Merremia pterygocaulos</i>	Climber		
177	Convolvulaceae		<i>Seddera bagshawei</i>	Herb		
178	Convolvulaceae		<i>Convolvulus farinosus</i>	Herb		
179	Convolvulaceae		<i>Evolvulus nummularius</i>	Herb		
180	Convolvulaceae		<i>Hewittia scandens</i>	Climber		
181	Convolvulaceae		<i>Ipomoea blepharophylla</i>	Climber		
182	Convolvulaceae		<i>Ipomoea tenuirostris</i>	Climber		
183	Convolvulaceae		<i>Ipomoea turbinata</i>	Climber		
184	Convolvulaceae		<i>Merremia tridentata</i>	Climber		
185	Cucurbitaceae		<i>Coccinia grandis</i>	Climber		
186	Cucurbitaceae		<i>Coccinia mildbraedii</i>	Climber		
187	Cucurbitaceae		<i>Diplocyclos palmatus</i>	Climber		
188	Cucurbitaceae		<i>Kedrostis foetidissima</i>	Climber		
189	Cucurbitaceae		<i>Momordica foetida</i>	Climber		
190	Cucurbitaceae		<i>Mukia maderaspatana</i>	Climber		
191	Cyperaceae		<i>Abildgaardia ovata</i>	Sedge		
192	Cyperaceae		<i>Fimbristylis filamentosa</i>	Sedge		
193	Cyperaceae		<i>Kyllinga elatior</i>	Sedge		
194	Cyperaceae		<i>Kyllinga pumila</i>	Sedge	LC	
195	Cyperaceae		<i>Cyperus cyperoides</i>	Sedge	LC	
196	Cyperaceae		<i>Cyperus dubius</i>	Sedge	LC	
197	Cyperaceae		<i>Kyllinga alba</i>	Sedge		
198	Cyperaceae		<i>Kyllinga brevifolia</i>	Sedge	LC	
199	Cyperaceae		<i>Kyllinga bulbosa</i>	Sedge	LC	
200	Cyperaceae		<i>Kyllinga crassipes</i>	Sedge		
201	Cyperaceae		<i>Kyllinga erecta</i>	Sedge	LC	
202	Cyperaceae		<i>Kyllinga sphaerocephala</i>	Sedge		
203	Dilleniaceae		<i>Tetracera potatoria</i>	Shrub		
204	Dioscoreaceae		<i>Dioscorea alata</i>	Climber		
205	Dioscoreaceae		<i>Dioscorea bulbifera</i>	climber		
206	Dioscoreaceae		<i>Dioscorea dumetorum</i>	Climber		
207	Dioscoreaceae	Ogborodii	<i>Dioscorea minutiflora</i>	Climber	LC	
208	Ebenaceae		<i>Diospyros abyssinica</i>	Tree	LC	
209	Euphorbiaceae		<i>Acalypha bipartita</i>	Shrub		
210	Euphorbiaceae		<i>Acalypha ornata</i>	Shrub	LC	
211	Euphorbiaceae		<i>Acalypha villicaulis</i>	Herb		

No	Family	Common Name	Scientific name	Type	Red List Status	Uganda List
212	Euphorbiaceae		<i>Alchornea cordifolia</i>	Shrub	LC	
213	Euphorbiaceae		<i>Antidesma membranaceum</i>	Tree	LC	
214	Euphorbiaceae		<i>Antidesma venosum</i>	Tree	LC	
215	Euphorbiaceae	Bird Pepper	<i>Capsicum frutescens</i>	Herb	LC	
216	Euphorbiaceae		<i>Erythrococca atrovirens</i>	Shrub	LC	
217	Euphorbiaceae		<i>Erythrococca bongensis</i>	Shrub	LC	
218	Euphorbiaceae		<i>Euphorbia candelabrum</i>	Tree	LC	
219	Euphorbiaceae		<i>Margaritaria discoidea</i>	Tree	LC	
220	Euphorbiaceae		<i>Micrococca mercurialis</i>	Herb		
221	Euphorbiaceae		<i>Neoboutonia macrocalyx</i>	Tree	LC	
222	Euphorbiaceae		<i>Ricinus communis</i>	Herb		
223	Euphorbiaceae		<i>Shirakiopsis elliptica</i>	Tree	LC	
224	Euphorbiaceae		<i>Tragia brevipes</i>	Climber		
225	Euphorbiaceae		<i>Euphorbia heterophylla</i>	Herb	LC	
226	Euphorbiaceae		<i>Euphorbia hirta</i>	Herb		
227	Euphorbiaceae		<i>Euphorbia inaequilatera</i>	Herb		
228	Euphorbiaceae		<i>Euphorbia schimperiana</i>	Herb		
229	Fabaceae		<i>Abrus canescens</i>	Climber		
230	Fabaceae		<i>Abrus precatorius</i>	Climber		
231	Fabaceae		<i>Albizia coriaria</i>	Tree	LC	
232	Fabaceae		<i>Albizia grandibracteata</i>	Tree	LC	
233	Fabaceae	Okuro	<i>Albizia zygia</i>	Tree	LC	
234	Fabaceae		<i>Alysicarpus glumaceus</i>	Herb		
235	Fabaceae		<i>Alysicarpus rugosus</i>	Herb		
236	Fabaceae		<i>Cassia petersiana</i>	Shrub	LC	
237	Fabaceae		<i>Centrosema pubescens</i>	Climber		
238	Fabaceae	Fish-bone Cassia	<i>Chamaecrista mimosoides</i>	Herb	LC	
239	Fabaceae		<i>Crotalaria brevidens</i>	Herb		
240	Fabaceae		<i>Crotalaria cephalotes</i>	Herb		
241	Fabaceae		<i>Crotalaria chrysoclora</i>	Herb	LC	
242	Fabaceae		<i>Crotalaria glauca</i>	Herb		
243	Fabaceae		<i>Crotalaria ononoides</i>	Herb		
244	Fabaceae		<i>Crotalaria recta</i>	Herb		
245	Fabaceae		<i>Crotalaria spinosa</i>	Herb	LC	
246	Fabaceae		<i>Desmodium adscendens</i>	Herb	LC	
247	Fabaceae		<i>Desmodium dregeanum</i>	Herb		
248	Fabaceae		<i>Desmodium gangeticum</i>	Herb		
249	Fabaceae		<i>Desmodium incanum</i>	Herb		
250	Fabaceae		<i>Desmodium setigerum</i>	Herb		
251	Fabaceae		<i>Desmodium velutinum</i>	Shrub		
252	Fabaceae		<i>Dolichos trilobus</i>	Climber		
253	Fabaceae		<i>Entada wahlbergii</i>	Climber		
254	Fabaceae		<i>Eriosema glomeratum</i>	Herb		
255	Fabaceae		<i>Eriosema psoraleoides</i>	Shrub		
256	Fabaceae		<i>Erythrina abyssinica</i>	Tree	LC	
257	Fabaceae		<i>Indigofera circinnella</i>	Herb		
258	Fabaceae		<i>Indigofera dendroides</i>	Herb		
259	Fabaceae		<i>Indigofera emarginella</i>	Shrub		
260	Fabaceae		<i>Indigofera erecta</i>	Shrub		
261	Fabaceae		<i>Indigofera linifolia</i>	Shrub	LC	
262	Fabaceae	Sensitive Plant	<i>Mimosa pudica</i>	Herb	LC	
263	Fabaceae	Perennial Soybean	<i>Neonotonia wightii</i>	Herb	LC	
264	Fabaceae		<i>Ophrestia hedysaroides</i>	climber		
265	Fabaceae		<i>Philenoptera laxiflora</i>	Tree	LC	
266	Fabaceae		<i>Rhynchosia densiflora</i>	Climber		
267	Fabaceae		<i>Rhynchosia stipulosa</i>	Climber		
268	Fabaceae		<i>Rhynchosia viscosa</i>	Climber		
269	Fabaceae		<i>Senegalia senegal</i>	Tree		
270	Fabaceae		<i>Senna hirsuta</i>	Herb		
271	Fabaceae	Pheasantwood	<i>Senna siamea</i>	Tree	LC	
272	Fabaceae	Egyptian Sesban	<i>Sesbania sesban</i>	Shrub	LC	
273	Fabaceae		<i>Tamarindus indica</i>	Tree	LC	VU
274	Fabaceae		<i>Tephrosia elegans</i>	Herb		
275	Fabaceae		<i>Tephrosia linearis</i>	Herb		
276	Fabaceae		<i>Teramus uncinatus</i>	Climber		
277	Fabaceae		<i>Tylosema fassoglensis</i>	Climber		
278	Fabaceae		<i>Uraria picta</i>	Herb	LC	
279	Fabaceae		<i>Vachellia abyssinica</i>	Tree		
280	Fabaceae		<i>Vachellia brevispica</i>	Shrub		
281	Fabaceae		<i>Vachellia hockii</i>	Shrub		
282	Fabaceae		<i>Vachellia polyacantha</i>	Tree		
283	Fabaceae	Paper-bark Thorn	<i>Vachellia sieberiana</i>	Tree	LC	
284	Fabaceae	Tropical Sensitive Pea	<i>Cassia absus</i>	Herb	LC	
285	Fabaceae		<i>Cassia kirkii</i>	Herb	LC	

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286	Fabaceae		<i>Clitoria ternatea</i>	Herb		
287	Fabaceae		<i>Crotalaria annua</i>	Herb		
288	Fabaceae		<i>Crotalaria natalitica</i>	Herb		
289	Fabaceae		<i>Indigofera atriceps</i>	Herb		
290	Fabaceae		<i>Indigofera hirsuta</i>	Herb		
291	Fabaceae		<i>Indigofera paniculata</i>	Herb		
292	Fabaceae		<i>Rhynchosia elegans</i>	Climber		
293	Fabaceae		<i>Rhynchosia hirta</i>	Climber		
294	Fabaceae		<i>Rhynchosia minima</i>	Climber	LC	
295	Fabaceae		<i>Teramnus micans</i>	Climber		
296	Fabaceae		<i>Zornia pratensis</i>	Herb		
297	Fabaceae		<i>Canavalia virosa</i>	Climber		
298	Fabaceae		<i>Desmodium salicifolium</i>	Shrub	LC	
299	Fabaceae		<i>Desmodium tortuosum</i>	Herb		
300	Fabaceae		<i>Dichrostachys cinerea</i>	Shrub	LC	
301	Fabaceae		<i>Galactia tenuiflora</i>	Climber	LC	
302	Fabaceae		<i>Indigofera spicata</i>	Herb		
303	Fabaceae		<i>Macrotyloma axillare</i>	Climber		
304	Fabaceae		<i>Mimosa pigra</i>	Shrub	LC	
305	Fabaceae	Camel's foot	<i>Piliostigma thonningii</i>	Tree	LC	
306	Fabaceae		<i>Pseudarthria hookeri</i>	Shrub		
307	Fabaceae	Christmas Bush	<i>Senna bicapsularis</i>	Shrub	LC	
308	Fabaceae	Coffee Senna	<i>Senna occidentalis</i>	Herb	LC	
309	Fabaceae		<i>Senna spectabilis</i>	Tree	LC	
310	Fabaceae		<i>Tephrosia nana</i>	Herb		
311	Fabaceae		<i>Teramnus labialis</i>	Herb		
312	Fabaceae	Inaola Kwaka	<i>Vigna kirkii</i>	Climber	LC	
313	Fabaceae	Gilibande	<i>Vigna luteola</i>	Climber	LC	
314	Fabaceae	Creeping Vigna	<i>Vigna parkeri</i>	Climber	LC	
315	Fabaceae		<i>Vigna reticulata</i>	Climber		
316	Fabaceae		<i>Vigna vexillata</i>	Climber		
317	Fabaceae		<i>Alysicarpus vaginalis</i>	Herb		
318	Fabaceae		<i>Desmodium triflorum</i>	Herb	LC	
319	Fabaceae	Sicklepod	<i>Senna obtusifolia</i>	Herb	LC	
320	Fabaceae		<i>Tephrosia pumila</i>	Herb	LC	
321	Gisectiaceae		<i>Gisekia pharnaceoides</i>	Herb		
322	Hymenocardiaceae		<i>Hymenocardia acida</i>	Shrub	LC	
323	Lamiaceae		<i>Becium angustifolium</i>	Herb		
324	Lamiaceae		<i>Clerodendrum johnstonii</i>	Shrub	LC	
325	Lamiaceae		<i>Hoslundia opposita</i>	Shrub		
326	Lamiaceae		<i>Hyptis lanceolata</i>	Herb		
327	Lamiaceae		<i>Leonotis nepetifolia</i>	Herb		
328	Lamiaceae		<i>Ocimum gratissimum</i>	Shrub		
329	Lamiaceae		<i>Orthosiphon parvifolius</i>	Herb		
330	Lamiaceae	Cats-whiskers	<i>Rotheca myricoides</i>	shrub	LC	
331	Lamiaceae		<i>Tetradenia riparia</i>	Shrub	LC	
332	Lamiaceae		<i>Timnea aethiopica</i>	Shrub		
333	Lamiaceae		<i>Aeollanthus suaveolens</i>	Herb		
334	Lamiaceae		<i>Leucas deflexa</i>	Herb		
335	Lamiaceae		<i>Ocimum punctatum</i>	Herb		
336	Lamiaceae		<i>Basilicum polystachyon</i>	Herb		
337	Lamiaceae		<i>Leucas martinicensis</i>	Herb		
338	Lamiaceae		<i>Ocimum americanum</i>	Herb		
339	Loganiaceae		<i>Strychnos innocua</i>	Shrub	LC	
340	Lythraceae		<i>Ammannia auriculata</i>	Herb	LC	
341	Malvaceae		<i>Abutilon longispue</i>	Herb		
342	Malvaceae		<i>Abutilon mauritanum</i>	Herb		
343	Malvaceae		<i>Corchorus olitorius</i>	Herb		
344	Malvaceae		<i>Corchorus tridens</i>	Herb		
345	Malvaceae		<i>Grewia bicolor</i>	Shrub		
346	Malvaceae	Sandpaper Raisin	<i>Grewia flavescens</i>	Shrub	LC	
347	Malvaceae		<i>Grewia floribunda</i>	Shrub		
348	Malvaceae		<i>Grewia mollis</i>	Shrub	LC	
349	Malvaceae		<i>Grewia trichocarpa</i>	Shrub		
350	Malvaceae		<i>Hibiscus calyphyllus</i>	Shrub	LC	
351	Malvaceae		<i>Hibiscus cannabinus</i>	Shrub		
352	Malvaceae		<i>Kosteletzkya adoensis</i>	herb		
353	Malvaceae		<i>Melochia melissifolia</i>	Herb		
354	Malvaceae		<i>Pavonia burchellii</i>	shrub		
355	Malvaceae		<i>Pavonia kilimandscharica</i>	Shrub		
356	Malvaceae		<i>Sida acuta</i>	Herb		
357	Malvaceae		<i>Sida cordifolia</i>	Herb		
358	Malvaceae		<i>Sida micrantha</i>	Herb		
359	Malvaceae		<i>Sida ovata</i>	Herb		

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360	Malvaceae		<i>Sida pilosa</i>	Herb		
361	Malvaceae		<i>Sida rhombifolia</i>	Herb		
362	Malvaceae		<i>Sida urens</i>	Herb		
363	Malvaceae		<i>Triumfetta annua</i>	Herb		
364	Malvaceae		<i>Triumfetta macrophylla</i>	Shrub		
365	Malvaceae		<i>Triumfetta rhomboidea</i>	Herb		
366	Malvaceae		<i>Urena lobata</i>	Shrub	LC	
367	Malvaceae		<i>Wissadula amplissima</i>	Herb		
368	Malvaceae		<i>Pavonia senegalensis</i>	Herb		
369	Malvaceae		<i>Sida javensis</i>	Herb		
370	Melastomataceae		<i>Antherotoma naudinii</i>	Herb		
371	Melastomataceae		<i>Dissotis brazzae</i>	Herb		
372	Melastomataceae		<i>Dissotis senegambiensis</i>	Herb		
373	Meliaceae		<i>Ekerbergia capensis</i>	Tree		
374	Meliaceae	African Mahogany	<i>Khaya senegalensis</i>	Tree	VU	EN
375	Meliaceae		<i>Pseudocedrela kotschy</i>	Tree	LC	
376	Menispermaceae		<i>Chasmanthera dependens</i>	Climber		
377	Menispermaceae		<i>Cissampelos mucronata</i>	Climber		
378	Menispermaceae		<i>Stephania abyssinica</i>	Climber		
379	Moraceae		<i>Antiaris toxicaria</i>	Tree	LC	
380	Moraceae		<i>Ficus asperifolia</i>	Shrub	LC	
381	Moraceae	Hairy Rock Fig	<i>Ficus glumosa</i>	Tree	LC	
382	Moraceae		<i>Ficus mucoso</i>	Tree	LC	
383	Moraceae		<i>Ficus ovata</i>	Tree		
384	Moraceae		<i>Ficus platyphylla</i>	Tree	LC	
385	Moraceae	Broom Cluster Fig	<i>Ficus sur</i>	Tree	LC	
386	Moraceae	Iroko	<i>Milicia excelsa</i>	Tree	NT	EN
387	Mulluginaceae		<i>Mollugo nudicaulis</i>	Herb		
388	Myrsinaceae		<i>Maesa lanceolata</i>	Shrub	LC	
389	Myrsinaceae		<i>Maesa welwitschii</i>	Shrub		
390	Myrtaceae		<i>Eugenia capensis</i>	Shrub		
391	Myrtaceae	Guava	<i>Psidium guajava</i>	Tree	LC	
392	Myrtaceae		<i>Syzygium cordatum</i>	Tree	LC	
393	Nyctaginaceae		<i>Boerhavia diffusa</i>	Herb		
394	Nyctaginaceae		<i>Commicarpus plumbagineus</i>	Climber		
395	Nyctaginaceae		<i>Bougainvillea spectabilis</i>	Shrub		
396	Oleaceae		<i>Ximelia americana</i>	Shrub	LC	
397	Oleaceae		<i>Jasminum pauciflorum</i>	Climber		
398	Oleaceae		<i>Jasminum abyssinicum</i>	Climber		
399	Oleaceae		<i>Jasminum emini</i>	Climber		
400	Oleaceae	Black Ironwood	<i>Olea capensis</i>	Tree	LC	
401	Opiliaceae		<i>Opilia celtidifolia</i>	Climber		
402	Orobanchaceae		<i>Cynium tubulosum</i>	Climber	LC	
403	Oxalidaceae		<i>Biophytum abyssinicum</i>	Herb		
404	Oxalidaceae		<i>Oxalis corniculata</i>	Herb		
405	Oxalidaceae		<i>Oxalis latifolia</i>	Herb		
406	Passifloraceae		<i>Adenia cissampeloides</i>	climber		
407	Passifloraceae		<i>Passiflora edulis</i>	Climber		
408	Pedaliaceae		<i>Sesamum angustifolium</i>	Herb		
409	Phyllanthaceae		<i>Bridelia atroviridis</i>	Shrub	LC	
410	Phyllanthaceae		<i>Bridelia micrantha</i>	Tree	LC	
411	Phyllanthaceae		<i>Bridelia scleroneura</i>	Tree	LC	
412	Phyllanthaceae		<i>Flueggea virosa</i>	Shrub	LC	
413	Phyllanthaceae		<i>Phyllanthus maderaspatensis</i>	Shrub	LC	
414	Phyllanthaceae		<i>Phyllanthus ovalifolius</i>	Shrub	LC	
415	Phyllanthaceae		<i>Phyllanthus pseudoniruri</i>	Shrub		
416	Phyllanthaceae		<i>Phyllanthus nummulariifolius</i>	Herb		
417	Phyllanthaceae		<i>Phytolacca dodecandra</i>	Shrub		
418	Phyllanthaceae		<i>Phyllanthus amarus</i>	Herb		
419	Phyllanthaceae		<i>Phyllanthus niruri</i>	Herb		
420	Phyllanthaceae		<i>Phyllanthus rotundifolius</i>	Herb		
421	Poaceae		<i>Andropogon canaliculatus</i>	Grass		
422	Poaceae		<i>Andropogon chinensis</i>	Grass		
423	Poaceae		<i>Bothriochloa insculpta</i>	Grass		
424	Poaceae		<i>Brachiaria brizantha</i>	Grass		
425	Poaceae		<i>Brachiaria comata (Kotschyana)</i>	Grass		
426	Poaceae		<i>Brachiaria decumbens</i>	Grass		
427	Poaceae	Guinea Grass	<i>Brachiaria jubata</i>	Grass	LC	
428	Poaceae		<i>Brachiaria leersoides</i>	Grass		
429	Poaceae		<i>Brachiaria platynota</i>	Grass		
430	Poaceae		<i>Chloris gayana</i>	Grass		
431	Poaceae		<i>Chloris pycnothrix</i>	Grass		
432	Poaceae		<i>Chloris virgata</i>	Grass		
433	Poaceae		<i>Cenium newtonii</i>	Grass		



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434	Poaceae		<i>Cynodon dactylon</i>	Grass		
435	Poaceae		<i>Digitaria abyssinica</i>	Grass		
436	Poaceae		<i>Digitaria longiflora</i>	Grass		
437	Poaceae		<i>Digitaria maitlandii</i>	Grass		
438	Poaceae		<i>Digitaria scalarum</i>	Grass		
439	Poaceae		<i>Digitaria ternata</i>	Grass		
440	Poaceae		<i>Eleusin africana</i>	Grass		
441	Poaceae		<i>Eragrostis racemosa</i>	Grass		
442	Poaceae		<i>Eragrostis tenuifolia</i>	Grass		
443	Poaceae		<i>Eragrostis tremula</i>	Grass		
444	Poaceae		<i>Heteropogon contortus</i>	Grass		
445	Poaceae		<i>Hyparrhenia collina</i>	Grass		
446	Poaceae		<i>Hyparrhenia filipendula</i>	Grass		
447	Poaceae		<i>Hyparrhenia rufa</i>	Grass		
448	Poaceae		<i>Hyparrhenia schimperi</i>	Grass		
449	Poaceae		<i>Hyperthelia dissoluta</i>	Grass		
450	Poaceae		<i>Imperata cylindrica</i>	Grass		
451	Poaceae		<i>Leptochloa obtusiflora</i>	Grass	LC	
452	Poaceae		<i>Loudelia arundinacea</i>	Grass		
453	Poaceae		<i>Melinis minutiflora</i>	Grass		
454	Poaceae		<i>Melinis repens</i>	Grass		
455	Poaceae		<i>Opismenus hirtellus</i>	Grass		
456	Poaceae		<i>Panicum calvum</i>	Grass		
457	Poaceae		<i>Panicum coloratum</i>	Grass	LC	
458	Poaceae		<i>Panicum deustum</i>	Grass		
459	Poaceae		<i>Panicum maximum</i>	Grass		
460	Poaceae		<i>Panicum trichocladium</i>	Grass		
461	Poaceae	Kodo Millet	<i>Paspalum scrobiculatum</i>	Grass	LC	
462	Poaceae		<i>Rotboellia cochinchinensis</i>	Grass		
463	Poaceae		<i>Setaria bicolor</i>	Grass		
464	Poaceae		<i>Setaria kagerensis</i>	Grass		
465	Poaceae		<i>Setaria poiretiana</i>	Grass		
466	Poaceae		<i>Setaria sphacelata</i>	Grass	LC	
467	Poaceae	Common wild sorghum	<i>Sorghum arundinaceum</i>	Grass	LC	
468	Poaceae		<i>Sporobolus festinus</i>	Grass		
469	Poaceae		<i>Sporobolus pyramidalis</i>	Grass		
470	Poaceae		<i>Sporobolus stapfianus</i>	Grass	LC	
471	Poaceae		<i>Tetrapogon tenellus</i>	Grass		
472	Poaceae		<i>Digitaria velutina</i>	Grass	LC	
473	Poaceae		<i>Eriochloa fatmensis</i>	Grass	LC	
474	Poaceae		<i>Eriochloa meyeriana</i>	Grass	LC	
475	Poaceae	Spring Grass	<i>Eriochloa procer</i>	Grass	LC	
476	Poaceae		<i>Perotis patens</i>	Grass		
477	Poaceae		<i>Setaria pumila</i>	Grass		
478	Poaceae		<i>Urochloa panicoides</i>	Grass	LC	
479	Polygalaceae		<i>Polygala sphenoptera</i>	Herb		
480	Polygonaceae		<i>Persicaria setosula</i>	Herb		
481	Portulacaceae		<i>Portulaca quadrifida</i>	Herb		
482	Ranunculaceae		<i>Clematis hirsuta</i>	Climber	LC	
483	Rhamnaceae		<i>Ziziphus abyssinica</i>	Shrub	LC	
484	Rhamnaceae		<i>Ziziphus mauritiana</i>	Tree		
485	Rhamnaceae		<i>Ziziphus mucronata</i>	Tree	LC	
486	Rhamnaceae		<i>Ziziphus pubescens</i>	Tree	DD	
487	Rubiaceae		<i>Coffea sp</i>	shrub		
488	Rubiaceae		<i>Fadogia cienkowski</i>	Herb		
489	Rubiaceae		<i>Fadogia stenophylla</i>	Herb		
490	Rubiaceae		<i>Gardenia ternifolia</i>	Tree	LC	
491	Rubiaceae		<i>Macrosphyra longistyla</i>	Shrub		
492	Rubiaceae		<i>Mondia whitei</i>	Climber		VU
493	Rubiaceae		<i>Morinda lucida</i>	Tree	LC	
494	Rubiaceae		<i>Sarcocephalus latifolius</i>	shrub		
495	Rubiaceae		<i>Spermacoce chaetocephala</i>	Herb		
496	Rubiaceae		<i>Spermacoce ruelliae</i>	Herb		
497	Rubiaceae		<i>Vangueria apiculata</i>	Tree	LC	
498	Rubiaceae	Vandrika	<i>Vangueria madagascariensis</i>	Tree	LC	
499	Rubiaceae		<i>Mitracarpus villosus</i>	Herb		
500	Rubiaceae		<i>Otiophora scabra</i>	Herb		
501	Rubiaceae		<i>Spermacoce pusilla</i>	Herb		
502	Rubiaceae		<i>Spermacoce subvulgata</i>	Herb		
503	Rutaceae	Horsewood	<i>Clausena anisata</i>	Shrub	LC	
504	Rutaceae		<i>Toddalia asiatica</i>	climber		
505	Rutaceae		<i>Vepris lanceolata</i>	shrub		
506	Rutaceae		<i>Vepris nobilis</i>	Tree	LC	
507	Sapindaceae		<i>Allophylus abyssinicus</i>	Shrub		



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508	Sapindaceae		<i>Allophylus africanus</i>	Shrub	LC	
509	Sapindaceae		<i>Allophylus chaunostachys</i>	Shrub	LC	
510	Sapindaceae		<i>Allophylus macrobotrys</i>	Shrub		
511	Sapindaceae	Triangle Tops	<i>Blighia unijugata</i>	Tree	LC	
512	Sapindaceae		<i>Cardiospermum grandiflorum</i>	Climber		
513	Sapindaceae	Balloon vine	<i>Cardiospermum halicacabum</i>	Climber	LC	
514	Sapindaceae		<i>Paullinia pinnata</i>	Climber		
515	Scrophulariaceae	False Pimpernel	<i>Lindernia nummulariifolia</i>	Herb	LC	
516	Scrophulariaceae		<i>Alectra sessiliflora</i>	Herb		
517	Simaroubaceae		<i>Harrisonia abyssinica</i>	Shrub	LC	
518	Solanaceae		<i>Solanum inguivi</i>	Shrub		
519	Solanaceae	Bitter Apple	<i>Solanum incanum</i>	Shrub	LC	
520	Solanaceae		<i>Solanum nigrum</i>	Herb		
521	Solanaceae		<i>Solanum taitense</i>	Shrub	LC	
522	Solanaceae		<i>Withania somnifera</i>	Herb	DD	
523	Solanaceae	Angular Winter-cherry	<i>Physalis angulara</i>	Herb	LC	
524	Solanaceae		<i>Solanum lycopersicum</i>	Herb		
525	Sterculiaceae		<i>Dombeya kirkii</i>	Tree		
526	Sterculiaceae		<i>Waltheria indica</i>	Herb	LC	
527	Talinaceae		<i>Talinum portulacifolium</i>	Herb	LC	
528	Thelypteridaceae		<i>Christella parasitica</i>	Fem		
529	Tiliaceae		<i>Glyphaea brevis</i>	Shrub	LC	
530	Ulmaceae	Andrarezina	<i>Trema orientalis</i>	Tree	LC	
531	Urticaceae		<i>Pouzolzia denudata</i>	Herb		
532	Urticaceae		<i>Pouzolzia parasitica</i>	Herb		
533	Urticaceae		<i>Laportea ovalifolia</i>	Herb		
534	Verbenaceae		<i>Clerodendrum myricoides</i>	Shrub		
535	Verbenaceae		<i>Lantana camara</i>	Shrub		
536	Verbenaceae		<i>Lantana trifolia</i>	Shrub		
537	Verbenaceae		<i>Lippia javanica</i>	Herb		
538	Verbenaceae		<i>Stachytarpheta urticifolia</i>	Herb		
539	Verbenaceae	Black Plum	<i>Vitex doniana</i>	Tree	LC	
540	Verbenaceae		<i>Priva cordifolia</i>	Herb		
541	Vitaceae		<i>Ampelocissus africana</i>	Climber	LC	
542	Vitaceae		<i>Cissus petiolata</i>	Climber		
543	Vitaceae		<i>Cissus rotundifolia</i>	Climber		
544	Vitaceae		<i>Cissus sycoides</i>	Climber		
545	Vitaceae		<i>Cissus verticillata</i>	Climber	LC	
546	Vitaceae		<i>Cyphostemma adenocaulis</i>	Climber		
547	Vitaceae		<i>Cyphostemma serpens</i>	Climber	LC	
548	Zingiberaceae		<i>Aframomum sp</i>	Herb		

Note) IUCN Red List Category: Extinct (EX), Extinct in the Wild (EW), Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT), Least Concern (LC), Data Deficient (DD), Not Evaluated (NE), "Blank" Not Applicable

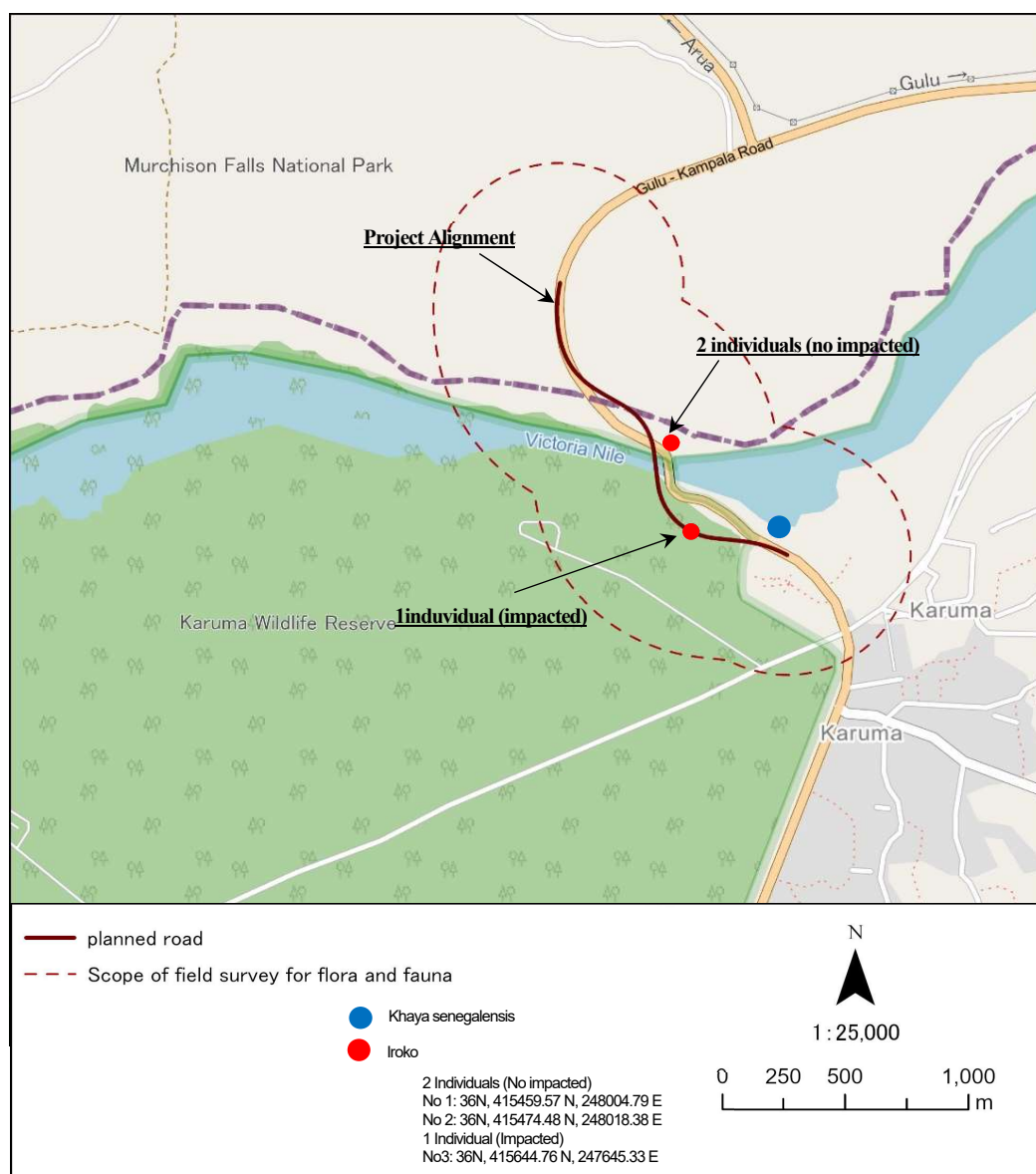
Source: JICA Survey Team

Results of the field survey and biology of the threatened species (IUCN high-categorized species) are shown in Table 6.2.16. The locations where these species were identified are shown in Figure 6.2.9.

**Table 6.2.16 Results of the Field Surveys and Biology of the Threatened Species (Flora)**

Common Name (Scientific Name)	Photo	IUCN Category	Results of the Field Surveys and Biology
African Mahogany ( <i>Khaya senegalensis</i> )		VU	<p><b>【Biology】</b> A plant of the family Cendaceae, found mainly in forested areas of Africa. It is distributed at altitudes of 30-300 m. It is an evergreen tree with a height of 30 m and a trunk diameter of 1 m. It flowers in May and June and bears spherical capsules about 2 cm in diameter in autumn.</p> <p><b>【Results of Field Surveys】</b> During the field survey, this species was found outside the affected area on the east side of the current Karuma Bridge, therefore, there is no impact from the project.</p>
Iroko ( <i>Milicia excelsa</i> )		NT	<p><b>【Biology】</b> A plant of the mulberry family found in the lowland forests and moist savannas of tropical central Africa. It is a deciduous tree that can reach a height of 30 meters or more. It can withstand 6 months of drought with less than 70 cm of annual rainfall as long as there is a river or groundwater source nearby. It is dioecious and flowers from January to February. The ripe fruits are eaten by squirrels, bats, and birds, and the seeds are dispersed by feces.</p> <p><b>【Results of Field Surveys】</b> During the field survey, this species was found at two points outside the affected area and one point within the affected area (see photo at left).</p>

Source: JICA Survey Team



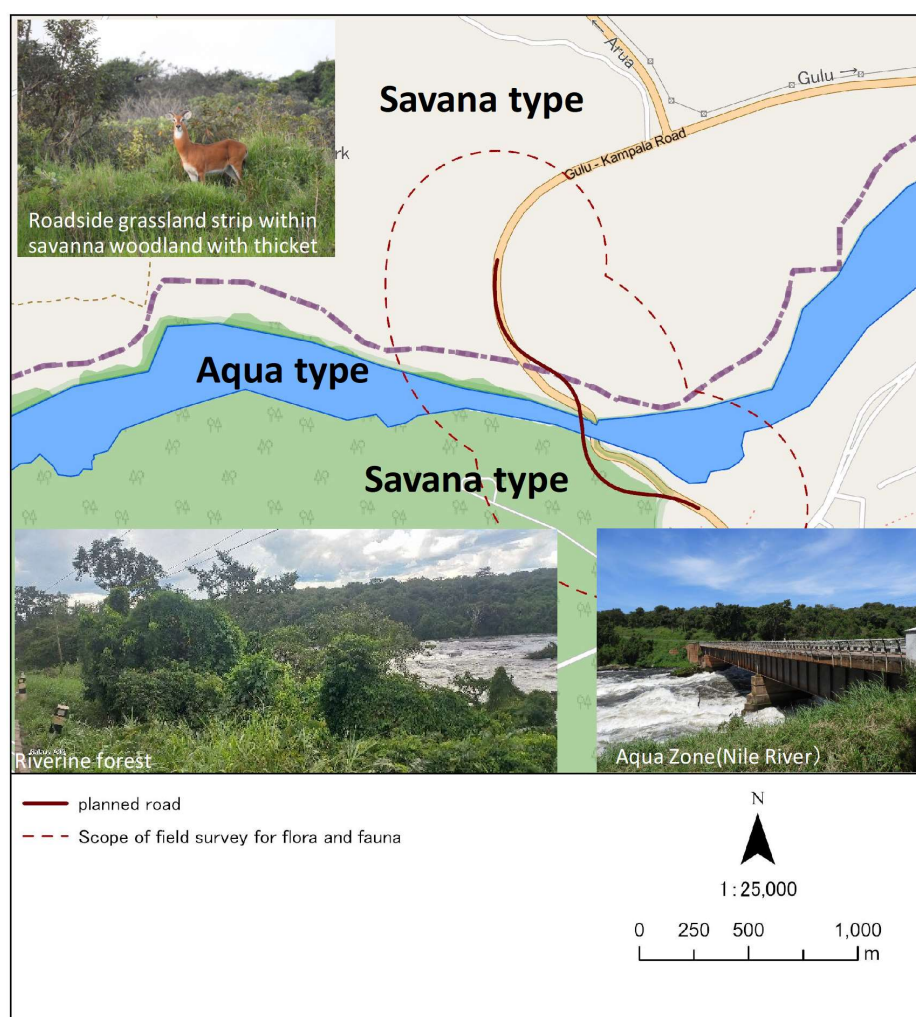
Source: JICA Survey Team

**Figure 6.2.9 Locations where Threatened Species (Flora) were Identified**

#### 4) Ecosystem

In order to forecast and evaluation of ecosystems, ecosystems were classified.

The classification of the ecosystems was based on the vegetation, topography, and identified species that form the habitat base. As a result, the survey area was divided into mainly two types of ecosystems: the savanna type which consists mainly of trees and shrubs on land, and the aqua (open water) type which consists of the Nile River and its surrounding riparian forests. Representative species and key stone species (species that have a relatively small biomass in an ecosystem but have large impacts on the ecosystem) were established as the basis for ecosystem forecasts and evaluation.



Source: JICA Survey Team

**Figure 6.2.10 Map of Ecosystem Classification (Savanna/Aqua type)**

**Table 6.2.17 Ecosystem Type around the Project Area and its Overview**

Ecosystem Type	Feature
Savanna Type	It is located a few hundred meters from the Nile River coast and consists of grasslands, shrubs, and trees. It is mainly a foraging area for amphibians, reptiles, birds, and mammals.
Aqua Type	This area is established from the Nile River and the riparian forests, continuous shrubs, trees, and grasslands along the Nile River. It is a breeding and habitat for plankton, fishes and amphibians. It also provides watering and foraging grounds for birds and mammals.

Source: JICA Survey Team

Typical species and key stone species for each trophic level in each ecosystem are listed in Table 6.2.18.

**Table 6.2.18 Typical Species and Key Stone Species for Each Trophic Level in Each Ecosystem**

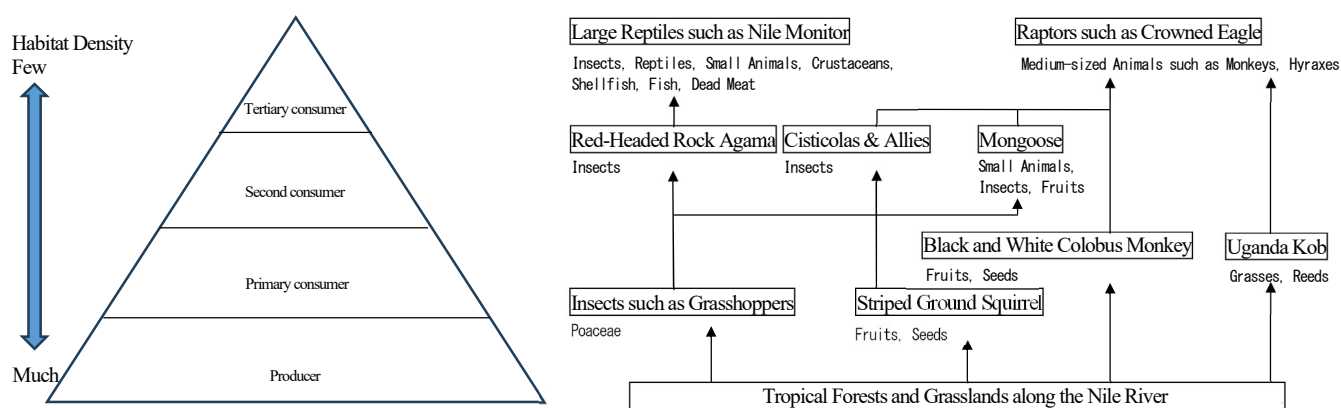
Trophic level		Notable species of superordinate and typicality	
		Savanna Type	Aqua Type
4 <sup>th</sup>	Tertiary consumer	Nile Monitor Lizard, Crowned Eagle	None Note) Nile Crocodile cannot stay in/around the current and new Karuma bridge location due to fast river flow
3 <sup>rd</sup>	Second consumer	Red-Headed Rock Agama, Cisticolas & Allies, Marsh mongoose	Kivu Reed Frog, African Palm Swift
2 <sup>nd</sup>	Primary consumer	Grasshoppers, Striped Ground Squirrel, Black and White Colobus Monkey, Uganda Kob	Aquatic Insect in the river, Dragonfly
1 <sup>st</sup>	Producer	Meadow with trees covered with savanna bushes	Zooplankton, Benthic fauna, Riverine forest strip on steep slope at edge of wooded grassland(Antiaris toxicaria, Ficus ovata, Veris lanceolata, Vepris nobilis, Vachellia sieberiana Combretum molle, Spathodea camapnolata, Terminalia glauzens)
Key Stone Species		African Savana Elephant Hippopotamus	Hippopotamus

Note) The relationship between species at each trophic level does not necessarily indicate predator-prey.

Key Stone Species: species that have a relatively small biomass in an ecosystem but have large impacts on the ecosystem

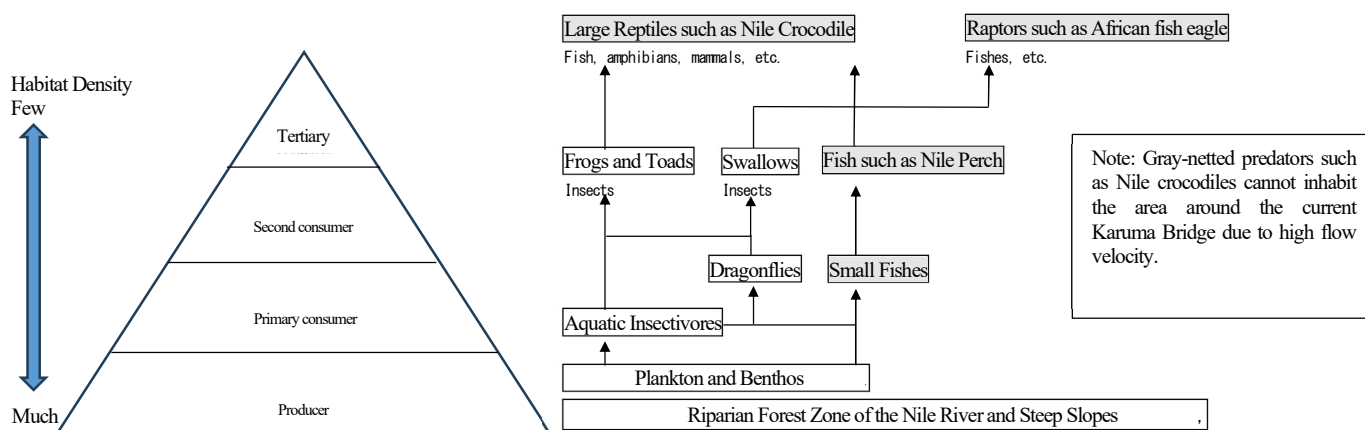
Source: JICA Survey Team

Ecosystem pyramids based on typical species considering the food chain can be exemplified as follows.



Source: JICA Survey Team

**Figure 6.2.11 Conceptual Diagram of Ecosystem and Food Chain (Savanna Type)**



Source: JICA Survey Team

**Figure 6.2.12 Conceptual Diagram of Ecosystem and Food Chain (Aqua Type)**



(2) Observations from Experts

The comments on the degree of impacts to ecosystem and valuable species and mitigation measures from experts and NGOs are shown below;

**Table 6.2.19 Major Comments on Impacts and Mitigation Measures on Ecosystem**

Organization/Expert (Date)	Major Comment
Makerere University Prof. Mwaavu Edward (2024/01/22)	<ol style="list-style-type: none"> <li>1. Hippopotamuses are unable to move through sections with high flow velocities, so habitat and migration at the existing and new bridge locations would be difficult.</li> <li>2. The appearance of the new bridge and approach road is not expected to hinder bird migration because the forest is already fragmented by the Nile River from north to south. The new bridge and approach road are not expected to inhibit bird migration because the forest is already fragmented by the Nile River from north to south.</li> <li>3. When planting trees, it is desirable to adopt important local species such as mahogany. 4) The soil flow around the river should be controlled to prevent soil erosion.</li> <li>4. It is desirable to consider mitigation measures to minimize soil runoff in the vicinity of the river.</li> <li>5. Since the area around the project area is not a major large mammal breeding ground, it is assumed that the lighting to be installed on the new bridge and approach road will not affect wildlife in the area. In addition, the existing road and bridge currently exist, and the major large mammals in the vicinity of the project area are accustomed to vehicle traffic and nighttime lights, and therefore, it is assumed that there will be little or no impact on them when the project is in service. Therefore, general nighttime lighting during the in-service period is considered acceptable.</li> <li>6. Fences, trenches, etc. should be installed at the construction area boundaries to prevent accidents involving contact between wildlife and workers during construction, and construction activities should be limited to daytime.</li> </ol>
WCS (Wildlife Conservation Society) Mr. Simon (Executive Director) and other 2 members (2024/01/22)	<ol style="list-style-type: none"> <li>7. Continuous monitoring should be conducted after the construction of the new bridge, as there is a possibility that African elephants and other animals may enter the area from the north bank toward Karuma TC.</li> <li>8. It should be noted that the operation of heavy construction equipment may damage the current Karuma Bridge.</li> <li>9. Construction workers should be managed not to poach.</li> <li>10. The impact of the construction on the surrounding hippopotamuses and fishermen should be taken into consideration.</li> </ol>
Wildlife Expert, Principal of Zoo in Kanagawa Pref., Professor of Nihon University, IUCN Species Survival Commission Chair, Veterinary Expert Group East Asia Region Dr. Koichi MURATA (2024/06/19)	<ol style="list-style-type: none"> <li>11. Japanese people living far from Africa tend to imagine that the habitat for African elephants, hippopotamuses, and other wild animals is a vast and rich natural environment. However, the proposed project site is located at the edge of a protected area, adjacent to residential areas such as Karuma TC. Therefore, wildlife has entered a part of residential area, with causing a "Human Wildlife Conflict," but at the same time, they are living together in harmony. Therefore, it is essential to minimize the impact of the project while constructing bridges to secure the livelihood of the residents, taking into account the long-standing situation.</li> <li>12. African elephants, a keystone species living in the vicinity of the project area, use the area outside the project impact zone as part of their migration route to the upper reaches of rivers in the protected area and to agricultural lands outside the protected area. This migration route is away from the construction area and is not expected to have a significant impact.</li> <li>13. Similarly, hippopotamuses, which are considered to be a keystone species in the area, are unlikely to be affected by the project because of the high flow velocity and difficulty of habitat and migration in the vicinity of the bridge location. However, several groups of hippopotamuses inhabit several hundred meters upstream and downstream of the current Karuma Bridge, and they routinely migrate to the land area to forage for food, occasionally coming into the village and causing human casualties. Therefore, mitigation measures to minimize contact accidents with workers during construction are essential.</li> <li>14. During operation phase, since travelling speed will be increased and number of roadkill case will be increased. Therefore, mitigation measures for these impacts are necessary.</li> <li>15. Based on the results of interviews with local UWA staff and the ESIA survey results, no</li> </ol>

Organization/Expert (Date)	Major Comment
	significant impacts on valuable species and ecosystems such as African elephants and hippopotamuses are expected.
	16. Based on the results of the surveys presented in the ESIA, the results of interviews with UWA staff, it is concluded that the project area does not meet the "applicable conditions for critical natural habitats" as stated in the JICA guidelines.

Source: JICA Survey Team

### (3) Potential Impacts

#### 1) During Construction

The current and new road alignment passes through Murchison Falls National Park (MFNP) and Karuma Wildlife Reserve (KWR) and the edge of Murchison Falls National Park (MFNP), respectively, and the following impacts could be expected.

- i. Tree cutting, land alteration due to earthworks, operation of construction equipment, and construction and presence of roads and bridges may have impacts on fauna and flora and ecosystems in and around the project area.
- ii. Waste, turbid and polluted water generated from the construction area and base camp may have negative impacts on the surrounding flora and fauna.
- iii. Traffic accidents with wildlife may happen due to construction vehicles traveling on the current national road and construction road.
- iv. Invasive species may be introduced by incoming people and may disturb native species.
- v. Conflicts between workers and wildlife (especially African savanna elephants, hippopotamuses, Nile crocodiles, and African buffaloes) may occur.
- vi. The increased influx of construction personnel from outside may lead poachers to MFNP and KWR. In such cases, the target species would potentially be endangered.
- vii. There is concern about the impacts on flora, fauna, and ecosystems due to the development and operation of new borrow pit and quarry sites outside of the protected area.

#### 2) After Construction

The following impacts are expected when the road and the bridge are in service after the completion of the construction work.

- i. The presence of the bridge and traffic flow with noise and vibration may have negative impacts on species that use the area in and around the project area as important habitats (feeding, nesting, migratory sites, etc.).
- ii. If travel speed increases, traffic accidents with wildlife that live in the surrounding area may happen.
- iii. If tourism increases, there is concern about the impacts of increased general waste and illegal dumping.
- iv. An increase in outside visitors could lead poachers to the MFNP and KWR. In that case, the target species could be at risk.

(4) Impact Forecast

1) During Construction

a) Degree of Impacts on Threatened Species (Valuable Species)

The extent of the impacts on the identified threatened species is shown in Table 6.2.20.

As a result of the construction work, part of the tropical forest and grassland areas along the Nile River, which are habitat and growth environments for threatened species, will be cut down or altered. Approximately 29,000m<sup>2</sup> of trees will be cut down, but the impacts on the habitat and growth environment of important species is not expected to be significant due to the implementation of reforestation and the fact that a similar environment will remain in the surrounding area.

As for Iroko, which has been found to be growing in one individual within the planned road area, the status of this species will be confirmed once again during construction as an environmental preservation measure. In addition, the transplantation will be considered, if necessary, with the guidance and advice of experts.

**Table 6.2.20 Results of Impact Forecast on Threatened Species (During Construction)**

Common Name (Scientific Name)	IUCN Category	Degree of Impacts (During Construction)
Hippopotamus	VU	<p>The field survey showed that the area around the proposed bridge is a rocky area with steep riverbanks and high flow velocities. The river is difficult for this species to move within the river, and there are no access points to land or slow-flowing pools that could serve as schooling and breeding areas for this species. Several access points to the land were identified approximately 300m and further downstream from the proposed bridge and it was inferred that they use these access points to move to the grassland on the south bank of the Nile River as their main feeding ground.</p> <p>In addition, a certain number of individuals are also staying in the upper stream of the Karuma Bridge and has been observed using a portion of the north bank as a part of feeding area. (see Figure 6.2.13)</p> <p>Although parts of the tropical forest and grassland areas along the Nile River will be deforested or altered as a result of the project, the area directly affected is not expected to be a major feeding ground for hippopotamuses. In addition, the proposed route will not pass through the route to the main feeding areas, therefore, there will be no fragmentation of the pathways for movement. And, the proposed project will not alter salt lick site, which are important habitat for this species.</p> <p>However, since this species mainly comes ashore at night to forage, nighttime construction activities, lighting, and construction worker activities that extend outside of the construction area may impacts the foraging activities of this species, and impacts should be minimized through implementation of mitigation measures (e.g., prohibiting nighttime construction, minimizing nighttime lighting and range restrictions, clarifying the construction area).</p>
African Savanna Elephant	EN	<p>During the field survey, this species was most likely observed foraging and moving to the east side of the north bank of the Nile River for water at or beyond 300m northeast of the proposed project site on the north bank of the Nile River. From other observation points and sightings, it was inferred that this species moves north of the proposed project site, forages in grasslands and tropical forests, and uses the Nile River as a watering hole due to the gentle riverbank topography at approximately 500m upstream of the current Karuma Bridge. The area around the proposed bridge is a rocky area with steep riverbanks and high flow velocity, and there are no access points to the Nile River, which is the main waterhole of the species.</p> <p>On the southern bank, elephants were assumed to be mainly living inside the reserve due to the anti-encroachment trenches installed at the boundary between the Karuma Wild Reserve (KWR) and the main road (Arua-Kampala road). (See Figure 6.2.14)</p> <p>Although the project will deforest and alter some of the tropical forest and grassland areas along the Nile River, which are the main foraging areas, the impacts on the main feeding and watering areas for this species are expected to be low.</p> <p>In addition, the proposed route will not pass through the route to the main feeding areas, therefore, there will be no fragmentation of the pathways for movement. And, the proposed project will not alter salt lick site, which are important habitat for this species.</p> <p>However, since the northern end of the access road for the project is relatively close to movement routes of this species, it is necessary to minimize impacts by implementing mitigation measures in and around the construction zone (e.g., prohibiting construction trucks from parking along the roadside, clarifying the area of construction and prohibiting alterations outside the range, minimizing lighting, preventing contact accidents with construction workers, etc.).</p>
African Buffalo	NT	<p>During the field survey, this species was observed approximately 1 km southwest of the proposed project site on the south bank of the Nile River, and it was inferred that the species mainly forages in grasslands within the protected area.</p>

Common Name (Scientific Name)	IUCN Category	Degree of Impacts (During Construction)
		<p>Although the project will alter part of the tropical forest and grassland areas along the Nile River, the impacts are expected to be negligible because these areas are not the main feeding grounds of this species. In addition, the salt lick site, which is an important habitat for this species, will not be altered, and there are no wetlands within the area of alteration where this species can bathe in the mud during the day.</p> <p>In addition, there are no access points to the Nile River, which is the main waterhole, because the area around the proposed bridge is a rocky terrain with steep riverbanks and rapid flow speeds.</p> <p>However, it is necessary to minimize the impacts of the project by implementing mitigation measures in and around the construction area (e.g., prohibiting construction trucks from parking along the roadside, clarifying the area of the project and prohibiting alterations outside the area, minimizing lighting, and preventing contact accidents with construction workers).</p>
Patas monkey	NT	<p>During the field survey, this species was observed to be moving while foraging in the tropical forest near the UWA office on the south bank of the Nile River.</p> <p>The construction work is expected to alter part of the foraging habitat of this species, causing it to escape to the surrounding area, but the impacts are not expected to be significant because similar environments are widespread in the surrounding area.</p> <p>However, mitigation measures (e.g., clarification of the construction area, prohibition of alteration outside the area, minimization of lighting, prohibition of feeding by construction workers, etc.) should be implemented in and around the construction area to minimize the impacts.</p>
Crowned Eagle	NT	<p>During the field survey, it is highly likely that they were observed moving and foraging near the proposed road site. Although a part of the tropical forest and grassland areas along the Nile River, which are the main foraging areas, will be altered, however, the area of alteration is expected to be very small in relation to the size of the activity range of these species. Since these species are expected to avoid the construction area during construction and continue to forage in similar environments in the surrounding area, and since no nesting sites for these species have been identified, construction activities are expected to have little or no impact on these species.</p>
Bateleur	EN	
Martial Eagle	EN	
Central Africa Rock Python	EN	<p>This species was observed outside of the project area but may also be inhabiting within the affected area. The construction work will alter part of the tropical forest and grassland areas along the Nile River, which are the main habitat of this species. However, no significant impact is expected as similar environments will remain in the surrounding areas and the species will avoid or move into the surrounding environment once construction begins. Furthermore, a survey will be conducted to confirm the presence of this species within the construction affected area prior to the start of construction, and if it is observed, measures will be taken to move it out of the affected area to mitigate the impacts.</p>
Iroko (Milicia excelsa)	NT	<p>Since two individuals of this species have been observed growing outside of the proposed road and one inside the proposed road, it is expected that the construction activities will impact the habitat. Therefore, mitigation measures (replanting with seeds and young trees) as described below should be implemented for the affected individuals.</p> <p>Individuals observed growing outside of the proposed road area are not expected to experience any loss or reduction of growth of this species or changes in sunlight or other impacts to the growing environment as a result of the construction activities.</p>
African Mahogany (Khaya senegalensis)	VU	<p>This species has been observed growing outside of the proposed road area, and construction is not expected to result in the loss or reduction of growth of this species, or to affect its habitat, such as changes in sunlight.</p>

Note) Mormyrus niloticus (scientific name) was identified as a threatened species during the fish field survey but was excluded from the forecast because it is a species captured more than 2 km downstream from the current Karuma Bridge.

Source: JICA Survey Team

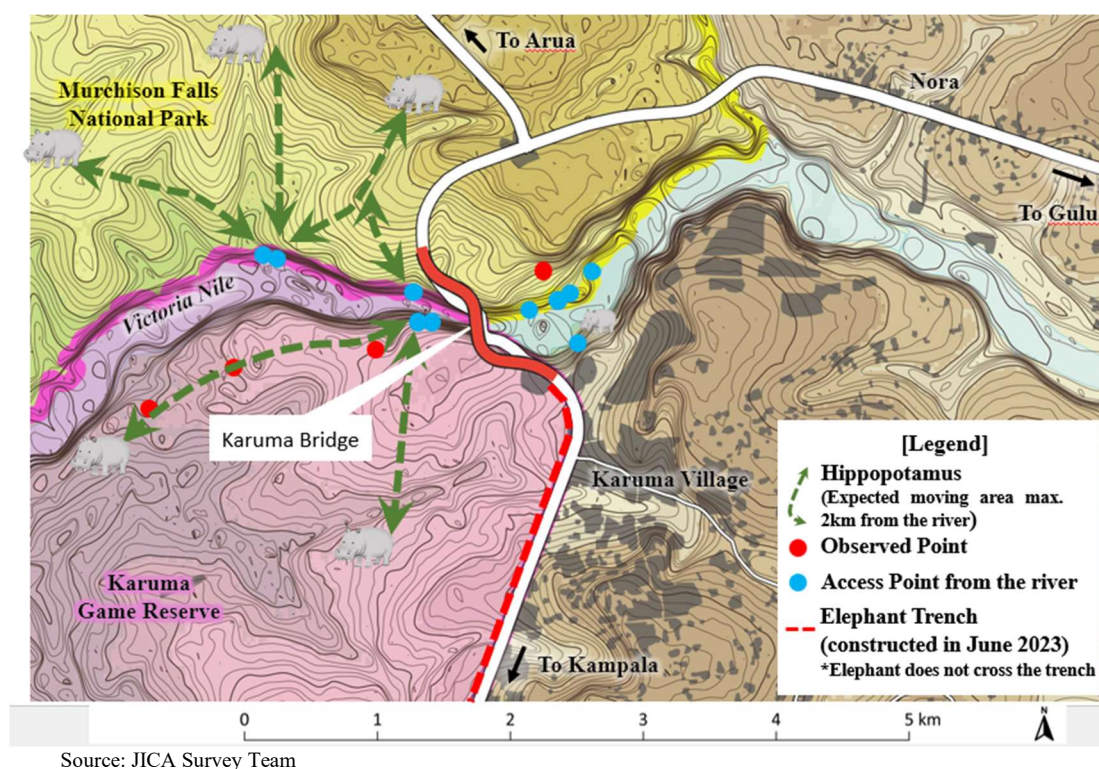


Figure 6.2.13 Sketch of Habitat of Hippopotamus

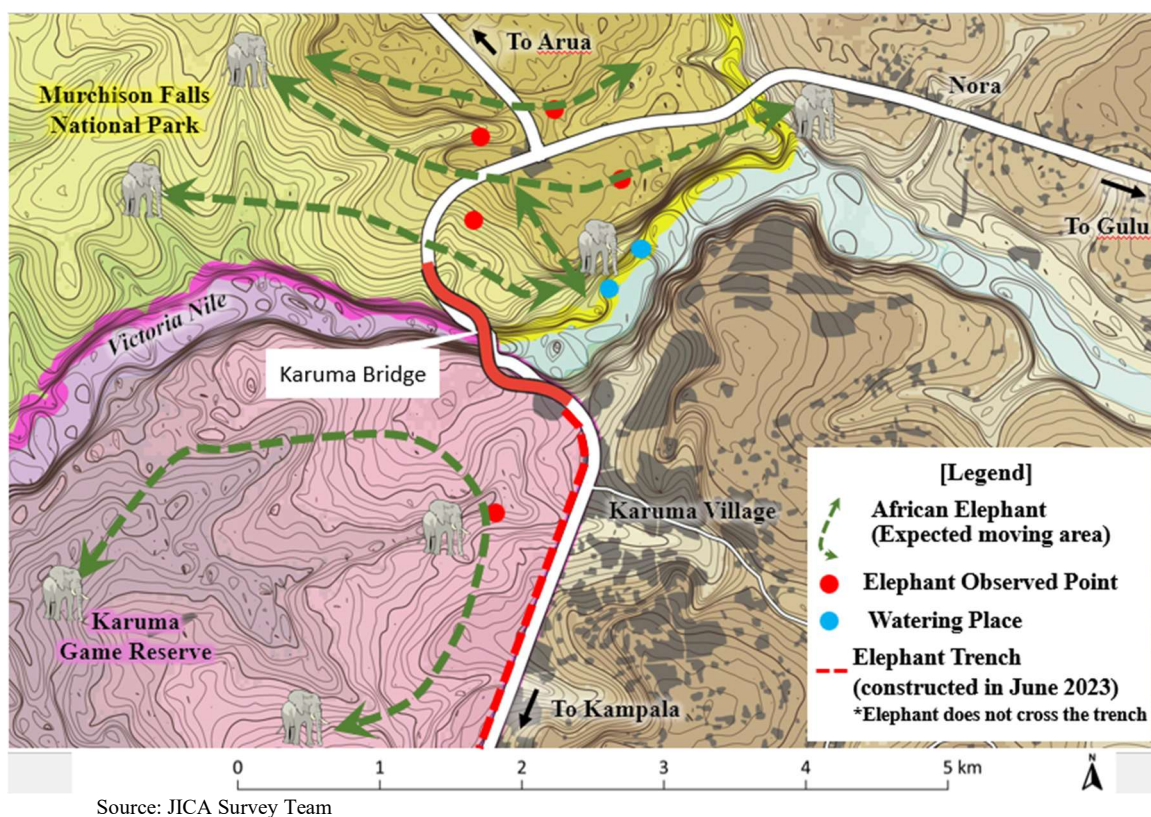


Figure 6.2.14 Sketch of Habitat of African Elephant



b) Impacts on Ecosystems

The extent of the impacts on the savanna ecosystem (tropical forests and grasslands along the Nile River) and the open water ecosystem (the Nile River and steep-slope riparian forest zones), which are the ecosystems that characterize the region, is shown in Table 6.2.21.

The impacts of the construction on the savanna and open water ecosystems are expected to be minor. This is because the contribution to each ecosystem by the Key Stone Species, (i.e., hippopotamus and African elephant) will remain almost unchanged, and some of the main habitats of the higher and typical species in each ecosystem will be modified, but similar environments will remain in the surrounding areas.

**Table 6.2.21 Forecast Results of the Impacts on the Ecosystems that Characterize the Area (Under Construction)**

Target	Classification of Ecosystem	
	Savanna Type	Aqua Type
Impacts on Key Stone Species	<p>(1) Hippopotamus In the tropical forests and grasslands along the Nile River, which are the main feeding grounds of this species, it has been confirmed that various grassland environments of different grass height have been formed in patches. It is assumed that the foraging of this species contributes to the formation of diverse habitats and growth environments for fauna and flora, and it was extracted as a key stone species. As described in the forecast results for threatened species shown in Table 6.2.20, the impacts of the project during construction are not expected to be significant, and therefore, the contribution of the foraging of this species to the formation of habitat and growth environment for a variety of flora and fauna is expected to remain almost unchanged.</p>	<p>(1) Hippopotamus In addition to the savanna-type ecosystem described at left, this species also forages on waterweeds and other plants in open water and was similarly extracted as a key stone species. As shown on the left, the impacts on this species during construction are not expected to be significant, and therefore, the contribution of the foraging of this species to the formation of habitat and growth environment for a variety of flora and fauna is expected to remain almost unchanged.</p>
	<p>(2) African Savanna Elephant The grassland environment is relatively more widely distributed on the north bank of the Nile River, where this species has been observed in large numbers, than on the south bank. It is assumed that the foraging of this species contributes to the formation of a diverse habitat and growth environment for a variety of flora and fauna, and was extracted as a key stone species. As described in the predicted results for keystone species shown in Table 6.2.20, the impacts of the project during construction are not expected to be significant, and therefore, the contribution of foraging by this species to the formation of diverse habitat and growth environments for flora and fauna is considered to be almost unchanged.</p>	
Impacts on Typical Species at each Trophic Level	<p>(1) Tertiary consumer Typical species of the upper echelon of the ecosystem in the tropical forest and grassland areas along the Nile River include large reptiles such as the Nile monitor, which prey on insects and small mammals, and raptors such as the Crowned Eagle, which prey on medium-sized mammals. 【Nile Monitor and Other Large Reptiles】 The construction will alter some of the tropical forests and grasslands along the Nile River, which are the main habitats of these reptiles, but the impacts are not expected to be significant because similar environments will remain in the surrounding areas and the reptiles are expected to escape to these environments. In addition, land alteration associated with the construction is planned to be minimized, and habitat alteration is to be controlled. Therefore, the impacts on the habitat are not expected to be significant. 【Crowned Eagle and Other Raptors】 Although the construction will alter part of the tropical forest and grassland areas along the Nile River, which are the main foraging areas, it is expected that a similar environment will</p>	<p>(1) Tertiary consumer Predators such as Nile crocodiles are thought to be unable to inhabit the area around the current Karuma Bridge due to the high flow velocity.  (2) Second and Primary consumer Typical species of the Nile River and steep-slope riparian forest zone ecosystems include the followings; Primary consumers: aquatic insects which feed on plankton and benthos and insects such as dragonflies; Secondary consumers: frogs and small birds such as swallows which prey on these insects. The implementation of the construction work will not alter the riparian zone of the Nile River, which is the main habitat for primary and secondary consumers, as no</p>



Target	Classification of Ecosystem	
	Savanna Type	Aqua Type
	<p>remain in the surrounding area and be used as a feeding ground. In addition, since no raptor nesting sites have been identified around the proposed road area, it is assumed that there will be no direct impact on breeding by construction activities. Furthermore, the land alteration associated with the construction will be minimized, and habitat alteration is to be controlled. Therefore, it is predicted that there will be no significant level of impact on the higher echelons of the ecosystem of the tropical forest and grassland areas along the Nile River.</p> <p>(2) Primary and Second consumer Species typical of the tropical forest and grassland ecosystems along the Nile include the followings; Primary consumers: herbivorous insects such as grasshoppers, herbivorous medium-sized mammals such as the Uganda kob, and small and medium-sized mammals such as striped ground squirrel and black and white colobus monkey that forage for fruits and seeds; Secondary consumers: small-sized reptiles such as red-headed rock agama that prey on them, small-sized birds such as cisticolas and allies, and medium-sized mammals such as mongoose.</p> <p>Although the construction will alter part of the tropical forest and grassland areas along the Nile River, which are the main habitat of the primary and secondary consumers, they will escape to these environments and will not have a significant impact on the area as a whole, as similar environments will remain widely available in the surrounding areas. In addition, land alteration associated with the construction is planned to be minimized, and habitat alteration is to be controlled. Therefore, the impacts on habitats throughout the region are predicted to be minor. Based on the above, the impacts on primary and secondary consumers in the tropical forest and grassland ecosystems along the Nile River are estimated to be at a less than significant level.</p> <p>(3) Producers (Plants) Although trees and other vegetation will be cut down and the land altered over an area of approximately 29,000m<sup>2</sup>, Reforestation is planned to be implemented for the 3 times of the lost area. The ecosystem of the entire area is not expected to change significantly, as similar vegetation is spreading in the surrounding area.</p>	<p>construction work is planned in the river. However, some wetlands in the adjacent riparian forest zone will be altered, but it is assumed that there will be no significant impact on the entire area as similar environments will remain in the vicinity and they will escape to those environments. In addition, land alteration associated with the construction is planned to be minimized, and habitat alteration is to be controlled. Therefore, the impact on the habitat is not expected to be significant. Based on the above, the impacts on typical species of the Nile River and steep slope riparian forest zone ecosystems are expected to be at a less than significant level.</p> <p>(3) Producers (Plants) Although there will be no alteration within the Nile River, the surrounding riparian forests will be affected. However, reforestation is planned to be implemented for the 3 times of the lost area. In addition, the ecosystem of the entire area is not expected to change significantly, as similar vegetation is spreading in the surrounding area.</p>

Source: JICA Survey Team

## 2) After Construction

### a) Degree of Impacts on Threatened Species (Valuable Species)

The extent of the impacts on the identified threatened species is shown in Table 6.2.22.

The presence of the road will alter part of the tropical forest and grassland areas along the Nile River, which are habitats and growth environments for threatened species, but similar environments will remain in the surrounding areas. Therefore, the impacts on the habitats and habitats of important species are expected to be minor.

**Table 6.2.22 Results of Impact Forecast on Threatened Species (After Construction)**

Common Name (Scientific Name)	IUCN Category	Degree of Impacts (After Construction)
Hippopotamus	VU	<p>The field survey showed that the area around the proposed bridge is a rocky area with steep riverbanks and high flow velocities. The river is difficult for this species to move within the river, and there are no access points to land or slow-flowing pools that could serve as schooling and breeding areas for this species.</p> <p>Several access points to the land were identified approximately 300m and further downstream from the proposed bridge and it was inferred that they use these access points to move to the grassland on the south bank of the Nile River as their main feeding ground.</p>

Common Name (Scientific Name)	IUCN Category	Degree of Impacts (After Construction)
		<p>Although parts of the tropical forest and grassland areas along the Nile River will be deforested or altered as a result of the project, the area directly affected is not expected to be a major feeding ground for hippopotamuses. In addition, the proposed route will not pass through the route to the main feeding areas, therefore, there will be no fragmentation of the pathways for movement. And, the proposed project will not alter salt lick site, which are important habitat for this species.</p> <p>However, since this species mainly comes ashore at night to forage, nighttime lighting from high elevations outside the road area may affect the foraging activities of this species, therefore, mitigation measures (e.g., limiting the lighting area to the road surface) should be implemented to minimize the impacts.</p> <p>In addition, when the planned road is in service, mitigation measures will include the installation of speed control signs and humps to control vehicle speeds and prevent roadkill. Therefore, impacts to this species are not expected to be significant.</p>
African Savanna Elephant	EN	<p>This species was most likely observed moving in the area around the proposed road to forage for food and water. It was inferred that this species moves from east to west in the north of the access road on the north bank of the Nile River, to access the Nile River on the east side, or forages in the forest and grassland areas. The area around the proposed bridge is a rocky area where the riverbanks are steep and the flow velocity is fast, and there are no access points to the Nile River, which is the main waterhole for this species.</p> <p>In addition, the salt lick site, which are important habitat for this species, will not be altered. However, since the northern end of an access road of the project is relatively close to the movement path of this species, it is recommended that mitigation measures to prevent roadkill (e.g., installation of signs and humps to control speed) be taken to minimize the impacts.</p>
African Buffalo	NT	<p>During the field survey, this species was observed approximately 1 km southwest of the proposed project site on the south bank of the Nile River, and it was inferred that the species mainly forages in grasslands within the protected area.</p> <p>Although the project will alter part of the tropical forest and grassland areas along the Nile River, the impact is expected to be negligible because these areas are not the main feeding grounds of this species. In addition, the salt lick site, which are important habitats for this species, will not be altered, and there are no wetlands within the area of alteration where the species can bathe in the mud during the day.</p> <p>In addition, there are no access points to the Nile River, which is the main waterhole, because the riverbanks around the proposed bridge are steep and rocky with high flow velocity.</p> <p>However, it is assumed that this species may accidentally approach the access road of the project, and it is recommended that mitigation measures (e.g., installation of signs and humps to control speed) be taken to prevent roadkill and prevent impacts before they occur.</p>
Patas monkey	NT	<p>During the field survey, it was observed that this species was moving while foraging in the tropical forest near the UWA office on the south bank of the Nile River.</p> <p>Although it is considered that this project will alter part of the foraging habitat of this species and cause it to escape to the surrounding area, the impacts are not expected to be significant because similar environments are widespread in the surrounding area.</p> <p>However, it is assumed that this species may accidentally approach the access road of the project, and it is recommended that mitigation measures to prevent roadkill (e.g., installation of signs and humps for speed control) be implemented to prevent impacts before they occur.</p>
Crowned Eagle	NT	<p>According to the field survey, this species is likely to have been observed moving around the proposed road area while foraging. Although part of the tropical forest and grassland areas along the Nile River, which are their main foraging grounds, will be altered, the area of alteration is assumed to be extremely small in relation to the size of the behavior zone of these species.</p> <p>In addition, the bridge section will be constructed at a height approximately 20 m higher than the current Karuma Bridge, but since these species have been confirmed to fly higher than that, the impact on their flight is expected to be negligible. Also, the project is planned without piers, and there is sufficient flying space below the bridge.</p> <p>In addition, the project is planned to minimize bird strike impacts through the implementation of mitigation measures (e.g., installation of signs and humps for speed control), and the impact of the project on this species is not expected to be significant.</p>
Bateleur	EN	
Martial Eagle	EN	
Central Africa Rock Python	EN	<p>Although this species was observed outside of the project area, it is possible that the species inhabits within the affected area as well.</p> <p>Although the implementation of the project will alter part of the tropical forest and grassland areas along the Nile River, which are the main habitat of this species, similar environments remain in the surrounding area and are not expected to have significant impacts on the habitat of this species.</p> <p>However, it is assumed that this species may accidentally approach and cross the access road of the project, and it is recommended that mitigation measures to prevent roadkill (e.g., installation of signs and humps for speed control and crossing paths for animals) be implemented to minimize the impacts.</p>
Iroko (Milicia excelsa)	NT	<p>Since two individuals of this species have been observed growing outside the proposed road and one inside the proposed road, it is predicted that the presence of the road and the bridge will impact the habitat.</p> <p>Therefore, mitigation measures (replanting with seeds and young trees) as described below should be implemented for the affected individuals.</p>

Common Name (Scientific Name)	IUCN Category	Degree of Impacts (After Construction)
		For individuals found to be growing outside of the proposed road area, it is not predicted that the presence of the road and the bridge will have any impact on the growing environment (e.g., loss or reduction of growth, changes in sunlight, etc.).
African Mahogany ( <i>Khaya senegalensis</i> )	VU	This species has been observed growing outside of the proposed road area. It is not predicted that no impact on the growing environment of this species, such as loss or reduction of growth or changes in sunlight, will be caused by the presence of the road and the bridge.

Note) *Momyrus niloticus* (scientific name) was identified as a threatened species during the fish field survey but was excluded from the forecast because it is a species captured more than 2 km downstream from the current Karuma Bridge.

Source: JICA Survey Team

### b) Impacts on Ecosystems

The degree of impacts on the ecosystems of savanna (tropical forests and grasslands along the Nile River) and open water (the Nile River and steep-slope riparian forest zone), which are ecosystems that characterize the region, is the same as the impacts shown during construction. The impact of the Project on the savanna and open water ecosystems is not expected to be significant. This is because the contribution to each ecosystem by the Key Stone Species, hippopotamuses and African savanna elephants, will remain almost unchanged, and some of the main habitats of species that are higher and typical of each ecosystem will be modified, but similar environments will remain in the surrounding areas.

### 3) Other Human Impacts During and After Construction

In addition to the impacts to threatened species and ecosystems due to the construction and the presence of the road, the following impacts are of concern during and after construction. These impacts shall be avoided or reduced by considering the following mitigation measures.

**Table 6.2.23 Human Impacts and Mitigation Measures During Construction**

Impacted Factor	Mitigation Measures
Negative impacts on nearby flora and fauna due to waste, turbid and polluted water generated from construction areas, base camps, etc.	<ul style="list-style-type: none"> <li>✓ Waste oil shall be stored and disposed to the designated site or disposed by the licensed agent so as not to leak into the water body and on land.</li> <li>✓ Domestic waste in the construction area shall be stored properly for not to attract wild animals and disposed at the designated site.</li> </ul>
Disturbance of native species due to introduction of exotic species by the influx of people	<ul style="list-style-type: none"> <li>✓ Borrow soil from out of project area shall be inspected not included alien plant species before carrying into the protected area.</li> </ul>
Conflicts between workers and wildlife (especially African savanna elephants, hippopotamuses, Nile crocodiles, and African buffaloes)	<ul style="list-style-type: none"> <li>✓ UWA officers shall be deployed near the project site for emergency case such as encountering with wild animals.</li> <li>✓ Construction machines shall driver less than 60km/h not to cause roadkill on the surrounding public road.</li> </ul>
Possibility of leading poachers to MFNP and KWR due to increase in construction workers from outside	<ul style="list-style-type: none"> <li>✓ UWA officers shall be deployed near the project site for emergency case such as encountering with wild animals.</li> </ul>

Source: JICA Survey Team

**Table 6.2.24 Human Impacts and Mitigation Measures After Construction**

Impacted Factor	Mitigation Measures
Traffic accidents and roadkill with wildlife that live in the surrounding area if travel speeds increase	<ul style="list-style-type: none"> <li>✓ Installation of speed limit board and humps for speed control for prevention of roadkill and mitigate noise impacts to the wild animals.</li> <li>✓ Monitoring of movement of wild animals and management of individuals which intrude to the residential area</li> <li>✓ Construction of animal corridor under embankment for crossing small mammals, reptiles and amphibian species</li> </ul>
Impacts from increased general waste and illegal dumping if tourism increases	<ul style="list-style-type: none"> <li>✓ Implementation of periodical patrol by UWA, Police and UPDF for illegal dumping and poaching</li> </ul>
Potential to lead poachers to MFNP and KWR if tourism from outside increases	<ul style="list-style-type: none"> <li>✓ Establishment of land use plan near the project area, and implementation of appropriate land use management so as not to cause unplanned development.</li> </ul>

Source: JICA Survey Team

(5) Mitigation Measures

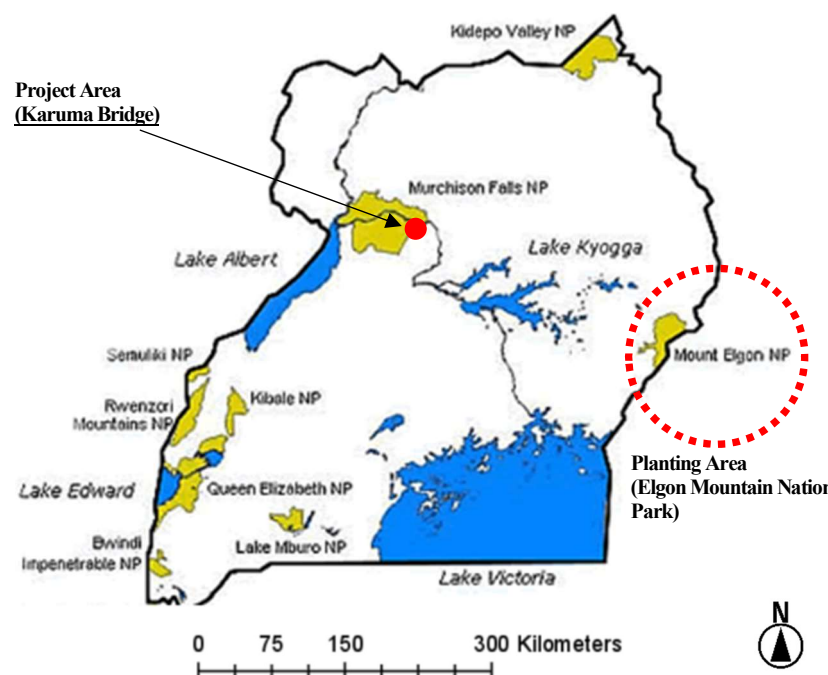
1) During Construction

- ✓ Affected area shall be marked and all relevant construction workers and communities shall be informed not to conduct development outside of the project area.
- ✓ Waste oil shall be stored and disposed to the designated site or disposed by the licensed agent so as not to leak into the water body and on land.
- ✓ Domestic waste in the construction area shall be stored properly for not to attract wild animals and disposed at the designated site.
- ✓ Tree replantation shall be carried out.

In Uganda, cutting tree permits are required to be obtained in cases where there are district ordinances, but the area where the project is located (Kiryandongo, Nwoya, and Oyam) have no relevant ordinances. Therefore, cutting tree will be permitted as long as the ESIA is approved, and permission is obtained from UWA. There are not any relevant laws and regulations on the tree planting after cutting trees, thus such mitigation measures on tree planting is prepared in the mitigation measures in the approved ESIA. Planting tree of approximately 1.9 ha will be conducted on the slope and embankment in the ROW. From the perspective of ensuring visibility of curves for traffic safety and preventing wildlife roadkill, local species of herbaceous and shrubby species (*Blepharis maderaspatensis* (herbaceous), *Brachiaria brizantha* (herbaceous), *Rhus natalensis* (shrubby), and *Rhus natalensis* (shrub)) and *Monanthotaxis buchananii* (shrub), etc. will be selected and used instead of tall trees.

It is also planned that approximately 13,200 trees which is 3 times of cutting trees by the project will be replanted in the protected area designated by UWA. Specific planting plans will be developed at the detailed design phase. The draft plan for the planting trees is shown below:

**Table 6.2.25 Summary of the Tree Planting Plan (Tentative)**

Item	Description
Planting Area	<p>Mountain Elgon National Park (forest area)</p> 
Summary of the Elgon Mountain National Park	<p>i) Name: Mount Elgon National Park  ii) Aea: 1,145 km<sup>2</sup> in Uganda out of total 1,279km<sup>2</sup> (This national park is located in Uganda and Kenya)  iii) Establishment: 1992 in Uganda, 1968 in Kenya  iv) Legal Status: Wildlife Act 2019  v) Other Category: IUCN II (National Park), KBA/IBA</p>
Planted Species (tentative)	Native species such as <i>Milicia Excelsa</i> , <i>Commobretum</i> spp, <i>Terminalia brownii</i> , <i>Khaya senegalensis</i> , etc.
Planting area/ number of trees	3 times of cutting area or number of tree (Area:: 8.7ha (2.9 ha x 3 times), or 13,200 trees (4,400 trees x 3 times)

Source: Based on the result of meeting between UNRA-UWA

- ✓ Borrow soil from out of project area shall be inspected not included alien plant species before carrying into the protected area.
  - ✓ Prohibition of blasting and adoption of lower noise and vibration construction methods
  - ✓ Poaching by construction workers shall be prohibited. Policy and regulations regarding natural environmental protection shall be instructed.
  - ✓ UWA officers shall be deployed near the project site for emergency case such as encountering with wild animals.
  - ✓ Construction machines shall driver less than 40km/h not to cause roadkill on the surrounding public road.
  - ✓ Lighting in the nighttime shall be minimized at night-time so as not to cause adverse impacts on the wild animals such as Hippopotamus and Elephant.
  - ✓ Avoid to park construction machines in the protected area for not to disturb crossing animals
  - ✓ Construction area shall be restored as the original condition after construction.
- 2) After Construction
- ✓ Setting up sign board of speed limit 40km/h and no-horn at the crossing points of wild

animals such as monkeys and African Elephant

- ✓ Installation of speed limit board and humps for prevention of roadkill and mitigate noise impacts to the wild animals.
- ✓ Installation of animal corridor under embankment of the approach road for crossing small mammal, reptile, amphibian species.
- ✓ Setting up of LED light in the bridge section so as not to attract insects.
- ✓ Setting up of light with cover so as not to irradiate the river surface and outside of the road in keeping with sound lifecycle of fishes.
- ✓ Monitoring of movement of wild animals and management of individuals which intrude to the residential area.



Source: JICA Survey Team

**Figure 6.2.15 Setting up sign board of speed limit 40km/h and no-horn**

[Status of Structure]



[Status of Utilization] ▼



[Status of Structure]



[Status of Utilization] ▼



Source: Technical data on the installation and post-monitoring survey of road crossing facilities for wildlife  
(Ministry of Land, Infrastructure, Transport and Tourism)

**Figure 6.2.16 Animal Crossing Culvert under the Approach Road**



(6) Evaluation

1) Impacts on Threatened Species (Valuable Species)

As a result of the construction work, part of the tropical forest and grassland area along the Nile River (approximately 29,000m<sup>2</sup>/ 4,400 trees), which is part of the habitat and growth environment for important species, will be cleared and altered. However, approximately 19,000m<sup>2</sup> of land will be planted, mainly on road slopes. In addition, It is also planned that approximately 13,200 trees which is 3 times of cutting trees by the project will be replanted in the protected area designated by UWA. A number of mitigation measures will also be implemented, including the capture and transplantation of valuable species outside the construction area during the initial phase of construction, the prohibition of nighttime construction to minimize habitat impacts on the surrounding area, and the limitation of lighting coverage. Most of the valuable species in the protected area can move and escape to similar environments in the vicinity. Therefore, impacts during the construction period are assessed to be less than significant. However, a plant species (Iroko) is located within the area of alteration, and therefore, seed collection and planting is planned to be conducted within the construction area to ensure the survival of the species.

At the time of service, the road will alter part of the tropical forest and grassland areas along the Nile River, which are important habitat and growth environments for the species, but the same environment will remain in the surrounding areas. No valuable species have been identified that live exclusively within the modified area, and it is expected that they will continue to use the surrounding environment as part of their feeding grounds, migration routes, etc. In addition, it is assessed that implementation of the aforementioned mitigation measures, such as installation of speed limit and no honking signs, installation of humps to prevent roadkill, and installation of an animal road under the approach road embankment, will minimize impacts. Therefore, it is evaluated that it is not likely to give significant impacts on threatened species both during construction and after construction.

2) Impacts on Ecosystem

The project area is characterized as the savanna ecosystem (tropical forests and grasslands along the Nile River) and open water ecosystems (the Nile River and steep-slope riparian forest zones).

The impact of such ecosystem during construction is minor because the contribution to each ecosystem by the Key Stone Species, (i.e., hippopotamus and African elephant) will remain almost unchanged, and some of the main habitats of the higher and typical species in each ecosystem will be modified, but similar environments will remain in the surrounding areas.

In addition, mitigation measures such as tree replantation, inspection of borrow soil outside of the protected area not included alien plant species before carrying into the protected area etc. during construction can minimize the impact to the ecosystem during construction.

The impacts on the ecosystems of savanna and open water after construction is not significant. It is because similarly to the impacts shown during construction, the contribution to each ecosystem by the Key Stone Species, hippopotamuses and African savanna elephants, will remain almost unchanged, and some of the main habitats of species that are higher and typical of each ecosystem will be modified, but similar environments will remain in the surrounding areas after construction as well.

Furthermore, mitigation measures such as such as setting up sign board of speed limit and no-horn, installation of humps for prevention of roadkill and installation of animal corridor under embankment of approach road and setting up of light with cover so as not to irradiate the river surface and outside of the road in keeping with sound lifecycle of fishes etc. will be implemented.

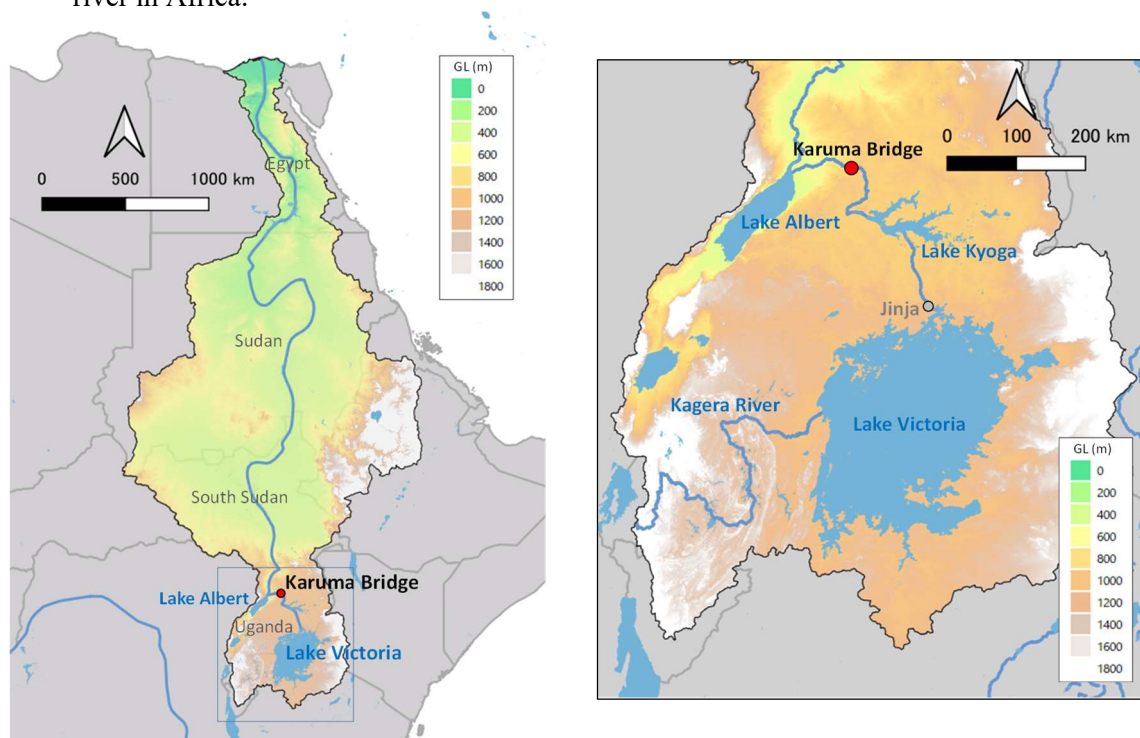
Thus, at the moment, they are not likely to give serious impacts on ecosystem both during construction and after construction if such mitigation measures are conducted appropriately.

## 6.2.2. Hydrology

### (1) Result of Baseline Survey

#### 1) River Basin and Project Site

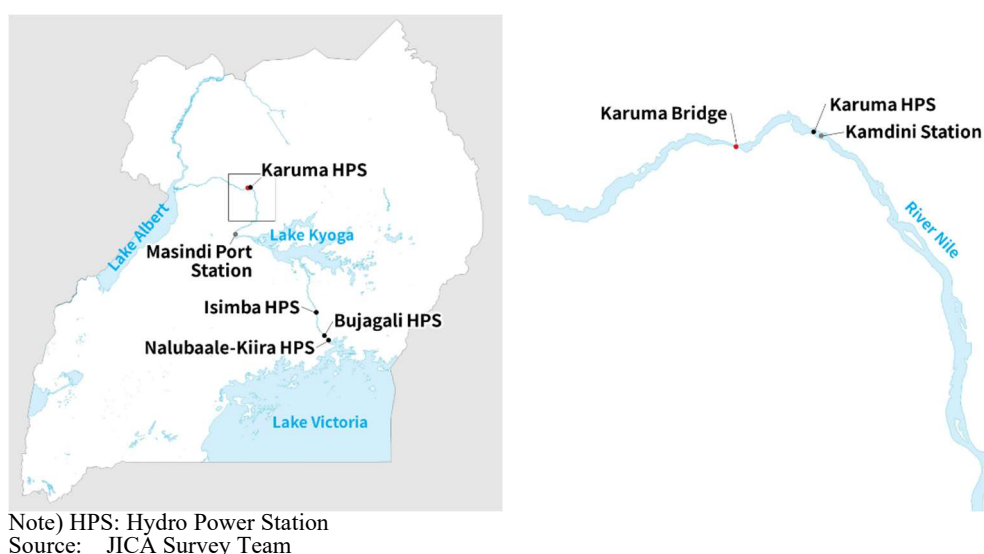
The River Nile, which Karuma Bridge crosses, is an international river that originates in Lake Victoria and flows into the Mediterranean Sea via Uganda, South Sudan, Sudan and Egypt, with a basin area of 2.9 million km<sup>2</sup> and a total length of 6,695 km. The river is the longest river in Africa.



Source: JICA Survey Team

**Figure 6.2.17 River Nile Basin**

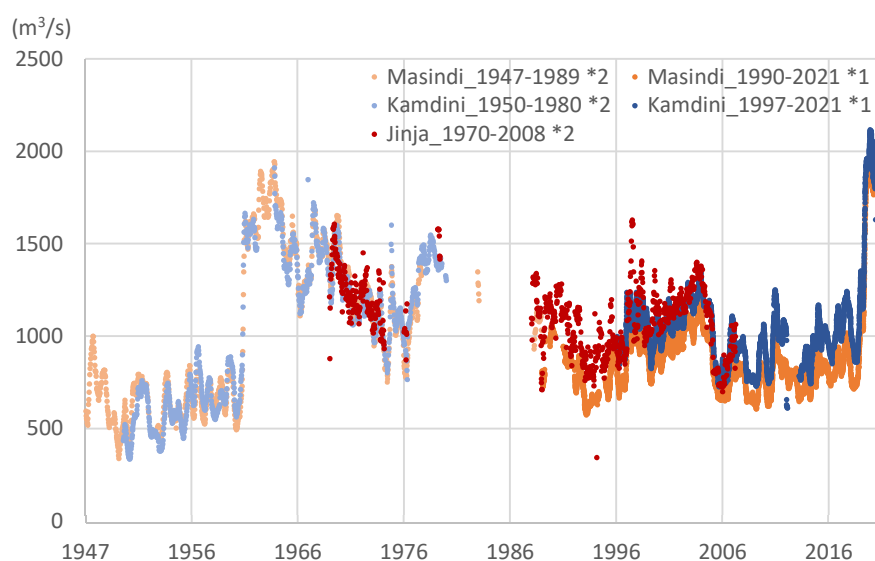
Karuma Bridge is located approximately 128 km downstream of Lake Kyoga, and there are five hydropower dams between Lake Victoria and the bridge - Nalubaale, Kiira, Bujagali, Isimba and Karuma (under construction; see below for details). Hydrological stations along The River Nile include Jinja station near Lake Victoria, Mbulamuti station about 40 km downstream, Masindi station about 90 km upstream from the bridge and Kamdini station about 10 km upstream. Ministry of Water and Environment (MWE) manage the hydrological data.



**Figure 6.2.18 Location Map of Karuma Bridge**

## 2) Hydrologic and Hydraulic Conditions of Karuma Bridge

Figure 6.2.19 shows trend in discharge of River Nile at Kamdini, Masindi and Jinja hydrometric stations. The historical maximum discharge at Kamdini and Masindi stations were 1,912 m<sup>3</sup>/s and 1,945 m<sup>3</sup>/s (October 1964), respectively, but in recent years, 2,117 m<sup>3</sup>/s (November 2020) and 2,008 m<sup>3</sup>/s (December 2021) were recorded, renewing the maximum discharge in observation history.



Source: MWE(\*1), Karuma Hydro Power Project Hydrological Studies(\*2)

**Figure 6.2.19 Trend in Discharge of River Nile at Kamdini, Masindi and Jinja (1947 - 2021)**

Annual maximum peak discharge at Kamdini station calculated is shown Table 6.2.26 and the calculated probable peak discharge is shown Table 6.2.27. 100 year probability peak discharge was 2,718 m<sup>3</sup>/s. The maximum discharge, 2,540 m<sup>3</sup>/s in November 2020, at Karuma Bridge is equivalent to 57 year probable discharge, and the results of the survey of flood water marks based on interviews with military personnel who knew the flow conditions in November 2020 show the maximum water level was estimated to be 996.08m as shown in Figure 6.2.20. In addition, HWL for 100 year probable discharge was calculated as 996.38m

as shown in Table 6.2.28.

**Table 6.2.26 Estimated Annual Max Peak Discharge at Karuma Bridge (m<sup>3</sup>/s)**

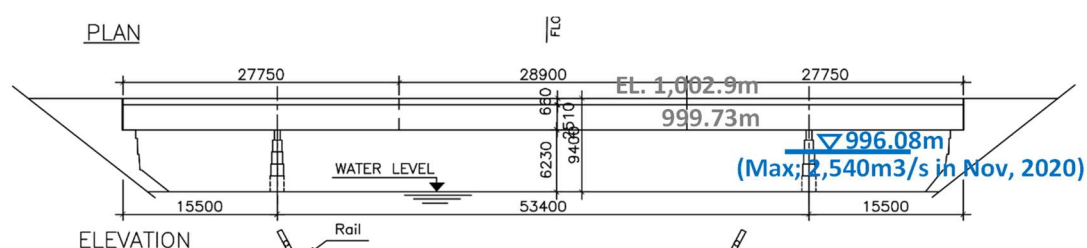
Year	Annual max observed discharges	Annual max peak discharge	Year	Annual max observed discharges	Annual max peak discharge
1951	770	924	1979	1549	1859
1952	795	954	1997	1238	1486
1953	562	674	1998	1238	1486
1954	806	967	1999	1204	1444
1955	647	776	2000	1139	1367
1956	841	1009	2001	1204	1444
1957	944	1133	2002	1178	1413
1958	776	931	2003	1291	1550
1959	776	931	2004	1363	1636
1960	889	1067	2005	1260	1512
1961	1608	1930	2006	1059	1271
1962	1666	1999	2007	1110	1332
1965	1766	2119	2008	1051	1261
1966	1649	1979	2009	930	1116
1967	1351	1621	2010	1064	1276
1968	1722	2066	2011	1252	1502
1969	1584	1901	2012	1225	1470
1970	1654	1985	2013	831	997
1971	1479	1775	2014	946	1135
1972	1291	1549	2015	1169	1403
1973	1286	1543	2016	1165	1398
1974	1254	1505	2017	1165	1398
1975	1602	1922	2018	1243	1491
1976	1187	1424	2019	1354	1625
1977	1258	1510	2020	2117	2540
1978	1494	1793			

Source: Prepared by JICA Survey Team based on the discharge data from MWE

**Table 6.2.27 Probable Peak Discharge**

Recurrency intervals (year)	25	50	100	1,000	10,000
Peak Discharge (m <sup>3</sup> /s)	2,279	2,500	2,718	3,440	4,161

Source: Prepared by JICA Survey Team



Source: UNRA, Edited by JICA Survey Team

**Figure 6.2.20 Maximum Water Level at Karuma Bridge**

**Table 6.2.28 Results of Uniform Flow Calculation**

Discharge (m <sup>3</sup> /s)	Water level (m)	Velocity (m/s)	Area (m <sup>2</sup> )	Manning's n	Froude number
2,540	996.08	4.47	567.9	0.0521	0.55
2,718 *100 year probable discharge	<b>996.38</b>	4.58	593.0	0.0521	0.55

\*Slope: 0.005

Source: Prepared by JICA Survey Team

## (2) Potential Impacts

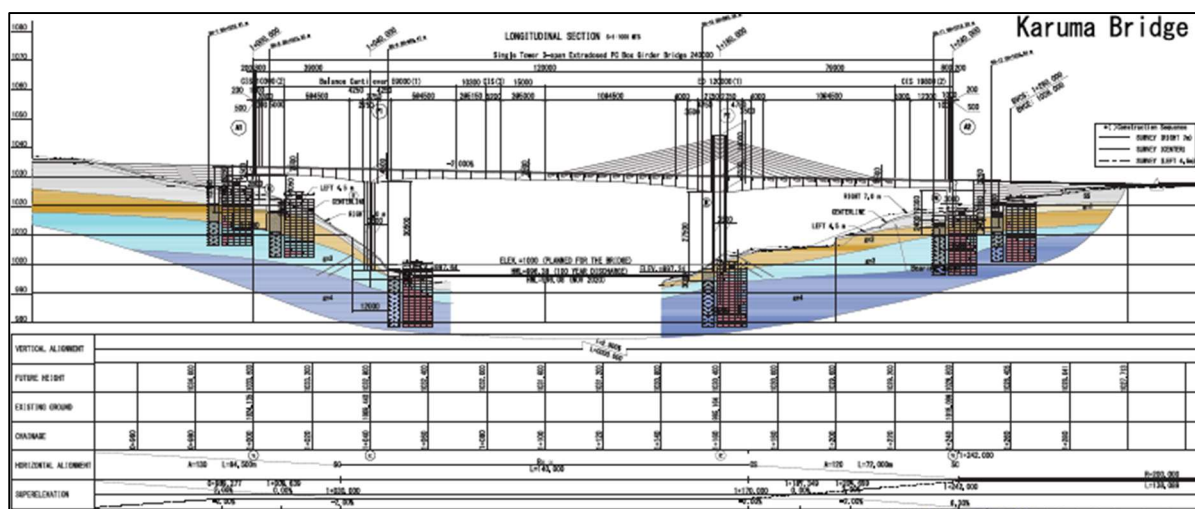
### 1) During and After Construction

Construction of bridge may change the hydrological situation of the river.

## (3) Impact Forecast

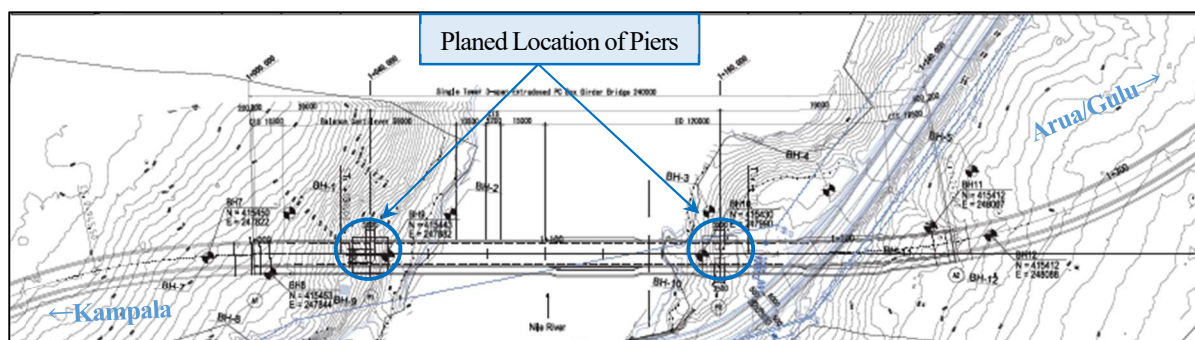
### 1) During and After Construction

According to the bridge design shown in Figure 6.2.21 and Figure 6.2.22 as well as the , the bridge piers and any other relevant facilities are not constructed in the river. Therefore, this project does not change hydrological situation of Nile river and it does not give any impact.



Source: JICA Survey Team

**Figure 6.2.21 Longitudinal Section for the Bridge and Approach Road**



Source: JICA Survey Team

**Figure 6.2.22 Ground Plan for the Bridge and Approach Road**





**Figure 6.2.23 Image of Planned Bridge (No piers in the river)**

(4) Mitigation Measures

1) During and After Construction

Although the project does not cause any negative impact, following mitigation measures are recommended be implemented.

- ✓ Diversion of irrigation channels and/or streams shall be set up if the project activities give impacts on such streams and irrigation.
- ✓ Implementation of appropriate maintenance of drainage along the approach road

(5) Evaluation

According to hydrological analysis and the design of the project, construction of the bridge and approach road does not give any impacts on hydrological situation of the current Nile River since the project does not touch in the Nile River as any physical structures are not planned.

### 6.2.3. Topography and Geology

(1) Result of Baseline Survey

There are no valuable topography and geological sites located in the project area.

(2) Potential Impacts

1) During Construction and After Construction,

No impact is expected since any valuable topography and geological sites are not located in the project area. However, embankment and cutting section of the approach road may cause slope failure.

(3) Impact Forecast

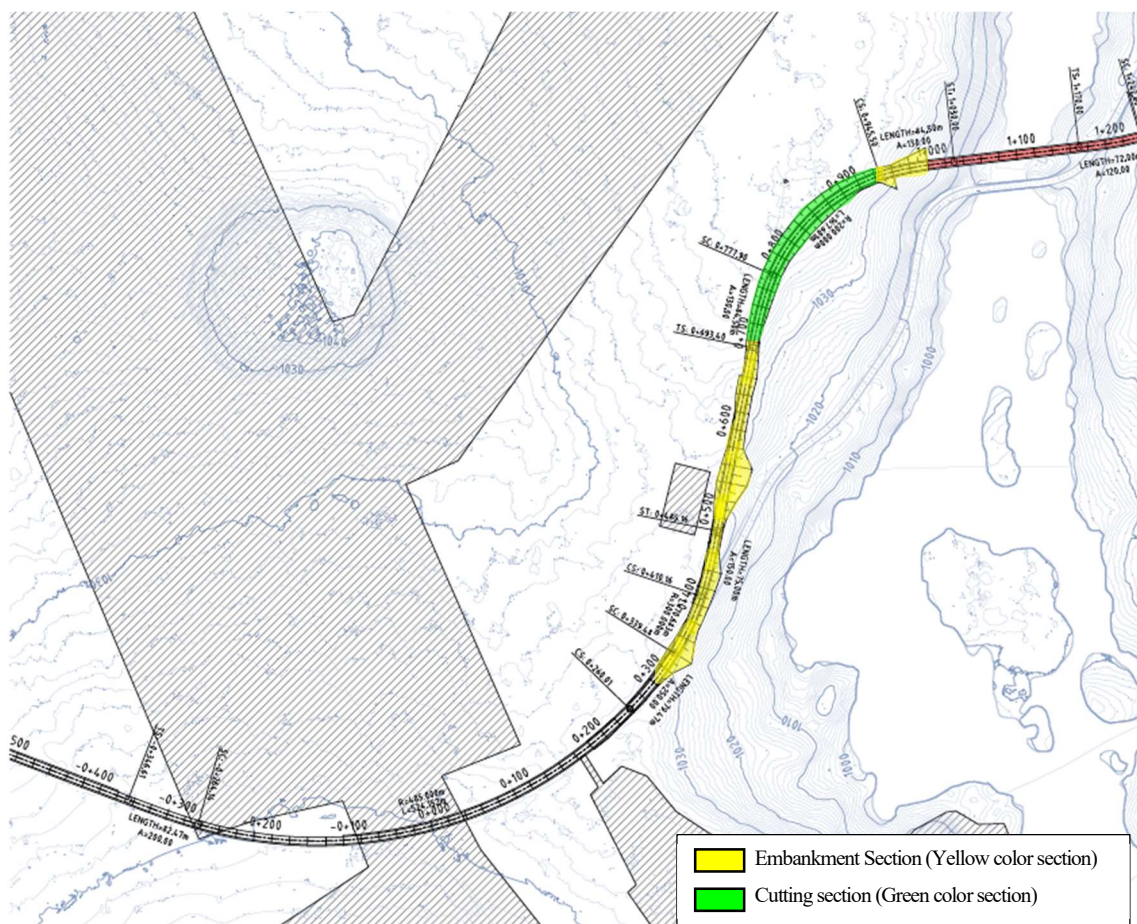
1) During Construction and After Construction

The major area of earthworks of cutting and embankment is shown in Figure 6.2.24 and Figure 6.2.25. Major embankment section is located from ST 0+300 to 0+700, from ST 0+940 to



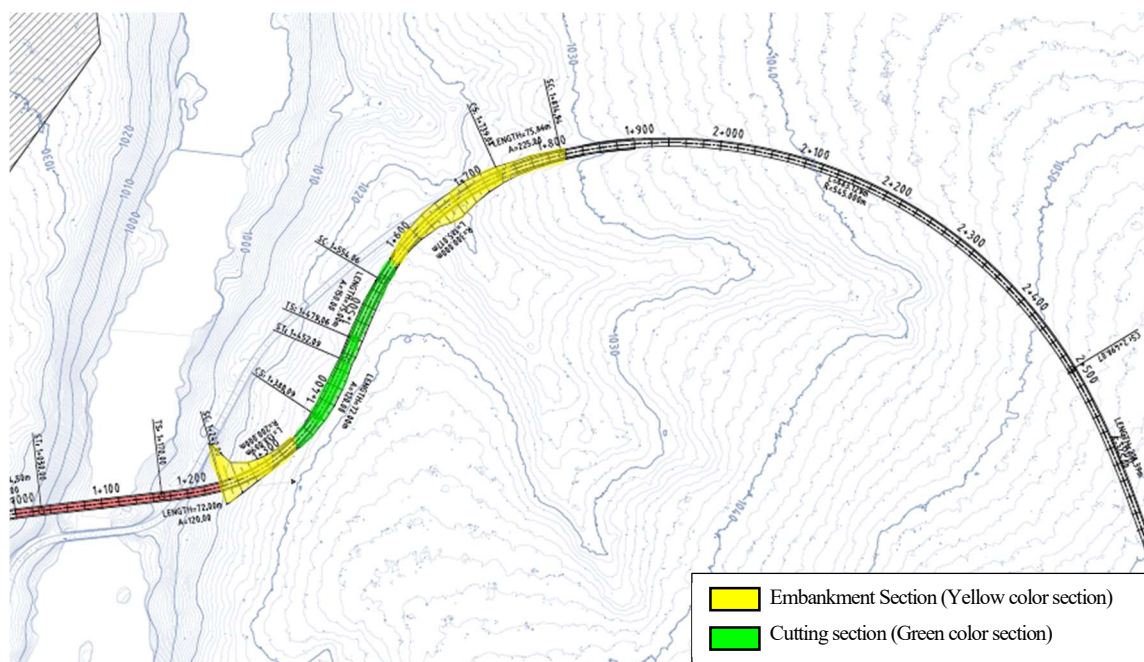
1+000, ST1+242 to ST1+340, ST1+580 to 1+800 and major cutting section is located from ST 0+700 to 0+940, ST1+340 to 1+580.

These earthwork sections have risks of soil erosion, slope failure and landslide. Thus, the following mitigation measures are taken in general.



Source: JICA Survey Team

**Figure 6.2.24 Major Earthwork Sections in the Project Area (Left Bank)**



Source: JICA Survey Team

**Figure 6.2.25 Major Earthwork Sections in the Project Area (Right Bank)**

#### (4) Mitigation Measures

##### 1) During Construction and After Construction

- ✓ The slop gradient for earthwork section is designed in accordance with Guideline of Earthwork (Japan Road Association)
- ✓ Implementation of appropriate slope protection such as turf work and seed spraying treatment.
- ✓ Implementation of appropriate maintenance of slope protection after construction.



(Turf work)



(Seed Spraying)

Source: JICA Survey Team

**Figure 6.2.26 Methodology of Slope Protection**

#### (5) Evaluation

Implementation of appropriate design and mitigation measures such as slope protection and periodical monitoring and maintenance will mitigate the expected impacts. Thus, it is not likely to give significant impacts on the stability of earthwork section.

## 6.3. Social Environment

### 6.3.1. Poverty Group

#### (1) Result of Baseline Survey

According to the Uganda National Household Survey (2019/20)<sup>1</sup>, the national poverty line is 1.77 USD/day, equivalent to 2,377,926 UGX/year.<sup>2</sup> However, it also states that the national level of the average consumption expenditure per adult equivalent (CPAE) is 96,774 UGX/month, equivalent to 1,161,228 UGX/year. In addition, 20.3% of the national population lives in poverty (Table 6.3.1). In the case of Bunyoro Sub-region where Kiryandongo District is located, the CPAE is 98,232 UGX (1,178,784 UGX/year) and slightly higher than the above national level. For Lango Sub-region where Oyam District is located, it is 76,526 UGX (918,312 UGX/year).

**Table 6.3.1 Economic Situation**

Item	Year	Sub-region	Value	Remarks
ACPAE* (UGX/month)	2019/ 20	Bunyoro (including Kiryandongo District)	98,232	1,178,784 UGX/year
		Lango (including Oyam District)	76,526	918,312 UGX/year
		Average in Uganda	96,774	1,161,288 UGX/year
Poverty rate** (%)	2019/ 20	Bunyoro Sub-region (including Kiryandongo District)	9.8	
		Lango Sub-region (including Oyam District)	23.4	
		Average in Uganda	20.3	

Note: \* Mean CPAE, and \*\* Poverty estimates with headcount.  
Source: UNHS 2019/2020

In order to confirm the current economic situation of the local people in the vicinity of the project area, the JICA Survey Team conducted the social condition survey by interviews with sampled households in Kiryandongo and Oyam districts (2023). As a result, the average net income in the Project Area was estimated at 2,544,194 UGX/year, and the poverty rate was 60%.<sup>3</sup> Compared with the national poverty level (20.3%), the poverty situation in the vicinity of the Project area is significant even while the average annual net income is higher than the national CPAE level.

**Table 6.3.2 Poverty Situation in the Vicinity of Project Area**

District	No. of Valid Household Respondents	Annual Net Income (UGX)	No. of Households below Poverty Line*	Poverty Rate (%)
Kiryandongo (including Karuma TC, and Diima SC)	181	4,161,153	98	54
Oyam (Kamdini SC)	74	-1,160,485	56	76
Total (Average)	255	(2,544,194)	154	60

Note: The Poverty Line is based on 1.77 USD/ day.  
Source: JICA Survey Team

#### (2) Potential Impacts

##### 1) During Construction

As the Project does not require land acquisition and resettlement, there will be no direct and significant impacts on the poverty groups. However, the poverty groups live in the vicinity of the

<sup>1</sup> UNHS 2019/2020 (Uganda Bureau of Statistics: UBOS): [https://www.ubos.org/wp-content/uploads/publications/09\\_2021Uganda-National-Survey-Report-2019-2020.pdf](https://www.ubos.org/wp-content/uploads/publications/09_2021Uganda-National-Survey-Report-2019-2020.pdf)

<sup>2</sup> 1 USD = 3,861 UGX at 1 USD = 151.3700 JPY, and 1 UGX = 0.039200 JPY (JICA Rate as of April 2024)

<sup>3</sup> Although comparisons should normally be made based on average annual expenditures, a simplified method was used in this case, assuming that "a net income above the poverty line would allow for higher expenditures than it."

project area and may experience impacts related to the influx of construction workers resulting in disruption of the job opportunities. Therefore, the level of impact will be assessed based on the above feature of the local community.

2) After Construction

No impacts are expected because no activities which may give adverse impacts on this item is planned.

(3) Impact Forecast

1) During Construction

As the Project does not require land acquisition and resettlement, there is no poverty group that may experience direct adverse impacts. In addition, the main income sources of the poverty groups are agriculture, fishery, etc., that they can continue their economic activities even in the construction period. It means there is no poverty group will not be affected at the level that they completely lost their means of livelihood by the Project.

The job opportunities related to the Project will positively impact local people including poverty group. In the rural area of Uganda, the median monthly earnings for person are 200,000 UGX/month in cash.<sup>4</sup> Therefore, if the persons belonging to the poverty group work at the wage for 12 months, they can earn more than the poverty line (2,377,926 UGX/year) by simple calculation.

As of now, approximately 200 construction workers per day will be hired, according to the construction plan. Of these, about 10 members will be Japanese workers, and 30 to 50 members will be hired mainly from other area such as Kampala as semi-skilled labour. In addition, the remaining 140 to 160 construction workers as un-skilled labour is required for the construction works. In addition, the un-skilled labours will be basically hired from the local community. Including the poverty group, the local people have a chance to apply to the job related to the Project so that their standard of living can be improved.

2) After Construction

No impacts are expected because no activities which may give adverse impacts on this item is planned.

(4) Mitigation Measures

1) During Construction

Mitigation measures are as follows:

- ✓ Provide equal job opportunities for the local people as construction workers.
- ✓ Announce the schedule, conditions, requirements, duration, etc. for recruiting all skilled, semi-skilled, and unskilled labours in places where the local people can easily observe, such as the town centre, local council office, and meeting places.
- ✓ Priority will be given to employ the local people whenever possible and the influx of construction workers from other areas.

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<sup>4</sup> Main Report, National Labour Force Survey 2021 (UBOS):  
[https://www.ubos.org/wp-content/uploads/publications/11\\_2022NLFS\\_2021\\_main\\_report.pdf](https://www.ubos.org/wp-content/uploads/publications/11_2022NLFS_2021_main_report.pdf)

2) After Construction

No mitigation measures are necessary.

(5) Evaluation

As the project does not require land acquisition and resettlement, no adverse impacts on the poor are expected. On the contrary, job opportunities will be provided to the local people including poverty group during construction. As the mitigation measures are in place to provide equal opportunities, it is expected that the impact could even be positive for the poverty group. Therefore, it is not likely to give a significant impact on this item.

### 6.3.2. Ethnic Group

(1) Result of Baseline Survey

As the Project does not require land acquisition and resettlement, no ethnic group will have its territory directly disturbed. In addition, as described the detail in below (Section 6.3.9), some local people have their own cultural sites along with the Victoria Nile, so they may have a collective attachment to the land, but no sites will not be affected by the Project. In short, there is no specific ethnic group that will directly be affected by the Project. However, it is worth to collect the detailed information about the local communities in the vicinity of the Project area so that the Project avoids unnecessary confusion to them.

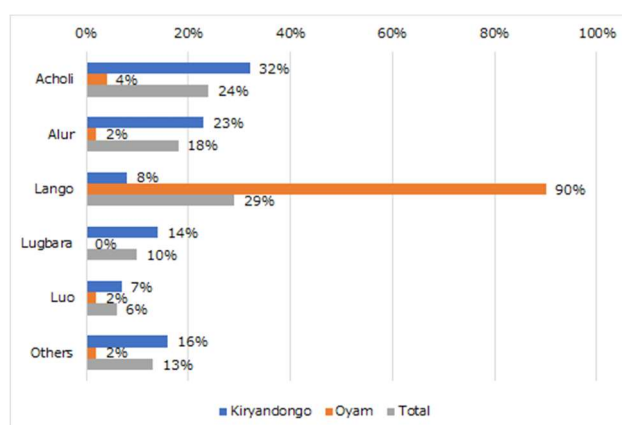
The Constitution (1995) lists 56 groups as “the indigenous communities (as of 1st February 1926).” According to the indigenous people planning prepared by the World Bank<sup>5</sup>, there is no official definition of indigenous peoples, and neither are their criteria in place for their identification. It should be highlighted that the term “indigenous” in the Constitution is used to describe the different ethnic groups that historically have resided within Uganda’s border.

The National Census Survey (2014) includes 9 groups in addition to 56 groups identified in the Constitution. Therefore, it can be considered that there are at least 65 ethnic groups in the country. This shows the diversity of Uganda’s ethnic groups. As evidence of the above, several types of ethnic groups such as Acholi, Alur, Chope, Langi, Lugbara, etc. are observed in the Project area through the Social Condition Survey (2023) (see Figure 6.3.1). Acholi and Lango tribes were identified as the largest ethnic groups in Kiryandongo District (Karuma TC and Diima SC) and Oyam district (Kamdini SC) with 32% and 90 %, respectively. Comparing Kiryandongo and Oyam districts, it can be said that Kiryandongo District has more diversity in terms of the number of tribal types.

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<sup>5</sup> <https://documents1.worldbank.org/curated/en/566231468318579563/pdf/IPP6560v20Ugan000PUBLIC00Box379829B.pdf>





Source: JICA Survey Team

**Figure 6.3.1 Distribution of Ethnic Group in the Project Area**

The National Census Survey (2014) shows the distribution of the population by ethnic groups as shown in Table 6.3.3. Due to the large number of ethnic groups in Uganda, although Baganda tribe is the 1st largest group in Uganda, it only accounts for 16.3% of the population. Looking at the tribes related to the Project area, Acholi tribe, which is the 1st largest group in Kiryandongo District and the 2nd largest group in Oyam, is the 8th largest group in Uganda with 4.31%. In addition, Langi tribe, which is the 1st largest group in Oyam District, is the 6th largest group in Uganda with 6.24%.

**Table 6.3.3 Distribution of Population by Ethnic Groups**

Rank	Ethnic Groups	Number (persons)	Percentage (%)	Remark*
1	Baganda	5,555,319	16.3	
2	Banyankore	32,163,32	9.4	
3	Basoga	2,960,890	8.7	
4	Bakiga	2,390,446	7.0	
5	Iteso	2,364,569	6.93	
6	Langi	2,131,495	6.24	5 <sup>th</sup> largest group in Kiryandongo District 1 <sup>st</sup> largest group in Oyam District
7	Bagisu	1,646,904	4.82	
8	Acholi	1,470,554	4.31	1 <sup>st</sup> largest group in Kiryandongo District 2 <sup>nd</sup> largest group in Oyam District
9	Lugbara	1,099,733	3.22	4 <sup>th</sup> largest group in Kiryandongo District
10	Banyoro	966,976	2.83	
11	Alur	878,453	2.57	2 <sup>nd</sup> largest group in Kiryandongo District 3 <sup>rd</sup> largest group in Oyam District
...	...	...	...	
47	Chope	34,327	0.10	3 <sup>rd</sup> largest group in Kiryandongo District 3 <sup>rd</sup> largest group in Oyam District
...	...	...	...	
Total		34,142,417	100	

Note: Information described in "Remark" is based on the result of the Social Condition Survey.

Source: JICA Survey Team

As mentioned above, there are several tribes in the local communities in the vicinity of the Project area, including those with small populations, such as the Chope tribe. The local people have their own language, culture, etc., but coexist with others in their area. According to the councillors of each town council and sub-county, there is no ethnic group, including the Chope tribe, that suffers from disempowerment or discrimination on economic, social and cultural grounds among them. On the other hand, some local people pointed out during the FGDs that they had been discriminated against in the employment by the previous projects.



## (2) Potential Impacts

### 1) During Construction

As the Project does not require the land acquisition and resettlement, there is no ethnic group that will be affected. However, the influx of construction workers may change the ethnic distribution of local communities in the vicinity of the Project area. In addition, a particular ethnic group may face discrimination in the employment process as construction workers.

### 2) After Construction

No impact is expected because no activities which may give adverse impacts on this item is planned.

## (3) Impact Forecast

### 1) During Construction

As described above, most of the construction workers will be hired from the local community. On the other hand, about 10 Japanese workers and 30 to 50 workers from other cities in Uganda will be hired. As of now, therefore, the population influx is expected to be at the maximum level of 60 workers. In principle, it is assumed that the construction workers will move to the Project area without their family. In order to estimate the potential population influx, however, the assumption with accompanying family members is as follows.

In the case of Japan, the average population in one household is 2.25 according to the statistical data. As well, the size in Uganda is 4.6. If the Japanese and Ugandan construction workers brought all their family members to the Project area, the population can be about 253 (2.25 members/household x 10 workers + 4.6 members/household x 50 workers) in maximum.

According to each local council office, the population size of the local community in the vicinity of the Project area is as shown in Table 6.3.4. Given that the total population in the vicinity of the Project area is 146,190, the significance of the population influx with the above 253 persons is negligible. In addition, the population influx of the construction workers and their families would be limited only during the construction period. Therefore, the Project is not expected to significantly change the distribution of ethnic groups in the local community.

**Table 6.3.4 Population Size of the Local Community in the Vicinity of the Project Area**

Item	Kiryandongo District		Oyam District	Total
	Karuma TC	Diima SC	Kamdini SC	
Male	22,248	16,857	32,741	71,846
Female	21,328	17,546	35,470	74,344
Total	43,576	34,403	68,211	146,190

Source: JICA Survey Team

While there is no particular group that will be directly affected and the influx of the construction workers is not significant, considerations on ethnic groups in the employment should be given. For example, if a particular ethnic group is given the benefits such as job opportunities related to the Project as construction work or eliminated from the opportunities, it may cause conflict between groups in the local community.

### 2) After Construction

No impact is expected because no activities which may give adverse impacts on this item is planned.

#### (4) Mitigation Measures

##### 1) During Construction

Mitigation measures are as follows:

- ✓ Ensure a clear principle no discrimination based on the ethnicity in the selection process of construction workers.
- ✓ Provide equal job opportunities for the local people as construction workers.
- ✓ Announce the schedule, conditions, requirements, duration, etc. for recruiting of all skilled, semi-skilled, and unskilled labours in places where the local people can easily observe, such as town centre, local council office, and meeting places.
- ✓ Priority will be given to employ the local people whenever possible and minimize the influx of construction workers from other areas.

##### 2) After Construction

No mitigation measures are necessary.

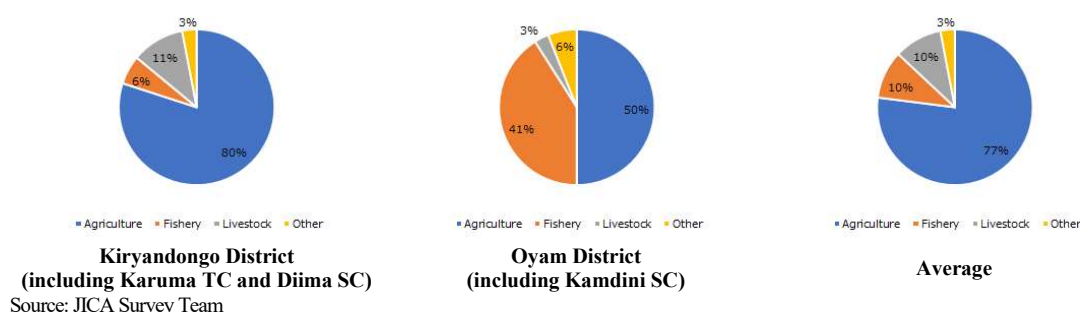
#### (5) Evaluation

Due to the implementation of mitigation measures during construction, inequality in job opportunities by the difference of ethnic group will be avoided. In addition, although the population influx of construction workers is anticipated, the significance is negligible. Therefore, it is not likely to give a significant impact on this item.

### 6.3.3. Local Economy Such as Employment and Livelihood

#### (1) Result of Baseline Survey

According to the Social Condition Survey (2023), the main sources of income are agriculture (crop production), livestock, fishing, and others such as vendors, restaurant, catering, and transportation. Looking at the characteristics of household income on average for both districts, it is clearly observed that agriculture is dominates in the monetary basis, as its percentage is about 77% (Figure 6.3.2). However, it is noteworthy that the income from fishing in Oyam District is 41% while it is only 6% in Kiryandongo District. Regarding the details about fishing activities, the impacts are discussed in Section 7.3.4.



**Figure 6.3.2 Main Sources of Household Income (Monetary Basis)**

As a result of the field observation, it was confirmed that there are several shops and restaurants within a distance of about 600 m range from the edge of the alignment along the Bobi-Mashindi Road in Kiryandongo District Side (Figure 6.3.3). In addition, along the same stretch, vendors can be seen selling items such as roasted and fresh food (meat, chicken,

maize, etc.) and drinks to mainly travellers in buses and taxis that stop before reaching the existing bridge. According to the interviews with the local people, about 500 people are engaged in economic activities along the said road.



Source: JICA Survey Team

**Figure 6.3.3 Commercial and Residential Area in the Vicinity of the Project Area**

**Table 6.3.5 Estimated Population Size engaging Economic Activities along the Bobi- Mashindi Road**

Type of Economic Activity	No. of Population	Remark
Shop and restaurants	100	Including owners and employers
Workshop (selling fuel and repairing tires)	40	
Taxi brokers	100	Including those who load passengers, luggage, etc.
Vendors (including fresh and roasted foods, chicken roasting, drinks, mobile career*)	110	
Chicken dealers	50	
Boda-boda	100	
Total	500	

Note: \* Some food vendors sell mobile career items with food.

Source: JICA Survey Team

During every LSMs and FGDs organized so far, most of the local people expressed their willingness to engage in the Project as construction workers (see CHAPTER 8). It was confirmed that the local people consider the Project positively as a source of income.

(2) Potential Impacts

1) During Construction

As there are no people living in the project affected area, no adverse impacts from resettlement and land acquisition are expected. However, some businesses such as shops, restaurants, workshops in/around the restricted area during construction may experience temporary impacts if their access is disrupted. In addition, vendors may have impacts, if their area of operation is subject to the restriction. However, job opportunities such as construction workers related to the construction activities and business opportunities caused by the buying interest of the construction workers will be increased.

2) After Construction

No impact is expected because no activities which may give adverse impacts on this item is planned.

(3) Impact Forecast

1) During Construction

The construction plan does not include any traffic restrictions that would require the complete closure of the use of the existing bridge, which could disrupt access between communities. In addition, the Project will not stop traffic on the existing road for the construction. This means that existing businesses within 600m range of the edge of the alignment (yellow line in Figure 6.3.3) can continue to operate and will not be directly affected. On the other hand, traffic control will be required when construction vehicles enter and/or exit the bifurcation area between the existing and new bridges and construction yards, and when the new alignment connects to the existing road, but impacts are expected to be temporary and limited.

Considering the above, there will be no impacts at the level that local people will lose their livelihoods such as shops, restaurants, vendors, etc. However, some mitigation measures for the temporary impacts are helpful to minimize the disruption in/around the controlled area.

2) After Construction

No impact is expected because no activities which may give adverse impacts on this item is planned.

(4) Mitigation Measures

1) During Construction

Mitigation measures are as follows:

- ✓ Information on the detailed construction plan, including schedule, location of construction area and related facilities, and traffic control area, should be disseminated in advance.
- ✓ Ensure access to the entrances of shops, restaurants, etc. in the vicinity of construction area, related facilities, and traffic control area. This should be planned by the construction contractor during the mobilization and inspected by the consultant prior to the construction work.
- ✓ Providing equal job opportunities for the local people as construction workers.
- ✓ Establish a Grievance Redress Mechanism (GRM) to resolve complaints received from the local people.

2) After Construction

No mitigation measures are necessary.

(5) Evaluation

With regard to businesses such as shops, restaurants, and vendors operating in the vicinity of the construction area, temporary disruption during the traffic control is expected in the construction period. Therefore, a detailed plan for the securing access to the entrances of shops, restaurants, etc. should be prepared by the construction contractor and inspected by the consultant during construction. However, the impact is limited in a certain period and minimized by the mitigation measures. In addition, job opportunities and business opportunities can be increased. Under such circumstances, it is not likely to give significant impacts on this item.

### 6.3.4. Land Use and Utilization of Local Resources

(1) Result of Baseline Survey

1) Agricultural Activity

As the Project area is designated as protected areas, no agricultural activity is observed.

2) Fishing Activity

According to the ESIA Report (2015 and 2018), it is anticipated the potential negative impacts on fishermen who take fish from the Nile River. Therefore, the JICA Survey Team had an interview with the Karuma UWA office during the field survey. Then, it is confirmed that fishermen on the downstream side of the current Karuma Bridge are registered as members of the Karuma Fisheries Association (KFA). The association was established in 2012, and the membership is 121 as of 2023 (Table 6.3.6).

**Table 6.3.6 Number of KFA Members**

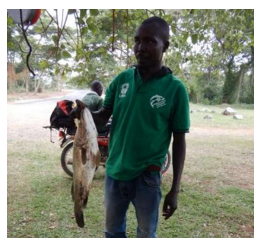
No.	Name of Village/ Cell	Number of Male	Number of Female	Total
1	Karuma	25	0	25
2	Ayuda	14	1	15
3	Awoo	15	0	15
4	Gwal 1	5	0	5
5	Gwal 2	10	0	10
6	Gwal 3	7	0	7
7	Abindo	15	0	15
8	Bedmot	6	0	6
9	Okwece	10	0	10
Sub-total for Karuma TC		107	1	108
10	Diima	8	0	8
11	Ogengo	5	0	5
Diima Sub County		13	0	13
<b>Total</b>		<b>120</b>	<b>1</b>	<b>121</b>

Source: Interview from KFA representatives (2023)

The KFA members conduct activities agriculture, beekeeping, aquaculture, as well as fishing within the Murchison Falls National Park. The Minutes of Understanding (MoU) between KFA and UWA regulates that the members can fish by using fishhooks approved for two days a week in an area ranging from 2 to 15 km of the current Karuma Bridge of the downstream side. The main fish species are Nile perch and Tilapia which are traded at the price of 8,000 UGX to 10,000UGX per kilo at markets. The close season of fishing for 1 month follows the open season of 3 months, and this cycle is repeated all year. It is strictly controlled that the KFA members must visit the Karuma UWA office to pay 5,000 UGX for



the activities of the KFA and another 5,000 UGX for entrance fee to the protected areas and report their fishing exploits when they finish fishing.



A member of KFA reporting his fishing exploits

Source: Interview from KFA representatives (2023)

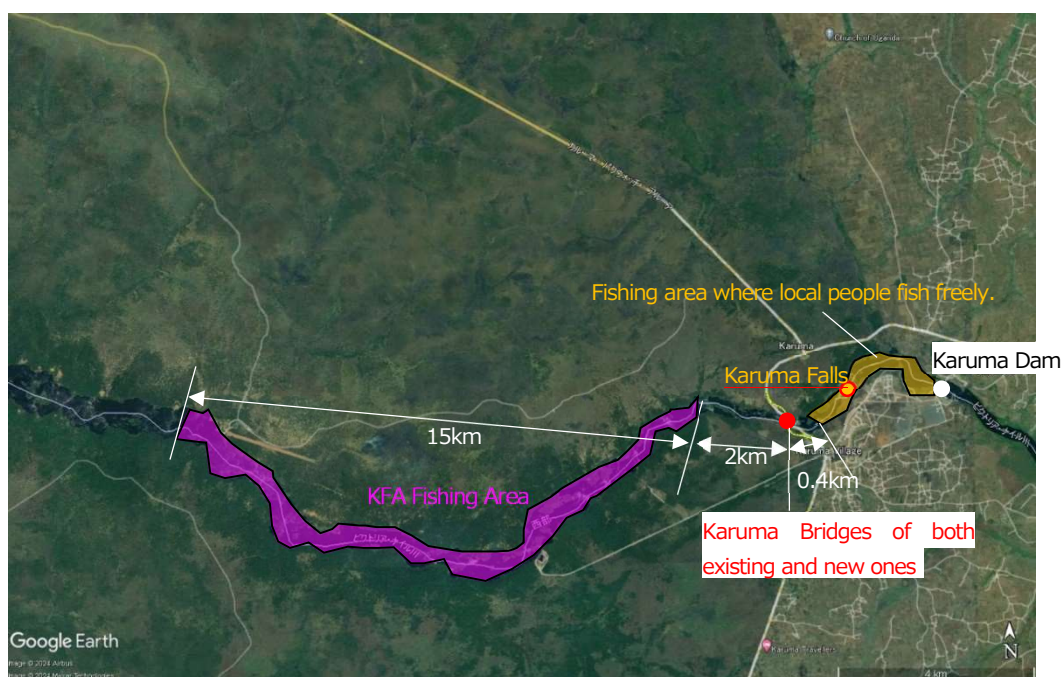


A fishhook approved for use by the KFA

### Figure 6.3.4 Fishing Activities by the KFA

According to UWA officials, during the construction of the previous project, some construction workers, who were hired from other areas or countries, illegally fished inside the protected area without obtaining any permission from UWA. Under such circumstances, UWA officials warned them at the site, and some of them were dismissed by the contractor of the said project. There have even been court cases against those who used nets for fishing, which is prohibited inside the protected area. It seems that the monitoring by UWA officials is working, but the problems were caused by the construction workers who did not follow the local manner or rule appropriately.

On the upstream side of the existing Karuma Bridge, the neighbouring local community members freely enjoy their fishing activities because it is outside of the protected areas and out of the control of the Karuma UWA office (Figure 6.3.5). According to the information during FGDs, local people mainly fish in the area between the Karuma Dam and Karuma Falls because the water flow is calm. On the other hand, the water flow in the area between the Karuma Falls and the existing Karuma Bridge is fast, and the number of local people who fish is low. In the case of upper side, the fishing area is 0.4km away from the existing Karuma Bridge.



Source: JICA Survey Team (based on Google Earth satellite map)

Figure 6.3.5 Fishing Areas in the Vicinity of the Project Area



(2) Potential Impacts

1) During Construction

On the upper side 0.4 km away and on the downstream side 2 km away from the current Karuma Bridge, local people or fishing group have been practicing fishing. However, local people who fish in the Nile River may have temporary impacts when their access is disturbed. In addition, the population influx of construction workers from outside of the Project area may affect the usage of local resources by catching fish, etc. without permission.

2) After Construction

No impact is expected because no activities which may give adverse impacts on this item is planned.

(3) Impact forecast

1) During Construction

No piers will be constructed in the Nile River and no blasting will be used for the Project, and water flow and fish habitats will not be affected. In addition, the main fishing areas of the local people both upstream and downstream sides have a certain distance from the construction area, they can continue fishing.

According to the local people, they have several routes to access their fishing area. Therefore, it is not expected that they will completely lose access to their fishing area, even if the project's control area is established and temporary disturbance occurs. However, the construction of detour will be considered if the local people request it.

As described above, the Project will hire about 60 construction workers from Japan and other cities in Uganda. In this regard, the potential risk that they will take local resources such as fish without following the rules of the local community will be increased, resulting in conflict between the local community and outsiders.

2) After Construction

No impact is expected because no activities which may give adverse impacts on this item is planned.

(4) Mitigation Measures

1) During Construction

Mitigation measures are as follows:

- ✓ Information on the detailed construction plan, including schedule, location of construction area and related facilities, and traffic control area, should be disseminated in advance.
- ✓ In order to avoid traffic disruption due to the complete closure, the existing Karuma Bridge will be maintained, and traffic will be kept on the existing Karuma Bridge during construction of the new bridge.
- ✓ Provision of detour to the river, as necessary. This should be planned by the construction contractor during the mobilization and inspected by the consultant prior to the construction work.
- ✓ Construction workers should not extra local resources such as fish and firewood.

- ✓ Establish a GRM to resolve complaints received from the local people.

2) After Construction

No mitigation measures are necessary.

(5) Evaluation

Regarding the possibility of disrupting the local people's access to the river during the construction, a detailed plan for the detour should be prepared by the construction contractor, if required. It should be also inspected by the consultant during construction. In addition, the conflict over the use of local resources by construction workers are expected. However, above impacts can be handled through the implementation of appropriate mitigation measures. Therefore, it is not likely to give serious impacts on this item.

### 6.3.5. Water Usage

(1) Result of Baseline Survey

According to the results of the social condition survey (2023), no residential houses, irrigation canals and boreholes are observed within 500 m range of the affected area. In addition, the supplementary information as shown in was given by the local people during the FGDs in November 2023. It means that the local people have been using river water at least 2 km away from the affected area.

**Table 6.3.7 Water Use in the Vicinity of the Project Area**

Discussed Point	Karuma TC	Kamdini SC
Whether any activities relying on water use have been carried out along the Nile River, except for fishing.	Since the water flow is too fast, no activities (including washing clothes, collecting water) are carried out.	Since the water flow downstream of the Karuma Dam is relatively slow, activities such as washing clothes, collecting water, and collecting firewood are seen.

Source: JICA Survey Team

During the FGDs in April 2024, however, some participants expressed their fears of the water shortages due to the population influx of construction workers. In fact, most of the construction workers will be hired from the local community, and the number of construction workers to be recruited from other areas will be a maximum of 60 as described above. Even if they bring their family members to the community, the population influx will be at the level of 253 people. The water shortage caused by the population influx is not expected to be significant level is not anticipated, but the contractor should secure its water resources through continuous consultation with the local community.

Regarding the access to the river, the people have several routes for approaching. Therefore, it is not expected that they will completely lose access, even if the project's control area is established and temporary disturbance occurs.

(2) Potential Impacts

1) During Construction

As no irrigation canals, boreholes, and residential houses are observed in the vicinity of the affected area, there will not be adverse impacts by the Project on this item. However, measures to secure water resources can be help to the local community, thus addressing the concerns of some FGD participants.

2) After Construction

No impact is expected because no activities which may give adverse impacts on this item is planned.

(3) Impact Forecast

During after the construction, no adverse impact is expected because no activities which may give adverse impacts on this item is planned. However, measures to secure water resources can help to the local community, thus addressing the concerns of some FGD participants.

(4) Mitigation Measures

1) During Construction

Mitigation measures are as follows:

- ✓ Priority will be given to employ the local people wherever possible and minimize the influx of construction workers from other areas.
- ✓ The contractor should prepare water supply plan with consultation including drinking water and obtain the Water Abstract Permit from Directorate of Water Resource Management.
- ✓ Establish a GRM to resolve complaints received from the local people.

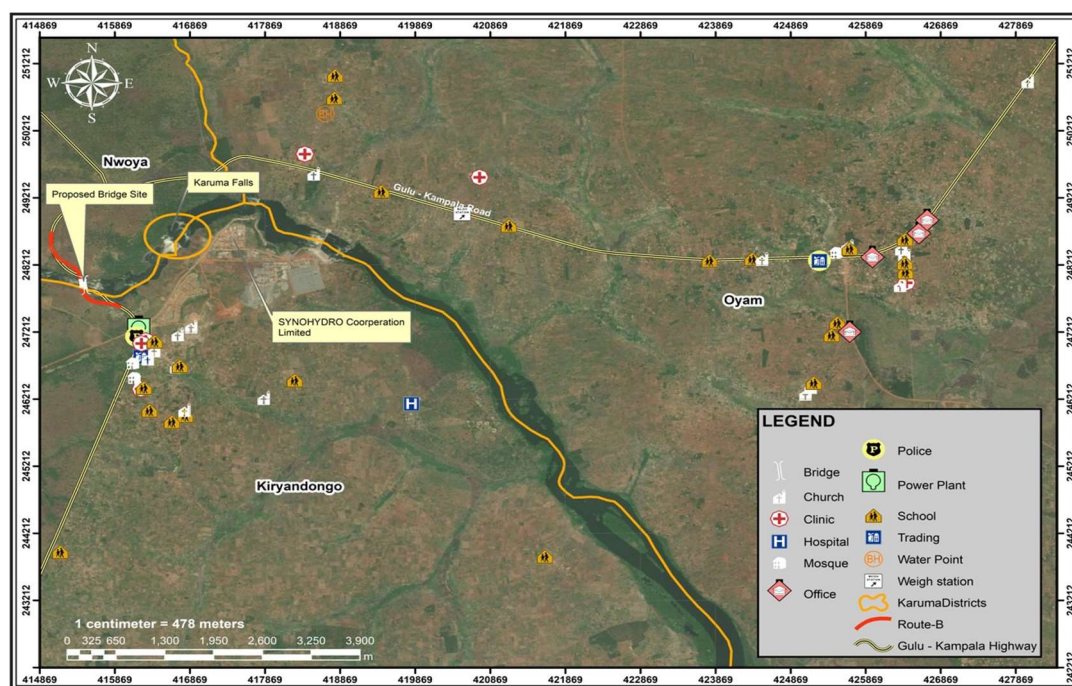
(5) Evaluation

During and after construction, no impacts are expected due to the implementation of mitigation measures.

### 6.3.6. Existing Social Infrastructure and Services

(1) Result of Baseline Survey

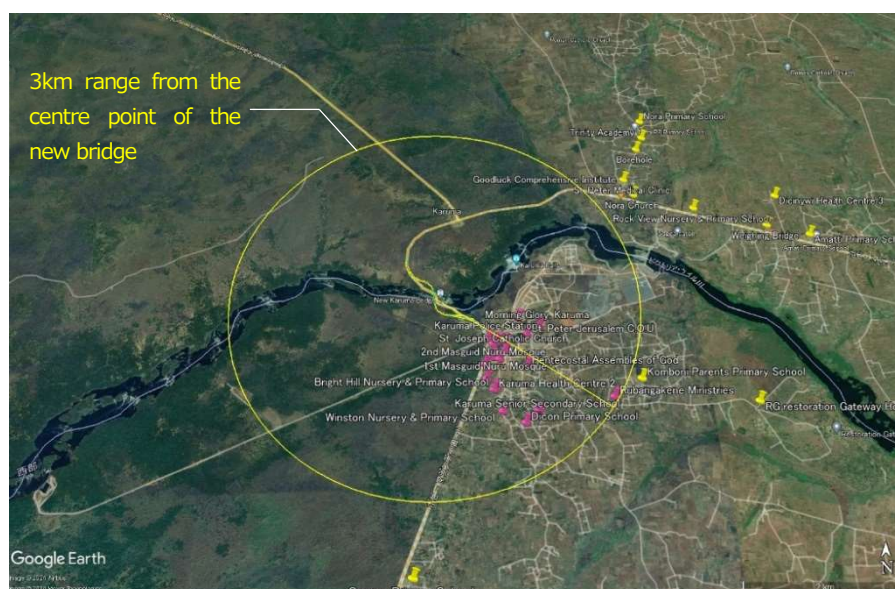
Based on the social condition survey (2023), the distribution map of social infrastructure in the vicinity of the Project area is illustrated as shown in Figure 6.3.6. As a result, it was confirmed that there are no social infrastructures such as schools, hospitals, health clinics, meeting places, etc. within the affected area.



Source: JICA Survey Team

**Figure 6.3.6 Social Infrastructures in the Vicinity of the Project Area**


In the case of Oyam and Nwoya Districts, there is no social infrastructure within 3 km from the centre point of the new bridge (Figure 6.3.7). On the other hand, there are several social infrastructures in Kiryandongo District side (Table 6.3.8). Within 3 km from the centre point of the new bridge, there are 22 structures were recorded, and the nearest infrastructure is the UWA Karuma Office, which is just 20 m away from the centreline of the alignment. Of the 22 structures recorded, the Karuma Police Station and the 2nd Masguid Nuru Mosque are built along the Bobi-Mathindi Road. The rest are located within Karuma SC and Diima SC.



Source: JICA Survey Team (based on Google Earth satellite map)

**Figure 6.3.7 Recorded Social Infrastructures**

**Table 6.3.8 List of Social Infrastructures within 3 km from the Centre Point of the New Bridge**

No.	Category	Name of Infrastructure	No. of Population		Distance
			Latitude	Longitude	
1	Office	Uganda Wilf Authority, Karuma Office	2°14'20.43"N	32°14'39.33"E	About 700m*
2	Office	Karuma Police Station	2°14'8.88"N	32°14'45.55"E	About 1 km
3	Hydropower plant	UEGCL Karuma Power Sation Office	2°14'18.57"N	32°14'59.90"E	
4	Clinic	Karuma Medical Clinic	2°14'6.84"N	32°14'49.56"E	
5	Clinic	Family Health Care Clinic	2°14'5.63"N	32°14'47.77"E	
6	School	Karuma Primary School	2°14'6.45"N	32°14'53.35"E	
7	Church	St. Joseph Catholic Church	2°14'2.21"N	32°14'53.32"E	
8	Church	St. Peter Jerusalem C.O.U	2°14'9.93"N	32°15'3.45"E	
9	Church	Moming Glory, Karuma	2°14'13.75"N	32°15'9.31"E	
10	Trading	Karuma Trading Canter	2°13'59.05"N	32°14'47.53"E	
11	Church	Christ in you	2°13'58.17"N	32°14'50.54"E	
12	Mosque	2nd Masguid Nuru Mosque	2°13'55.82"N	32°14'43.97"E	
13	Church	Pentecostal Assembles of God	2°13'54.37"N	32°15'2.81"E	
14	School	Little Angels Nursery & Primary School	2°13'54.53"N	32°15'4.27"E	
15	Mosque	1st Masguid Nuru Mosque	2°13'48.79"N	32°14'44.55"E	
16	School	Bright Hill Nursery & Primary School	2°13'43.94"N	32°14'48.73"E	
17	Clinic	Karuma Health Centre 2	2°13'43.35"N	32°14'47.47"E	
18	Church	CER Church	2°13'33.23"N	32°15'6.44"E	
19	School	Winston Nursery & Primary School	2°13'32.97"N	32°14'51.17"E	
20	School	Karuma Senior Secondary School	2°13'30.40"N	32°15'6.57"E	
21	School	Dicon Primary School	2°13'27.47"N	32°15'0.81"E	
22	Church	Rubangakene Ministries Church	2°13'39.08"N	32°15'40.56"E	About 3km

Note: While the distance from the centre point of the new bridge is about 700m, the distance from the centreline of the alignment is about 20m.

Source: JICA Survey Team

## (2) Potential Impacts

### 1) During Construction

As described the above, the UWA Karuma office will be disturbed by the noise and vibration caused by the operation of construction machinery nearby, and the access to the office will be affected by traffic control. In addition, while the direct impacts on other social infrastructures such as noise and vibration are not expected due to a certain distance from construction work, the access to them can be caused by the traffic control.

### 2) After Construction

No impact is expected because no activities which may give adverse impacts on this item is planned.

## (3) Impact Forecast

### 1) During Construction

In the Project, the existing traffic will not be completely stopped by the works, although there will be some temporary traffic control will be made when the construction vehicles pass nearby. Therefore, there will be no significant impact on the social infrastructure, such as the complete disruption of access. However, in order to minimize the confusions caused by the temporary traffic control, the mitigation measures are necessary.

### 2) After Construction

No impact is expected because no activities which may give adverse impacts on this item is planned.

(4) Mitigation Measures

1) During Construction

Mitigation measures are as follows:

- ✓ Information on the detailed construction plan, including schedule, location of construction area and related facilities, and traffic control area, should be disseminated in advance.
- ✓ In order to avoid traffic disruption due to the complete closure, the existing Karuma Bridge will be maintained, and traffic will be kept on the existing Karuma Bridge during the construction of new bridge.
- ✓ Traffic guides will be deployed in the vicinity of construction area, related facilities, and traffic control area.
- ✓ Provision of detour to the existing social infrastructures and services, as necessary. This should be planned by the construction contractor during the mobilization and inspected by the consultant prior to the construction work.
- ✓ Establish a GRM to resolve complaints received from the local people.

2) After Construction

No mitigation measures are necessary.

(5) Evaluation

During construction, temporary traffic control may cause disruption around the construction site, resulting in disruption of access to existing social infrastructure. However, the implementation of mitigation measures will help to minimize such impacts. A detailed plan for detour should be prepared by the construction contractor and inspected by the consultant during construction. Given the above mitigation measures are taken, it is not likely to give significant impacts on this item.

**6.3.7. Social institutions such as local decision-making institutions**

(1) Result of Baseline Survey

In the local communities, the council members were elected by the residents as their representatives. Due to the differences in size, structure, characteristics, etc. of the local population, the number of council members varies in Karuma TC, Diima SC, and Kamdini SC, with 13 to 15 council members in each (Table 6.3.9). According to the council members, they have to have representatives of “special group” such as women, youth, elders, and disabled persons. The main tasks of council members are mainly to lead their residents, and to manage the local community by requesting budget from the local government and disbursing the budget, etc.

In the past, public projects such as KHHP, have communicated with local council members as a bridge between the project side and the residents to implement the Project in their communities. In addition, they played the key role of the coordinators in the local communities for the project during the consultations and sensitizations of the local people, they played roles of the coordinators in the local people. For the Project, the local council members have been engaged especially when the LSHMs and FGDs were held. Considering the previous experiences of the public projects, their engagement to the Project is essential



for the appropriate communication with the local people.

**Table 6.3.9 Structure of Local Council in the Vicinity of the Project Area**

Item	Kiryandongo District		Oyam District
	Karuma TC	Diima SC	Kamdini SC
Population	43,576	34,403	68,211
Number of Ward/ Parish (LC-2 Level)	3 wards	2 parishes	2 parishes
Number of Cell/ Village (LC-1 Level)	Central Ward: 4 cells Northern Ward: 4 cells Southern Ward: 4 cells <b>Total: 12 cells</b>	Diima Parish: 7 Villages Okwece Parish: 2 Villages <b>Total: 10 Villages</b>	Juma Parish: 14 villages Ocini Parish: 17 villages Pukica Parish: 11 villages Zambia Parish: 12 villages <b>Total: 54 villages</b>
Number of council members	15 (Male: 7, Female: 8)	13 (Male: 6, Female: 7)	15 (Male: 7, Female: 8)
Membership of council members*	Male- Chairperson: 1 person Female Central Ward (Secretary for Education): 1 person Male Central Ward (Deputy Speaker): 1 person Female Central Ward: 1 person Female Northern Ward (Secretary for Finance): 1 person Male Northern Ward (Speaker): 1 person Male Southern Ward (Chairperson Multipurpose): 1 person Female Southern Ward (Vice-chairperson): 1 person Female Northern Ward: 1 person Male Youth (Secretary for Production): 1 person Female Youth: 1 person Male Yelder (Chairperson Finance): 1 person Female Elder: 1 person Male PWD: 1 person Female PWD: 1 person	Male Chairperson: 1 Person Female-Deputy Speaker 1 Person Male- Speaker of Diima Sub County 1 Person Male-PWD 1 Person Male- Youth Council 1 Person Female- PWD 1: Person Female- Youth Councillor -1 Person Female-Council Okwece 1 Person Female – Secretary Finance; 1 Person Male- Okwece Councillor: 1- Person Female- Diima Councillor -1- Person Male – Diima councillor: 1 Person Female- Elderly 1 Person	Male- Chairperson: 1 person Female- Juma Councillor: 1 person Male- Zambia Councillor: 1 person Female- Ocini Councillor: 1 person Male-Pukica Councillor Pukica: 1 person Male- Ocini Councillor: 1 person Female- Juma Councillor Person With Disability: 1 person Female- Pukica Councillor Pukica: 1 person Male- Elder Councillor: 1 person Female-Youth: 1 person Male- Youth Councillor: 1 person Female- Zambia Councillor Zambia: 1 person Female- Ocini Councillor: 1 person Female- PDW Councillor: 1 person Female- Elder Councillor Elderly: 1 person
Means of selection of council members	Election by the residents	Election by the residents	Election by the residents

Note: PWD means persons with disability.

Source: JICA Survey Team

## (2) Potential Impacts

### 1) During Construction

The influx of construction workers from other cities can affect the existing institutions for making-decision.

### 2) After Construction

No impact is expected because no activities which may give adverse impacts on this item is planned.

## (3) Impact Forecast

### 1) During Construction

For the Project, most of the construction workers will be hired from the local communities

as much as possible, and the population influx will not be significant. In addition, the local council members are elected by the residents in accordance with the national law. Therefore, the impact on the existing social institution such as decision-making institution is negligible.

2) After Construction

No impact is expected because no activities which may give adverse impacts on this item is planned.

(4) Mitigation Measures

No mitigation measures are necessary.

(5) Evaluation

During and after construction, no impacts are expected.

### 6.3.8. Unequal distribution of positive and negative impacts of the Project

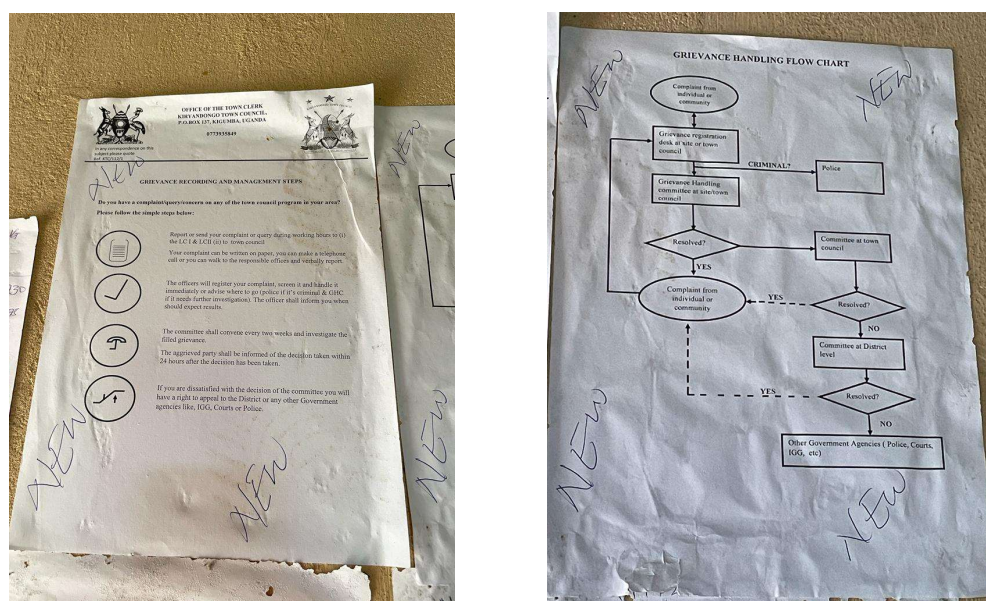
(1) Result of Baseline Survey

1) Previous experience

As the Project does not require land acquisition and resettlement, there will not be the local people who are significantly damaged by the Project. On the other hand, the local communities have experienced the conflicts with the previous project in their community, since local people were not initially hired as construction workers and could not get benefit from the project.

2) Existing conflict management system

As shown in Figure 6.3.8 as examples, the local communities have its own system for handling complaints from residents. It is considered that the system might have been established through previous projects and updated.



Source: JICA Survey Team

**Figure 6.3.8 Existing Grievance Handling Procedure in the Local Community**

(2) Potential Impacts

1) During Construction

Local conflicts may be caused if job opportunities are not provided fairly among local people. In addition, influx of construction workers may give impacts on security situation and relationship with current residents.

2) After Construction

No impact is expected because no activities which may give adverse impacts on this item is planned.

(3) Impact Forecast

1) During Construction

Given the demands on local people's job opportunities, the potential risk of conflict among local people would be high if the opportunities were misallocated. In addition, construction workers hired from other areas may give impacts on security situation and relationship with current residents.

2) After Construction

No impact is expected because no activities which may give adverse impacts on this item is planned.

(4) Mitigation Measures

1) During Construction

Mitigation measures are as follows:

- ✓ Establish a GRM for the Project by harmonizing the existing similar system.
- ✓ Explain the GRM for the Project to the local people in continuous public consultations.
- ✓ Provide the equal job opportunities to the local people as construction workers.
- ✓ Priority will be given to employ the local people whenever possible and minimize the influx of construction workers from other areas.
- ✓ Provide guidance to construction workers hired from other areas to avoid conflict with the local people.

2) After Construction

No mitigation measures are necessary.

(5) Evaluation

During construction, conflicts between the Project side and local communities, and/or among local people can be caused by the Project. However, the implementation of mitigation measures will help to minimize such impacts. Thus, it is not likely to give serious impacts on this item.

### 6.3.9. Cultural Heritage

#### (1) Result of Baseline Survey

##### 1) Cultural sites (including spiritual places and objects)

In the vicinity of the Project area, there is no world cultural heritage nor national heritage site that are designated. On the other hand, the ESIA Report for the KHPP indicated three spiritual sites, i.e., *Pajira*, *Pataka*, and *Manana*, which are used for the ritual activities of tribes. All of them are located along the Victoria Nile and the section between the said dam to Karuma Falls. They are also located at least 2 km away in the upstream side of the existing Karuma Bridge and will not be affected by the Project.

In order to collect more information related to the Project, community interviews were conducted. As a result, one more cultural site named “*Wangcol*” for the Chope tribe<sup>6</sup> was reported by local people. However, the site is also located at 2 km away in the downstream of the Project affected area and will not be directly affected by the Project.

In addition to the above, during the Focus Group Discussions (FGDs) with the local cultural leaders<sup>7</sup> in both side of Karuma TC and Kamdini SC, it was confirmed on whether there are other spiritual objects or sites in/around the Project area. According to the leaders, the Karuma Falls called “*Adag Lango*” and “*Gor Gang*” upstream of the existing Karuma Bridge and “*Akwagi*” downstream are their spiritual and ritual sites. After the discussions, the exact locations were confirmed on site with leaders. Then, it was also confirmed that they are located outside of the Project affected area.

Figure 6.3.9 shows the identified cultural sites, but all the sites shown have no visible special resources. All the sites are located along the Victoria Nile and are considered sacred spaces for rituals by the local people who believe in the spirits of water bodies such as rivers and waterfalls. Out of 7 cultural sites, “*Gor Gang*” is confirmed to be used by the Bukica clan under the Langi tribe, and others by the Chope tribe. The Chope tribe includes the Babiito, Kenon, and Manana clans, each of which uses a different site.

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<sup>6</sup> The Chope tribe is also sometimes referred to as the Paluo tribe because they use Paluo language.

<sup>7</sup> They are responsible for leading the people of the same tribe based on the culture and teachings of each tribe. In addition, they are chosen based on the customs.

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Location	Name of Cultural Site	Feature	Remark
Upstream side of the existing Karuma Bridge (outside of protected area)	<i>Adag Lango</i> (Karuma Falls)	Karuma Falls, located about 1.4 km upstream from the existing Karuma Bridge, is called “Adag Lango” by the Kenon clan of the Chohe tribe and is an object of worship.	
	<i>Manana</i>	It is located about 2 km upstream the existing Karuma Bridge, and is covered with trees and ricks along the river. The Manana clan of the Chohe tribe offer sacrifices such as goats, sheep, white peas, millet flour, new pots, etc. and perform rituals for rainmaking, spiritual healing, etc. there.	See, ESIA for the KHPP.
	<i>Pataka</i>	It is located about 2.3 km upstream from the existing Karuma Bridge. The Babiito clan of the Chohe tribe offer sacrifices such as goats, sheep, white peas, millet flour, new pots, etc. and perform rituals there.	See, ESIA for the KHPP.
	<i>Pajir</i>	It is located about 2.5 km upstream from the existing Karuma Bridge. The Baiito clan of the Chohe tribe offer sacrifices such as goats, sheep, white peas, millet flour, new pots, etc. and have rituals there.	See, ESIA for the KHPP.
	<i>Gor Gang</i>	It is located about 2.8 km upstream from the existing Karuma Bridge. The Bukica clan of the Langi tribe offer sacrifices such as goats, sheep, white peas, millet flour, new pots, etc. and have rituals there.	
Downstream side of the existing Karuma Bridge (inside of protected area)	<i>Akwigi</i>	It is located about 1 km downstream from the existing Karuma Bridge. The Keno of the Chohe tribe offer sacrifices such as goats, sheep, white peas, millet flour, new pots, etc. and have rituals there.	
	<i>Wangcol</i>	It is located about 2 km downstream from the existing Karuma Bridge. The Keno clan of the Chohe tribe offer sacrifices such as goats, sheep, white peas, millet flour, new pots, etc. and have rituals there.	

Source: JICA Survey Team (based on the information of Google Earth satellite map and interviews)

**Figure 6.3.9 Location of Cultural Sites identified in the Vicinity of the Project Area**

In conclusion, no cultural sites including spiritual objects and spaces were observed in the Project affected area. During the FGDs, cultural leaders expressed their gratitude to the Project for including them in the discussion, whereas they were easily ignored in the public projects. Respecting the local cultural aspects, the continued involvement of cultural leaders could contribute to a healthy relationship as “a good neighbour,” even if the Project does not directly impact to their culture.

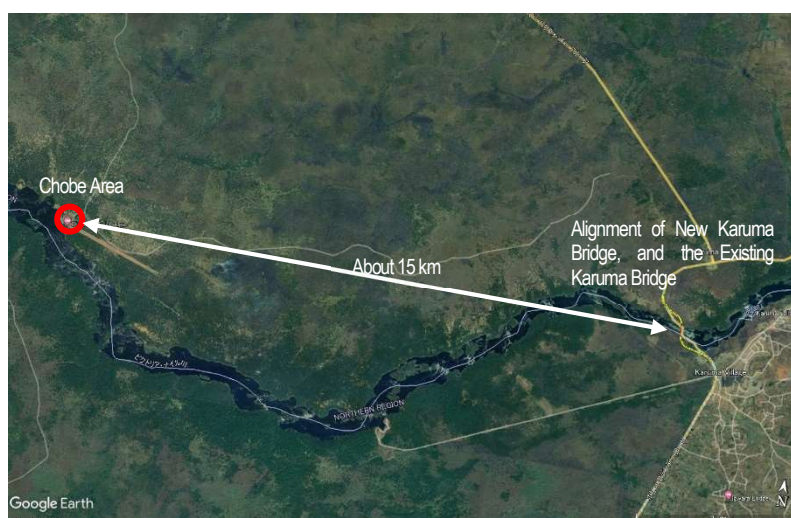


## 2) Historical and archaeological resources

In Uganda, the Department of Museum and Monuments (DMM) under the Ministry of Tourism, Wildlife, and Antiques is responsible for the cultural heritage. The Uganda Museum located in Kampala belongs to the above department, and the local experts from the museum conducted the following surveys.

### 2.1) Desktop survey

Previous archaeological studies in the vicinity of the Project area, for example, the one in 1971<sup>8</sup>, covered a larger area including the Chobe (also known as “Chobi Sector”) in Muchison Falls National Park, located approximately 15 km west of the Project area, where the test excavation were conducted (Figure 6.3.11).



Source: JICA Survey Team (based on Google Earth satellite map)

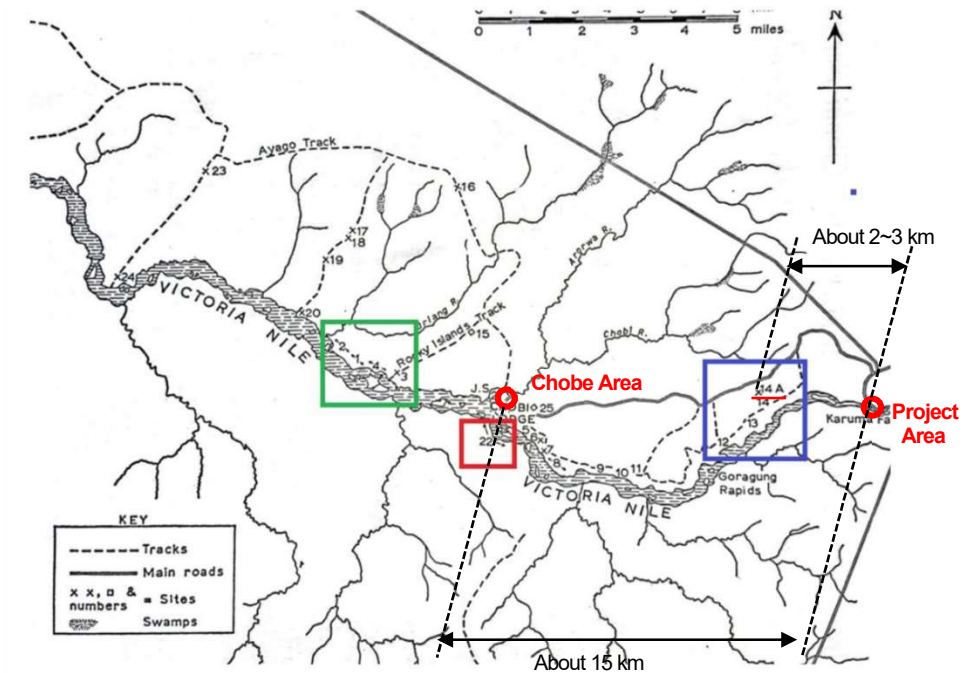
**Figure 6.3.10 Location of Chobe Area and the Project Area**

The closest point of the survey in 1971 to the

Project area was 14 A, which is indicated by the blue square in Figure 6.3.11 and is estimated to be approximately 2 to 3 km away. From the Point 14 A, 14 iron slag objects and a number of Stone Age materials of Quartz raw materials were recorded. In addition, Late Stone Age lithic material and three pottery traditions of Urewe, Chobi/ Bourdine and Roulette were also recorded. On the other hand, the report says that the number of finds at this point were not much compared to other survey points.

<sup>8</sup> Soper, R. (1971). 'Iron Age Archaeological sites in the Chobi Sector of Murchison Falls National Park, Uganda', Azania: Archaeological Research in Africa, 6:1, 53-87, DOI: 10.1080/00672707109511547





Source: JICA Survey Team pointed the location of the Project area and Chobe Area on the map provided in the report of Soper (1971).

**Figure 6.3.11 Survey Points of Archaeological Study about Chobi Sector (1971)**

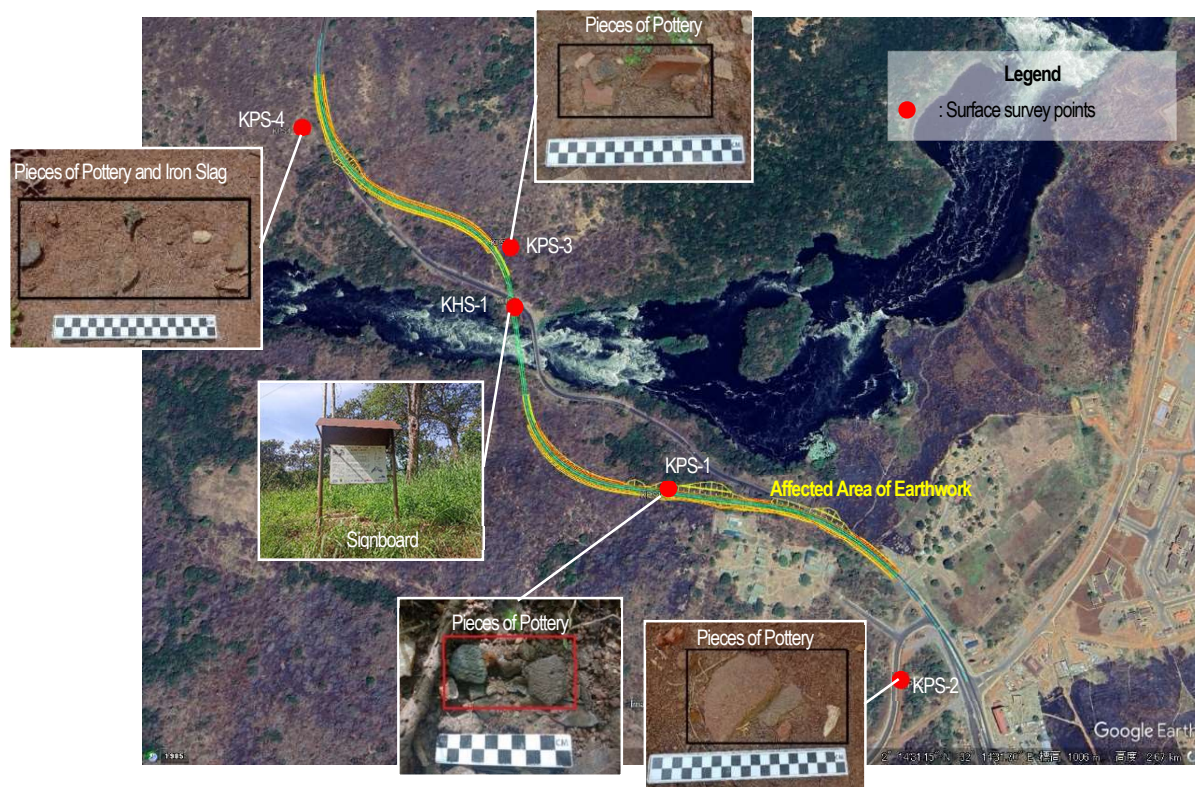
**Table 6.3.10 Results of Archaeological Study in 1971**

Iron Objects	Urewe
Roulette	Chobi Ware/ Bourdine

Source: Soper (1971).

## 2.2) Surface survey

According to the ESIA Reports for Karuma Bridge (2015 and 2018), it is mentioned that there are no physical cultural resources that were found or reported within the Project area of influence for the new Karuma Bridge and its approach road. However, as a result of the surface survey conducted by the local experts in early 2024 during this preparatory survey, the signboard depicting the history of Karuma Falls, and pieces of pottery and iron slag were found in the vicinity of the Project affected area. Figure 6.3.12 shows the affected area of the earthwork and the locations where the historical and archaeological resources were found. It should be noted that KPS-2, KPS-3, and KPS-4 are located outside of the affected area.



Id.	Record Name	Location (District)	Coordinates
KHS 1	Sir Samuel and Lady Florence Baker Historical Trail	Nwoya District	N: 0415422, E: 0248022
KPS 1	Karuma cell pottery site 1	Kiryandongo District	N: 0247633, E: 0415710
KPS 2	Karuma cell pottery site 2	Kiryandongo District	N: 0247292, E: 0416078
KPS 3	Karuma cell pottery site 3	Oyam District	N: 0248138, E: 0248138
KPS 4	Karuma cell pottery site 4	Nwoya District	N: 0248433, E: 0414983

Source: JICA Survey Team

**Figure 6.3.12 Location of Recorded Historical and Archaeological Resources**

### [KHS-1: Signboard]

The signboard tells the history of Sir Samuel White Baker (June 8, 1821 - December 30, 1893), a British explorer, officer, engineer, and author who is also remembered for his efforts to abolish the slave trade, and his wife, Lady Florence Baker, who crossed the Nile River after observing the Karuma Falls during their journeys to find the source of the river. While the signboard is not necessarily related to the existing Karuma Bridge, it helps the people to understand the history of the area.

The recorded signboard is located along the current access road to the existing Karuma Bridge, which is 60m away. Since KHS-1 is in the bridge section, direct damage such as destruction or loss of the signboard itself is not expected, but it is a point where care must be taken to prevent accidental



damage due to the construction works in the vicinity.



Source: JICA Survey Team

**Figure 6.3.13 Signboard about the Sir Samuel and Lady Florence Historical Trail**

#### **[KPS-1-4: Pieces of Pottery and Iron Slag]**

According to the local experts, the recorded potsherds (broken pieces of pot) and iron slag during the surface survey were produced in the Late Iron Age (1200 - 1800 A.D.). Although the Project area is a part of the protected area and no people are currently living there, this find tells us that there was human settlement in the said period. On the other hand, the field survey conducted by the experts in early 2024, did not report any resources proving the iron production in the Project area were found.

The similar potsherds were also found in the project area of the Karuma Hydro Power Project. In addition, the local experts of this survey classified the findings as low significance materials, not substantial to suspend the Project. However, there is a possibility that the further subsurface finds may be made during earthworks of the Project implementation. Given this situation in the Project area, the following test excavations were conducted by the local experts in April to May 2024 along the final alignment of the approach road and bridge to obtain more detailed information on the subsurface conditions.

#### **2.3) Test excavation survey**

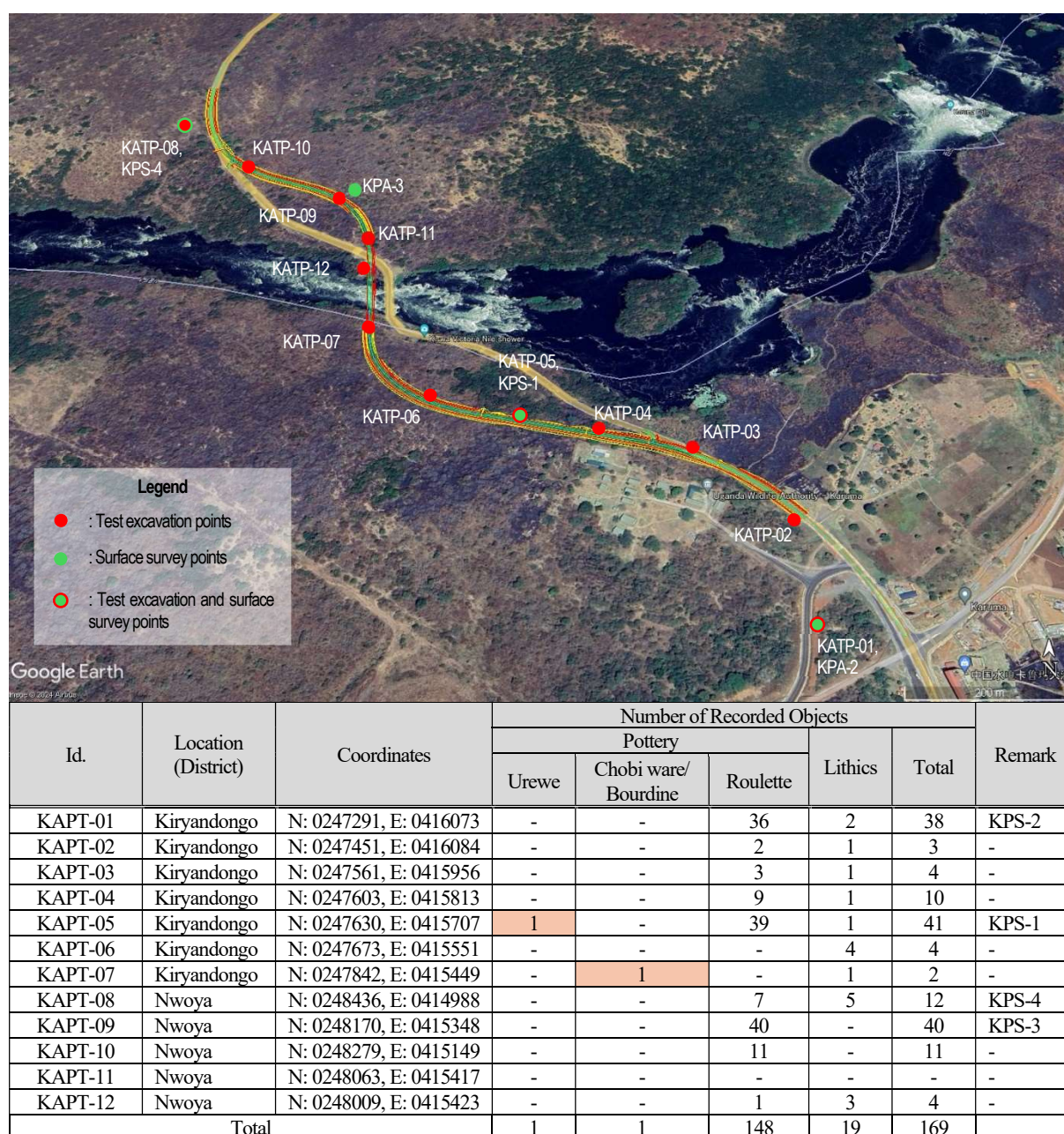
The size of a test pit was 1m<sup>2</sup> (1m long x 1m wide) and it was excavated at an interval of approximately 160m between points. The total number of test pits was 12. The work was done carefully by hand using tools specially for excavation such as trowels, brushes, sieves, and dustpans.



Source: JICA Survey Team

**Photos. Test Excavation Survey by Hand**

A total number of 19 surface and subsurface archaeological materials were recorded. Out of the 12 test pits, the most productive pits were KATP-01, KATP-05, and KATP-09, each yielding between 38 to 41 materials.



Note: Number of "Remark" is corresponding with the code numbers shown in Figure 6.3.12.



Source: JICA Survey Team

**Figure 6.3.14 Summarized Results of Test Excavation Survey**

As a result of the analysis, one piece found at 15 to 20 cm below the ground level in KATP-05 is categorized as Urewe (No. 3 in Table 6.3.13), and another piece excavated at 20 to 25 cm below the ground level in KATP-10 is categorized as Chobi ware/ Bourdine (No.7 in Table 6.3.13). These are similar objects that were reported about the Chobi sector by the previous study. Both were produced in Early Iron Age period, i.e., between 500 B.C. and 600 A.D. The former ware is characterized with comb stamp impressions while the latter is characterized by uneven fingerprints. According to the local experts, similar Early Iron Age potsherds were found during the KHPP, but the project was not stopped by the finds.





**Table 6.3.11 Findings at KATP-05 and KATP-10**

From KATP-05	From KATP-10
 <p>The red circled potsherd is categorized as Urewe produced in the Early Iron Age. The others are categorized as Roulette produced in the Late Iron Age.</p>	 <p>The blue circled potsherd is categorized as Chobi ware/ Bourdine produced in the Early Iron Age. Another is categorized as Roulette produced in the Late Iron Age.</p>

Source: JICA Survey Team

The remaining 148 potsherds were categorized as Roulette, produced in the Late Iron Age. In addition, the 19 lithic materials found were also categorized as having been produced in the same period. As described in the results of the surface survey above, these materials may be of comparatively low significance, because they are related to the present-day population.

**Table 6.3.12 Findings at KATP-02 and KATP-04**

From KATP-02	From KATP-04
 <p>All potsherds are categorized as Roulette produced in the Late Iron Age.</p>	 <p>All potsherds are categorized as Roulette produced in the Late Iron Age.</p>

Source: JICA Survey Team

Although previous studies have reported on the richness of the Chobi sector where many archaeological materials including Urewe, Chobi ware/ Bourdine and Roulette potsherds as well as Late Stone Age lithics materials were found, this may not be the case for the Project area. In fact, the local experts have concluded from the results of this test excavation that findings recorded are not substantive to suspend the Project not only because they were limited in terms of the cultural characteristics, but also limited in number. However, they also pointed out that the chance finds of the same or even more finds will be made during the earthworks. In addition, they also mentioned the necessity of assigning the archaeological experts available to provide appropriate guidance in a timely manner. Based on the above, these items recommended by the experts are to be included as mitigation measures for the Project, as detailed in below (4).

## (2) Potential Impacts

### 1) During Construction

Surface resources may be re-deposited, damaged, or destroyed because of ground works. Construction of the bridge and access road, and earthworks may result in the destruction of surface and/or subsurface archaeological materials.

2) After Construction

Due to the construction of the new bridge, the traffic will be rerouted and will not pass in front of the existing historical signboard, resulting in a lack of attention from anyone in the vicinity of the signboard.

(3) Impact Forecast

1) During Construction

As the Project does not plan the construction of any piers in the water or blasting, there will be no direct impact on water bodies (river or Karuma Falls) considered as worship by the local people. However, the construction may cause confusion and/or nourish concern to the local community, and the consideration is required. Regarding the historical and archaeological resources, the signboard about the historical trail (KHS-1) may be damaged if construction was implemented without paying attention. In addition, other archaeological objects will be found on the surface and/or subsurface due to the earthwork related to the Project.

2) After Construction

Due to the construction of the new bridge, the traffic will be rerouted and will not pass in front of the existing historical signboard, resulting in a lack of attention from anyone in the vicinity of the signboard. Then, the historical value of the local community may be disrupted.

(4) Mitigation Measures

1) During Construction

Mitigation measures are as follows:

- ✓ Consult with cultural leaders in advance to minimize disruption and concern to the local people, and to avoid unanticipated damage to symbolic trees, rocks, and other important resources that are objects of worship or those used in rituals.
- ✓ Develop and follow a “*Chance Finds Procedure*” to prevent damage to archaeological and historical resources. The procedure should include the content outlined in Table 6.3.13<sup>9</sup>.
- ✓ Conduct continuous monitoring by the Contractor during earthworks.
- ✓ Provide training on cultural site and archaeological and historical resources to the construction workers.

**Table 6.3.13 Draft Content of Chance Find Procedure**

STEP	Procedure
1	Construction workers should be provided the awareness training about the historical/ archaeological matter.
2	Construction workers must be careful with any relics found during the excavation.
3	If any relics are found, construction workers must immediately stop all the work in the vicinity of the field and report the case to their supervisor.
4	The notified supervisor shall then report to the construction manager or the resident engineer, and UNRA.
5	The supervisor should record the details of the find including its location (GPS coordinates), photos, brief description, and the estimated coverage.
6	The supervisor, construction manager, or the resident engineer shall secure or demarcate the site to prevent further damage of the removable objects. Note: This might include condoning or fencing off the find vicinity and where needs be a night guard employed to safeguard the find.
7	Through UNRA, the Department of Museums and Monuments (DMM) will be notified either via email or

<sup>9</sup> This procedure is conformity with the guidance of experts from the Uganda Museum who participated in the field survey.



STEP	Procedure
	a letter to the department head.
8	DMM will have to send qualified staff to access the material for further steps between 7 and 14 days.
9	The site visit by the DMM staff will also determine whether or not the construction work can continue.
10	If the DMM confirms that the objects found are of archaeological, paleontological, historical or any cultural value or importance, their conservation and safety shall be taken over by the government through the Ministry of Tourism, Wildlife, and Antiques.
11	Depending on disturbance already or likely to be caused, DMM will suggest feasible next steps, i.e., salvage archaeology or in-situ conservation.
12	<b><u>In the case of salvage archaeology</u></b> , the contractor and UNRA will ensure a period for archaeologists to conduct the archaeological excavations to recover the objects and store them in the National Museum.
13	<b><u>In the case of in-situ conservation</u></b> , the site can be gazetted, managed, and made accessible to local communities and tourists entering Project area in accordance with the law.
14	Local Council and police must be notified to determine if the remains were accidentally exhumed to be reburied in another location or if the remains are to be reinterred. In the case of reburial, the contractor and UNRA shall be responsible for the costs of the relocation and reburial expenses including the observing any associated rituals with the practice.
15	In any case an unknown sacred site nature or artificial feature (rock, tree, shrub, hill, mountain) is encountered, relocation ceremonies or ritual decision shall be determining or undertaken by custodians of the site and the contractor and UNRA will meet the expenses involved.
16	All chance finds must be recorded in the form and inventoried, and copies are made available to the relevant parties.
17	Upon ensuring those above, the Project activities will continue as before.

Note: The procedure was drafted based on the guidance of experts from Uganda Museum who participated in the field survey.

Source: JICA Survey Team

## 2) After Construction

Mitigation measures are as follows:

- ✓ Install signage to the signboard of the Sir Samuel and Lady Florence Historical Trail.

## (5) Evaluation

Although no direct impact to the cultural aspects of the local community is expected, further consultation with the cultural leaders is necessary to avoid the confusion and/or concern to the local community. The signboard about the historical trail (KHS-1) may be damaged if the construction is done without paying attention. In addition, other archaeological objects will be found on the surface and/or subsurface due to the earthwork related to the Project. Due to the implementation of mitigation measures, however, it is not likely to give significant impact on this item.

## 6.3.10. Landscape

### (1) Result of Baseline Survey

There are no law-based designated landscape in the project area and its surrounding area. However, the project area is passing through MFNP and KWR where the tourists enjoy natural landscape, but this area is not the main tourism area of MFNP and KWR and tourist are not observed in this area as shown in Figure 6.3.15 and Figure 6.3.16.

The landscape elements from the bridge crossing point are the river, existing bridge, approach road, the bank of the river and woodland and bushed grassland.



Source: JICA Survey Team

**Figure 6.3.15 Landscape at Existing Bridge**



Source: JICA Survey Team

**Figure 6.3.16 Landscape for Bridge Crossing Point**

(2) Potential Impacts

1) During and After Construction

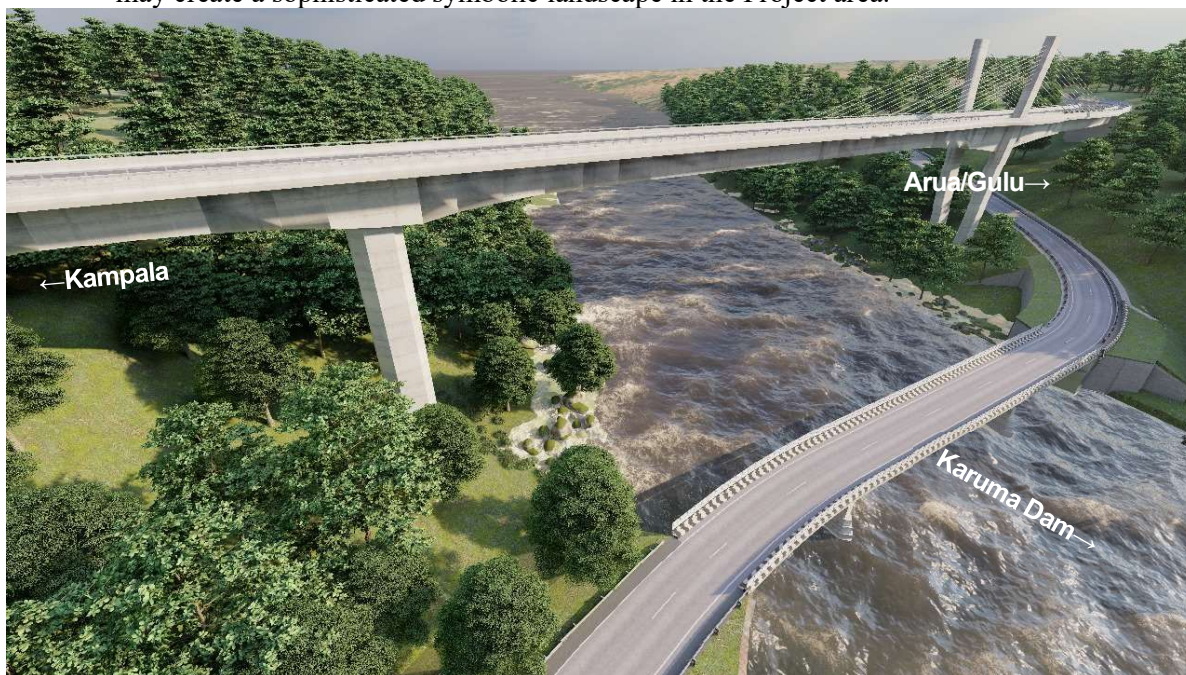
There are no law-based designated landscape in the project area and its surrounding area. There are not any law-based protected areas regarding landscape nearby project area, however the alignment is passing through MFNP and KWR where the tourists enjoy natural landscape, and some adverse impacts are expected during and after construction of bridge and approach road due to tree cutting, alternation of land and appearance of structures.

(3) Impact Forecast

Simulated computer graphic (CG) images are shown in Figure 6.3.17 - Figure 6.3.18. The landscape elements are structure of the bridge and carriageway for both existing and new



bridges and the bank of the river and woodland and bushed grassland. According to the CGs, the sky landscape and woodland is reduced by the construction of the new bridge. However, the changed elements are limited thus the impacts is negligible on this photomontage. Although the alignment is passing through Tourism Zones of MFNP and KWR, this area is not the main tourism area of MFNP and KWR and tourist are not observed in this area, thus adverse impact is not expected. The installation of a modern design structure of the bridge may create a sophisticated symbolic landscape in the Project area.



Source: JICA Survey Team

**Figure 6.3.17 CG Landscape for the New Karuma Bridge**



Source: JICA Survey Team

**Figure 6.3.18 CG Landscape from Other Angles**

#### (4) Mitigation Measures

To mitigate the adverse impacts, a monotone colour harmonized with the surrounding current landscape has been adopted as shown in Figure 6.3.17 and Figure 6.3.18.

#### (5) Evaluation

The changes before and after the construction of bridge and related structures are unavoidable. Although the sky factor and woodland has decreased due to the existence of bridge, a sophisticated and symbolic landscape is created. Furthermore, the colour of the structure harmonizes with the sky and woodland landscape. Thus, it is evaluated that the project does not give serious impacts on this item.

### 6.3.11. Gender

#### (1) Result of Baseline Survey

During the first series of the local stakeholder meetings in November 2023, FGDs were held with women in Karuma TC and Kamdini SC. In addition, consultations were held with two Community Based Organizations (CBOs), such as KHALCO and Ignite Chance which operate in the vicinity of the Project area and conduct activities for women. The latter organization in particular focuses on women's empowerment.

Comments on gender issues in the Project area are summarized in Table 6.3.14. The local people are concerned about gender issues as they have faced issues problems with sexual workers, teenage pregnancies, school dropouts, extramarital child, and Gender Based Violence (GBV), which they consider the reason is the influx of the population by the previous public project. Therefore, it is strongly demanded that the Project does not create similar problems for the local people.

Fortunately, however, the local community has not faced to the gender wage gap when men and women do the same work. It should be followed by the Project.

**Table 6.3.14 Summary of Observed Gender Issues in the Vicinity of the Project Area**

Discussion Point	Comment
Work experiences of women related to the construction works in previous projects	Women in the vicinity of the Project site have been hired as unskilled labor such as flagman, office cleaner, preparing meals for construction workers, etc.
Wage gap between men and women	There is no wage gap if men and women do the same work. However, only men are allowed to work at night, and in this case, the wage gaps are caused because wages at night are higher than during the daytime.
Undesirable relationship between construction workers hired from other areas and local people	During the KHPP, many construction workers were hired from other areas. The local women had sexual relationship with such workers. As a result, the increase of sexual workers from local community, teenage pregnancy, school dropout, born of extramarital child, etc. were increased.
Family strife after earning income as construction workers	Some of the local people who were hired as construction workers for KHPP caused Gender Based Violence (GBV) in their family. For example, the overconcentration of his/ her power within his/ her family by earned money, then they lost their control and violated to other family members. It was caused that they did not know how to manage and use the money with his/ her family properly. In addition, others have left their families with money, resulting in the family separation.

Source: FGDs and Interviews from CBOs

#### (2) Potential Impacts

##### 1) During Construction

Potential risk of sexual crimes will be increased if the population influx of construction workers from outside of the local community is cause. In addition, the increase of sexual workers, teenage pregnancies, school dropouts, extramarital child, and GBV can be caused.

2) After Construction

No impact is expected because no activities which may give adverse impacts on this item is planned.

(3) Impact Forecast

1) During Construction

As described above, the population influx of construction workers will not be significant. However, based on the experience and concerns of the local community, gender issues should be carefully taken into considered and avoided.

2) After Construction

No impact is expected because no activities which may give adverse impacts on this item is planned.

(4) Mitigation Measures

1) During Construction

Mitigation measures are as follows:

- ✓ Development of the Code of Conduct for Contractors in conformity with gender policy and Employment Act, Cap 219.
- ✓ Provide equal job opportunities and fair salary regardless of gender (including positive segregation mechanism to ring fence some jobs for women)
- ✓ Install the sanitary facilities in considering gender at construction area and related facilities (including basecamp).
- ✓ Provide the education training on gender issues to the construction workers.
- ✓ Sensitize the local people on gender issues.
- ✓ Ensure a certain distance between the local community and the basecamp.
- ✓ Establish a GRM to resolve complaints received from the local people with several options for submitting complaints (including the option that the local people can access to the local NGOs).
- ✓ Ensure anonymity to protect privacy when submitting complaints, if requested by the complainant.

2) After Construction

No mitigation measures are necessary.

(5) Evaluation

It is observed that local people are concerned about gender issues based on previous project experiences. As the Project will not need to hire the large number of construction workers from other areas during construction, the population influx at the significant level and the remarkable increase of gender issues are not expected. However, the implementation of mitigation measures helps to minimize potential risks, and it is assessed that the Project does not give a serious impact on this item.



### 6.3.12. Rights of Children

#### (1) Result of Baseline Survey

According to the National Household Survey 2019/2020, 17.5% of children between the ages of 5 and 17 are involved in child labour in Uganda. In the case of Bunyoro Sub-region (including Kiryandongo District), the percentage is 13.2%, which is lower than the national level. However, the Lango Sub-region (including Oyam District) has 18.2% which is slightly higher than the national level.

In fact, child labour problems were observed in the vicinity of the Project area during the social condition survey (2023) (see Figure 6.3.19). Children are used to do simple work in quarries, etc. During FGDs with CBOs and schoolteachers, participants pointed out that children had been involved in previous projects, although local people clearly understand that child labour is prohibited by laws. According to the information of CBOs, children were able to get the jobs as construction workers in the previous projects because the conditions of employment unfortunately did not include the concrete countermeasures to avoid hiring children.



Source: JICA Survey Team

**Figure 6.3.19 Child Labors observed in the Vicinity of the Project Area**

In April 2023, FGDs were organized with teachers from Karuma Primary School, Karuma Secondary School, Nora Primary School, and Marriolate Secondary School were organized. In addition to child labour issues, the teachers expressed their concerns related to children as shown in Table 6.3.15.

**Table 6.3.15 Main Concerns about Rights of Children**

Discussion Point	Comment
School dropout	<ul style="list-style-type: none"> <li>- Since children are involved in works such as working as construction workers, selling items to construction workers, babysitting for construction workers at the workers' camp, etc., the increase in school dropouts would be increased.</li> <li>- Early pregnancies among girls and construction workers, resulting in school dropouts, may increase.</li> </ul>
Attract and/or fear by construction work	<ul style="list-style-type: none"> <li>- Children can be interested in construction works and machinery and will not come to school.</li> <li>- Due to the operation of construction machinery around school-commuting roads, children may be afraid to come to school.</li> </ul>
Others	<ul style="list-style-type: none"> <li>- When the parents are involved in construction works, GBV issues may arise, leading to family disputes, family separation, and child neglect can be caused.</li> <li>- Some workers may use school facilities such as toilets and water system.</li> <li>- Increase in number of school children can be caused if construction workers will come with their children.</li> <li>- Teachers may choose to work in the construction site because they expect higher wages from the Project.</li> </ul>

Source: FGDs and Interviews from CBOs



(2) Potential Impacts

1) During Construction

Child labour may be involved in the work in/around the construction site. In addition, the other issues related to children's rights such as school dropout, early pregnancy, family problems, etc. may be caused.

2) After Construction

No impact is expected because no activities which may give adverse impacts on this item is planned.

(3) Impact forecast

1) During Construction

The local people have experienced the disturbance of children's rights in the past, through previous projects, etc. in the local community. For the Project, therefore, the mitigation measures should be taken during construction, including those that can help minimize the indirect impacts on children, in accordance with the comments from schoolteachers, etc.

2) After Construction

No impact is expected because no activities which may give adverse impacts on this item is planned.

(4) Mitigation Measures

1) During Construction

Mitigation measures are as follows:

- ✓ Follow relevant national legal frameworks on children's right such as the Children Act, Cap 59 and international standards such as the following IFC's Performance Standard 2 (Labor and Working Conditions)<sup>10</sup>.

**Child Labor**

21. The client will not employ children in any manner that is economically exploitative or is likely to be hazardous or to interfere with the child's education, or to be harmful to the child's health or physical, mental, spiritual, moral, or social development. The client will identify the presence of all persons under the age of 18. Where national laws have provisions for the employment of minors, the client will follow those laws applicable to the client. Children under the age of 18 will not be employed in hazardous work. All work of persons under the age of 18 will be subject to an appropriate risk assessment and regular monitoring of health, working conditions, and hours of work.

- ✓ Include a strict "no child labor" rule in the contractors' contract.
- ✓ When selecting construction workers, identification card, etc., will be checked to verify age.
- ✓ Provide educational training to construction workers not to buy goods from children, not to have inappropriate relationship with boys and girls, not to use school facilities such as toilets and water systems, and encourage children to go to school when children are gathered at the construction site to see the work, etc.

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<sup>10</sup> Performance Standard 2 (Labor and Working Conditions) (IFC, 2012): <https://www.ifc.org/en/insights-reports/2012/ifc-performance-standard-2>

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- ✓ Sensitization to the local people and schools.
- ✓ Install security facilities such as signboard in the vicinity of construction area and related facilities.

2) After Construction

No mitigation measures are necessary.

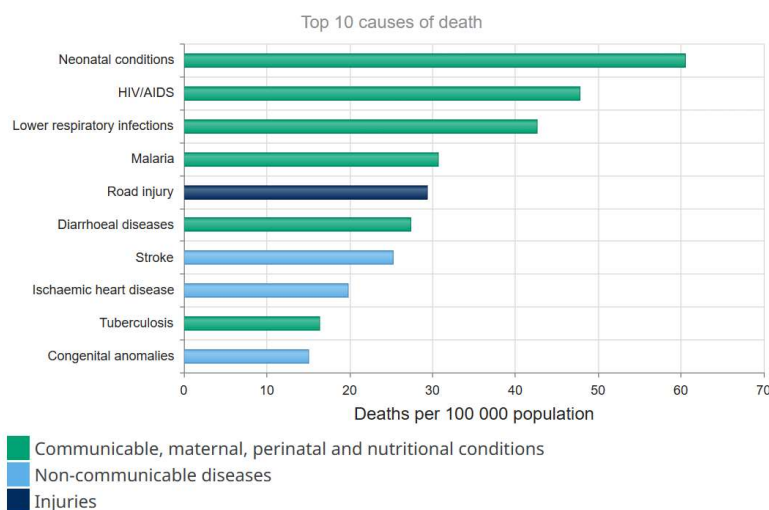
(5) Evaluation

Considering the current situation in the vicinity of the Project area and previous project experience, preventive measures should be taken to avoid the child labour during construction. In addition, in collaboration with schools and teachers, the Project will implement the other countermeasures against other issues on in children's rights. Due to this, it is assessed that the Project does not give a serious impact on this item.

### 6.3.13. Infectious Disease and Occupational Health

(1) Result of Baseline Survey

In Uganda, most of the death cases are caused by the neonatal conditions and it is followed by HIV/ AIDS which is one of the well-known infectious diseases.<sup>11</sup> While the infected numbers of HIV/ AIDS are decreasing year by year, 1.4 million people are estimated to be living with HIV.<sup>12</sup> In addition, Malaria remains a dominant communicable disease in Uganda, with an estimated 13 million cases and 19,663 deaths in 2021.<sup>13</sup>



Source: WHO

**Figure 6.3.20 Top 10 causes of Death in Uganda for both Sexes and for All Ages (2019)**

The situation of infectious diseases in Oyam District is as shown in Table 6.3.16. It can be observed that Malaria and HIV/ AIDS have a large number of infected persons as well as the national trends.

<sup>11</sup> Explore a world of health data (WHO, 2019): <https://www.who.int/data/gho/data/themes/mortality-and-global-health-estimates/gh-leading-causes-of-death>

<sup>12</sup> HIV Country Intelligence (WHO): <https://cfs.hivci.org/>

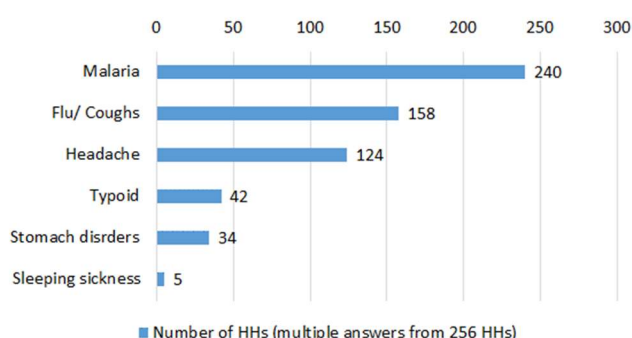
<sup>13</sup> Country Disease Outlook -Uganda (WHO, 2023): <https://www.afro.who.int/sites/default/files/2023-08/Uganda.pdf>

**Table 6.3.16 Number of Infected Persons in Oyam District**

Type of Disease	Total Number of Infected Persons in Oyam District (a)	Number of Infected Persons in Kamdini Sub-County (b)	Percentage (c) = (b) / (a) x 100
Malaria	170,783	7,677	4.5%
HIV/ AIDS	55,723	23,509	42.2%
Hepatitis B	325	170	52.3%
Tuberculosis (TB)	1,134	242	21.3%

Source: Interviews from District Officers

According to the Social Condition Survey (2023), most of sampled household replied that the common disease is Malaria, and it is followed by flu/ coughs, and headache, etc. in the vicinity of the Project area (both Kiryandongo and Oyam districts).



Source: JICA Survey Team

**Figure 6.3.21 Common Diseases in the Vicinity of the Project Area**

As a series of Stakeholder Meetings, the Uganda Aids Commission (UAC) were engaged. The experts from UAC pointed out the potential risk of discrimination against local people living with HIV/ AIDS in the employment as construction workers.

## (2) Potential Impacts

### 1) During Construction

Alternation to ground by cut land and filling may provide habitats for mosquitoes that could possibility transmit Malaria and dengue fever. In addition, the population influx of construction workers may cause the spread of infectious diseases such as Sexually Transmitted Diseases (STDs). Further, the people living with HIV/ AIDS can be discriminated.

### 2) After Construction

Insufficient drainage maintenance may provide a habitat of carrier mosquito.

## (3) Impact Forecast

### 1) During Construction

Puddles in the construction area and inefficient drainage will provide a habitat of mosquito for Malaria and dengue fever. In addition, hired construction workers from other areas may establish contact with inhabitants and spread infectious diseases such as STDs.

### 2) After Construction

Insufficient drainage maintenance along the access road may provide habitats for mosquito and cause infectious diseases such as Malaria and dengue fever.

#### (4) Mitigation Measures

##### 1) During Construction

Mitigation measures are as follows:

- ✓ Follow relevant national legal frameworks on infectious diseases such as the Occupational Safety and Health Act No.9 (2006) and international standards such as IFC's Performance Standard 2.
- ✓ Prevent the creation of vector mosquito habitats by installing appropriate drainage facilities in the construction area and relevant facilities (including basecamp).
- ✓ Take appropriate precautionary measures such as providing mosquito nets and purified water to construction workers.
- ✓ Provide adequate sanitation facilities, as well as trash boxes.
- ✓ Enforce medical screening and periodical medical check for construction workers.
- ✓ Not to discrimination against HIV/ AIDS infected persons in hiring construction workers.
- ✓ Provide the education training on prevention of infectious disease to construction workers.
- ✓ Sensitize the local people about infectious diseases.
- ✓ Provide condoms in sanitary facilities in the construction area and related facilities (including basecamp).

##### 2) After Construction

Mitigation measures are as follows:

- ✓ Provide adequate drainage facilities to avoid mosquito habitat.
- ✓ Implementation periodical maintenance of drainage facilities.

#### (5) Evaluation

While the number is not a large scale, the population inflow of workers during construction may provide opportunity for spreading infection disease. In addition, puddle in the construction area and insufficient drainage maintenance during and after construction may provide habitats of mosquito for Malaria and dengue fever. However, implementation of mitigation must prevent and minimize these adverse impacts. Thus, it is not likely to give serious impacts on them.

### 6.3.14. Labor Environment

#### (1) Result of Baseline Survey

In Uganda, there are national legal and institutional frameworks on labour environment. Out of them, Table 6.3.17 shows the key frameworks.

**Table 6.3.17 Key Legal and Institutional Frameworks on Labor Environment in Uganda**

Category	Name of Framework	Summary
National laws and regulations	The Occupational Safety Health Act No. 9 2006	The Act provides for the prevention and protection of persons at all workplaces from injuries, diseases, death, and damage to property. Employers must provide for the protection of workers from adverse weather, provision of a clean and healthy work environment, sanitary conveniences, washing facilities, first-aid

Category	Name of Framework	Summary
		and facilities for meals. In addition, the act provides for safe access to the workplaces and safe work practices.
	The Workers Compensation Act Cap 225 (Formerly known as The Workers Compensation Act No. 8 2000)	If personal injury by accident arises out of and in the course of a worker's employment, the injured worker's employer shall be liable to pay compensation in accordance with the Act.
	Employment Act, Cap 219	The Act provides for harmonization of relations between employees and employers of the contracted company in order to improve the proposed project, protect the interests and welfare of workers and ensure their occupational health and safety.
National Policies	National Occupational Health and Safety Policy (2005)	The policy seeks to provide and maintain a healthy working environment, etc.
	Environment Health Policy (2005)	The Policy concentrates on the importance of environmental sanitation which includes safe management of human waste and associated personal hygiene; the safe collection, storage, and use of drinking water; solid waste management; drainage; and protection against disease vectors.

Source: JICA Survey Team

## (2) Potential Impacts

### 1) During Construction

If the work environment is mismanaged, the potential risk of the accident will be increased.

### 2) After Construction

No impact is expected because no activities which may give adverse impacts on this item is planned.

## (3) Impact Forecast

### 1) During Construction

In appropriate labour environment and working without safety measures in accordance with legal and institutional frameworks may cause accidents. For instance, working without using helmets and working boots increase the risks of head and foot injuries.

### 2) After Construction

No impact is expected because no activities which may give adverse impacts on this item is planned.

## (4) Mitigation Measures

### 1) During Construction

Mitigation measures are as follows:

- ✓ Follow the relevant legal and institutional frameworks on work environment such as the Occupational Safety and Health Act No.9 (2006) and international standards such as the following IFC's Performance Standard 2 (Labor and Working Conditions)<sup>14</sup>.

#### **Occupational Health and Safety**

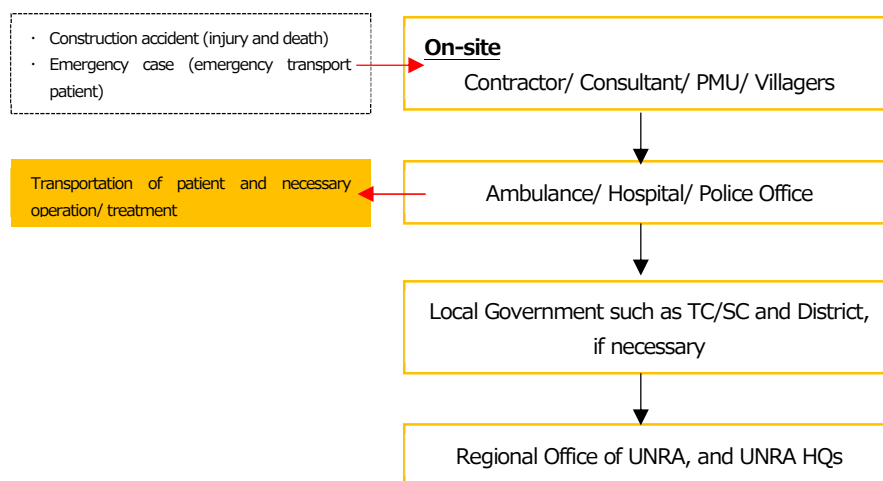
23. The client will provide a safe and healthy work environment, taking into account inherent risks in its particular sector and specific classes of hazards in the client's work areas, including physical, chemical, biological, and radiological hazards, and specific threats to women. The client will take steps to prevent accidents, injury, and disease arising from, associated with, or occurring in the course of work by minimizing, as far as reasonably practicable, the causes of hazards. In a manner consistent with good

<sup>14</sup> Performance Standard 2 (Labor and Working Conditions) (IFC, 2012): <https://www.ifc.org/en/insights-reports/2012/ifc-performance-standard-2>

international industry practice,\* as reflected in various internationally recognized sources including the World Bank Group Environmental, Health and Safety Guidelines, the client will address areas that include the (i) identification of potential hazards to workers, particularly those that may be life-threatening; (ii) provision of preventive and protective measures, including modification, substitution, or elimination of hazardous conditions or substances; (iii) training of workers; (iv) documentation and reporting of occupational accidents, diseases, and incidents; and (v) emergency prevention, preparedness, and response arrangements.

Note: \* Defined as the exercise of professional skill, diligence, prudence, and foresight that would reasonably be expected from skilled and experienced professionals engaged in the same type of undertaking under the same or similar circumstances, globally or regionally.

- ✓ Establish a response system in the event of an accident due to construction, patient transportation, or other emergencies. This system and procedure shall be proposed by the contractor during construction. Sample procedure is as shown in Figure 6.3.22.
- ✓ Implement countermeasures against “Tsetse fly”.



Source: JICA Survey Team

**Figure 6.3.22 Sample Response Process in Emergency Case (First-aid Plan/ Accident)**

## (5) Evaluation

Relevant legal and institutional frameworks in Uganda and IFC standards shall be applied for the employees during construction. The labour environment and safety will be secured in accordance with the above principles so that it is not likely to give a significant impact on this item.

### 6.3.15. Accident

#### (1) Result of Baseline Survey

According to the interview at the Karuma Police Office, most accidents that occur on the existing Karuma Bridge are single vehicle fatalities: any accident in which only one road vehicle is involved (including accidents where vehicles try to avoid a collision and veer off the road).

From the records between March to October 2023 in 8 months show a total of 8 accidents reported, averaging to at least one accident per month. In addition, there was one fatal accident recorded that involved plunging of a trailer truck into the Nile River.





Article: Police gives up search for bodies of Karuma Bridge Accidents (26<sup>th</sup> April 2021)\*1

Source: \*1 THE INDEPENDENT, and \*2 DAILY Express

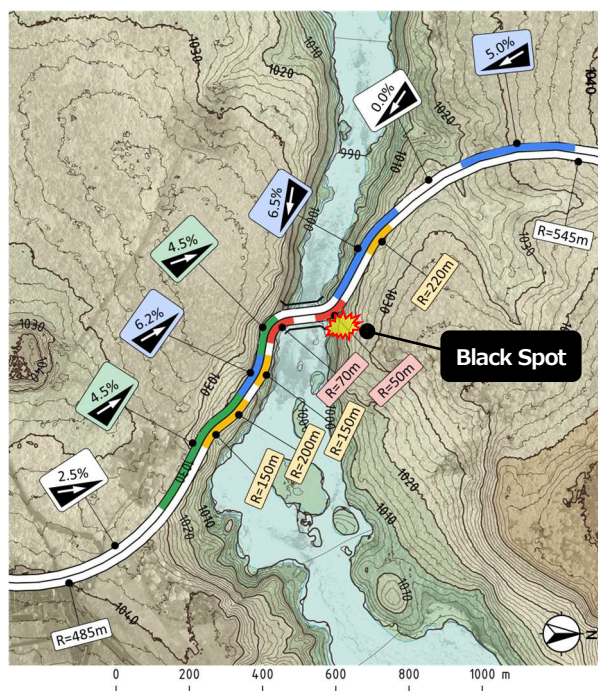


Karuma Accident: Truck body sighted, occupants still missing (22<sup>nd</sup> June 2023)\*2

### Figure 6.3.23 Current Accident Situation of the Existing Karuma Bridge

As the preparatory survey analysed, there is a black spot at Gulu side of the bridge (Figure 6.3.24). In addition, the officer in charge pointed out the main causes of accidents specific to the existing Karuma Bridge are summarized as below. Most of the accidents (if not all) happened to vehicles that are coming from Gulu side heading to Kampala.

- 1) Speeding and exceeding prescribed speed limits especially by boda-boda riders.
- 2) Narrow road/ bridge that two vehicles cannot pass at the same time.
- 3) Blind spots near the bridge, especially from the Gulu side.
- 4) Poor lighting at night.



Source: JICA Survey Team

Figure 6.3.24 Black Spot of the Existing Karuma Bridge

## (2) Potential Impacts

### 1) During Construction

Accidents related to the construction of access road and bridge, and the operation of quarry site and/or borrow pits, as well as traffic accidents related to the construction vehicles may increase. In traffic-controlled area, ordinary vehicles can cause traffic accidents.

2) After Construction

Risk of traffic accidents on the new access road and bridge will be reduced due to the improvement of the alignment. However, safety measure to prevent accidents can be helpful in further improving safety.

(3) Impact Forecast

1) During Construction

Accidents related to the construction of access road and bridge, and the operation of quarry site and/or borrow pits, as well as traffic accidents related to the construction vehicles may increase. In traffic-controlled area, ordinary vehicles can cause traffic accidents.

2) After Construction

Risk of traffic accidents on the new access road and bridge will be reduced due to the improvement of the alignment. However, safety measure to prevent accidents can be helpful in further improving safety.

(4) Mitigation Measures

1) During Construction

Mitigation measures are as follows:

- ✓ Traffic guides will be assigned to construction area, related facilities, and traffic control area.
- ✓ Install safety signs, including speed limits, in the construction area, related facilities, and traffic control area.
- ✓ Install nighttime lighting facilities in the vicinity of construction area, related facilities, and traffic control area.
- ✓ Limit traffic speed to less than 40km/h in the vicinity of construction area, related facilities, and traffic control area.
- ✓ Provide safety training to construction workers.
- ✓ Establish a response system in the event of an accident due to construction, patient transportation, or other emergencies.
- ✓ Sensitize the local people and schools.

2) After Construction

Mitigation measures are as follows:

- ✓ Install 40km/h speed limits signs and humps.
- ✓ Install LED lights along approach road and bridge.

(5) Evaluation

Operation of construction machines and vehicles may increase the number of accidents in/ around the construction site, and construction vehicles will be operated near residential and commercial areas. Thus, the number of traffic accidents may increase during construction. However, the implementation of mitigation measures must prevent and minimize these adverse impacts. Thus, it is not likely to give a serious impact on the item.

### 6.3.16. Cross Boundary Impacts and Climate Change

#### (1) Potential Impacts

##### 1) During Construction

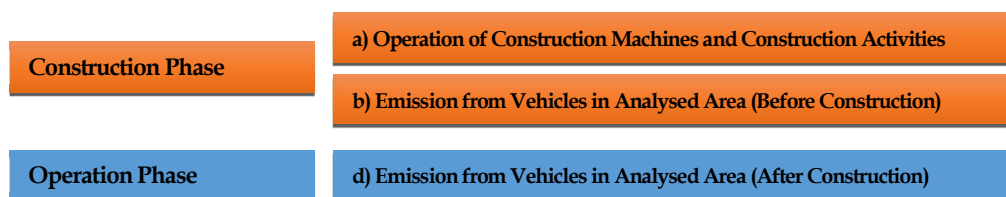
Operation of construction machines, construction activities generate CO<sub>2</sub> as shown in Figure 6.3.25.

##### 2) After Construction

##### a) GHGs Generation

In the project, the construction of the bridge and approach road does not generate additional traffic in the project area. Although the road length will be slightly extended as the proposed bridge location is 400m downstream of the existing bridge, the traveling speed will increase due to the improvement of the road alignment and gentle slope, therefore thus positive impacts are expected in the project area.

In addition, if this project is not implemented and the current Karuma Bridge becomes old, the Kampala - Gulu/Arua road needs to have traffic restriction and traffic from Kampala to northern Uganda will have to be largely diverted to the east side of Lake Choga which will result in the increase of travel distance of additionally 210 km. Thus, there will be change in the amount of GHGs generated during operation phase. The generated volume of CO<sub>2</sub> is forecasted quantitatively in “With” and “Without” project case.



Source: JICA Survey Team

**Figure 6.3.25 Analysed Item on CO<sub>2</sub> Generation**

#### (2) Impact Forecast

##### a) GHGs Generation

The generated CO<sub>2</sub> volume during construction and operation stage from September 2026 to August 2029 is shown in Table 6.3.18.

During construction, a total of approximately 1,762 tons of CO<sub>2</sub> is generated from construction activity for 3 years for with project case. In addition, 308,063 tons of CO<sub>2</sub> is generated from the traffic during construction period for both with/without project case.

After construction, large traffic needs to be diverted through the east side of Lake Choga from September 2029 to December 2032 and all the traffic are required to be diverted through the east side of Lake Choga after January 2033 in without project case. Therefore, generated CO<sub>2</sub> from traffic after construction of bridge for without project case will be larger for the longer travelling distance.

Quantitative forecast during and after construction (September 2026 - December 2050) is shown in Table 6.3.18.

Total accumulated CO<sub>2</sub> volume in the case of “Without Project” beyond “With Project” case from the operation year 2030. This means that the project gives positive impacts on CO<sub>2</sub> during the operation phase.

**Table 6.3.18 Estimated Generated CO2(t/year) During Construction Phase and Operation Phase**

Phase	Month/ Year	Without Project			With Project			Differences	Accumulation (WO)	Accumulation (W)	Differences
		Traffic	Construction	Total	Traffic	Construction	Total				
Construction	Sep-Dec 2026	31,068	0	31,068	31,068	196	31,264	-196	31,068	31,264	-196
	2027	98,617	0	98,617	98,617	587	99,205	-587	129,685	130,469	-783
	2028	104,504	0	104,504	104,504	587	105,092	-587	234,190	235,560	-1,370
	Jan-Aug 2029	73,873	0	73,873	73,873	392	74,264	-392	308,063	309,825	-1,762
Operation	Sep-Dec 2029	59,522	0	59,522	36,936	0	36,936	22,586	367,585	346,761	20,824
	2030	189,032	0	189,032	117,315	0	117,315	71,717	556,617	464,076	92,541
	2031	200,385	0	200,385	124,377	0	124,377	76,008	757,002	588,453	168,549
	2032	212,436	0	212,436	131,845	0	131,845	80,590	969,438	720,298	249,140
	2033	248,776	0	248,776	139,936	0	139,936	108,839	1,218,214	860,235	357,979
	2034	256,239	0	256,239	144,135	0	144,135	112,105	1,474,453	1,004,369	470,084
	2035	263,926	0	263,926	148,459	0	148,459	115,468	1,738,379	1,152,828	585,552
	2036	271,844	0	271,844	152,912	0	152,912	118,932	2,010,223	1,305,740	704,483
	2037	279,999	0	279,999	157,500	0	157,500	122,500	2,290,223	1,463,240	826,983
	2038	288,399	0	288,399	162,225	0	162,225	126,175	2,578,622	1,625,464	953,158
	2039	297,051	0	297,051	167,091	0	167,091	129,960	2,875,674	1,792,556	1,083,118
	2040	305,963	0	305,963	172,104	0	172,104	133,859	3,181,637	1,964,660	1,216,977
	2041	292,642	0	292,642	164,611	0	164,611	128,031	3,474,279	2,129,271	1,345,008
	2042	301,422	0	301,422	169,550	0	169,550	131,872	3,775,701	2,298,821	1,476,880
	2043	310,464	0	310,464	174,636	0	174,636	135,828	4,086,165	2,473,457	1,612,708
	2044	319,778	0	319,778	179,875	0	179,875	139,903	4,405,943	2,653,332	1,752,611
	2045	329,371	0	329,371	185,271	0	185,271	144,100	4,735,314	2,838,604	1,896,711
	2046	339,253	0	339,253	190,830	0	190,830	148,423	5,074,567	3,029,433	2,045,134
	2047	349,430	0	349,430	196,554	0	196,554	152,876	5,423,997	3,225,988	2,198,009
	2048	359,913	0	359,913	202,451	0	202,451	157,462	5,783,910	3,428,439	2,355,471
	2049	370,711	0	370,711	208,525	0	208,525	162,186	6,154,621	3,636,963	2,517,657
	2050	381,832	0	381,832	214,780	0	214,780	167,051	6,536,453	3,851,744	2,684,709
Total		6,536,453	0	6,536,453	3,849,982	1,762	3,851,744	2,684,709	6,536,453	3,851,744	2,684,709

Source: JICA Survey Team

### (3) Mitigation Measures

According to quantitative forecast on CO<sub>2</sub>, the project gives positive impact. However, implementation of mitigation measures can minimize adverse impacts.

#### 1) During Construction

With regard to the operation of construction machines, the following manner shall be observed during construction:

- ✓ Prohibition of unnecessary idling/operation of construction machines
- ✓ Periodical (daily, weekly and monthly) checking and maintenance of construction machines shall be done.

#### 2) After Construction

- ✓ Strengthening of speed control by the police department (UNRA requests to police department regarding strict speed control)
- ✓ Strengthening of car inspection mechanisms to restrict vehicles from discharging high emissions (UNRA requests to Police department and Ministry of Works and Transport regarding appropriate implementation of car inspection)

### (4) Evaluation

Negative impacts are forecasted during construction due to construction activities such as operation of construction machines. However, total CO<sub>2</sub> emission for with project case will be smaller than that of without project case from year 2030. Thus, the project gives positive impacts after 2030.

## CHAPTER 7 CONSISTENCY WITH JICA GUIDELINES

### [Summary of the Chapter 7]

Annex 1 of the JICA Guidelines for Environmental and Social Considerations (2010 edition), 'Compliance with Laws, Standards and Plans', states that "Projects must, in principle, be implemented outside protected areas specifically designated by law or ordinance for the protection of natural or cultural heritage. It also stipulates that projects must not have a significant adverse impact on designated protected areas".

The MFNP and KWR, where the project is located, fall within areas designated by law as national parks or wildlife reserves by the government for the protection of wild fauna and flora, and therefore need to meet the exceptions for project implementation in protected areas as stated in the FAQs of the JICA Guidelines for Environmental and Social Considerations (2010 edition) The following are the exceptions to the requirements for project implementation in protected areas. This chapter indicates that the project meets these exceptions.

#### 7.1. Confirmation of the conditions in the JICA Guideline FAQs that allow projects to be implemented in protected areas on an exceptional basis and the current status

According to the provision in Appendix 1 "Compliance with Laws, Standards, and Plans" of the JICA Guidelines for Environmental and Social Considerations (2010), it is described that "Projects must, in principle, be undertaken outside of protected areas that are specifically designated by laws or ordinances for the conservation of nature or cultural heritage (excluding projects whose primary objectives are to promote the protection or restoration of such areas). Projects are also not to impose significant adverse impacts on designated conservation areas."

MFNP and KWR correspond to areas designated by the government for the protection of wild fauna and flora by law as national parks and wildlife reserves, accordingly, it is necessary to meet the exceptions for implementing projects in protected areas as described in the FAQ of the JICA Guidelines for Environmental and Social Considerations (2010), shown in Table 7.1.1.

**Table 7.1.1 Five Requirements of JICA Guideline FAQs for exceptionally allowing projects to be implemented in protected areas**

Questions	Answers
<p>The JICA Guidelines write that "Projects must, in principle, be undertaken outside of protected areas that are specifically designated by laws or ordinances for the conservation of nature or cultural heritage (excluding projects whose primary objectives are to promote the protection or restoration of such areas)."</p> <p>Would you elaborate on exceptional cases?</p>	<p>"Compliance with Laws, Standards, and Plans" of Appendix 1 of the ESC Guidelines states that "Projects must, in principle, be undertaken outside of protected areas that are specifically designated by laws or ordinances for the conservation of nature or cultural heritage (excluding projects whose primary objectives are to promote the protection or restoration of such areas). Projects are also not to impose significant adverse impacts on designated conservation areas." Referring to IFC's Performance Standards, etc., JICA requires project formation and implementation in such areas to fulfil all conditions mentioned below,</p> <p>(1) No feasible alternative plans shall be available in areas other than the area designated as such by the country and/or local governments by laws and/or ordinances to protect nature and cultural heritage ("the Designated Area");</p> <p>(2) Development in the Designated Area shall be legally acceptable by the host country's domestic laws;</p> <p>(3) Project proponents etc., shall comply with the laws, ordinance concerning the Designated Area and management plan of the protected zones:</p>

Questions	Answers
	<p>(4) Project proponents etc., shall form a consensus about project implementation with stakeholders including organizations responsible for managing the Designated Area, local communities through consultations: and</p> <p>(5) Project proponents etc., shall perform additional programmes, where necessary, to ensure that the Designated Area is effectively managed for its conservation.*1</p> <p>*1 IFC's Performance Standards note the following: "Implementing additional programs may not be necessary for projects that do not create a new footprint."</p>

Source: ANSWERS TO FREQUENTLY ASKED QUESTIONS ABOUT JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)'S GUIDELINES FOR ENVIRONMENTAL AND SOCIAL CONSIDERATIONS (20 July 2011 (Revised on 5 February 2016))

Table 7.1.2 shows the evaluation results for the five requirements shown in Table 7.1.1.

**Table 7.1.2 Five requirements of the JICA guidelines and the current conclusions of the evaluation**

Conditions	Evaluation Results
(1) No feasible alternative plans shall be available in areas other than the area designated as such by the country and/or local governments by laws and/or ordinances to protect nature and cultural heritage ("the Designated Area" hereinafter):	<p>□ Table 2-1 8 shows the results of the comparative evaluation of i) not implementing the project, ii) avoiding the protected area altogether and iii) replacing the bridge near the existing bridge (in the protected area). For the following reasons, it was concluded that there are no feasible alternatives for project implementation outside the protected area and that replacing the bridge in the vicinity of the existing bridge (in the protected area) is appropriate.</p> <ul style="list-style-type: none"> <li>• Driveability: If the protected area is completely avoided, a diversion of approximately 7 km from the existing road is required and the convenience of the local residents is reduced, whereas if the bridge is replaced near the existing bridge, no significant change from the current situation is expected, and therefore replacing the bridge near the existing bridge is preferable.</li> <li>• Natural Environmental Impacts: Replacing the bridge near the existing bridge is preferable in terms of the area of alteration and the amount of GHGs generated. The area of alteration within the protected area is unlikely to be a key habitat for keystone species within the protected area and is not considered to be significantly greater than the impact of the current road and bridge operations. It is also considered that impacts can be minimised through the implementation of mitigation measures.</li> <li>• Socio Environmental Impacts: It is preferable to replace the bridge in the vicinity of the existing bridge, considering the impact on private land acquisition, resettlement and the local economy. In addition, the results of the route preference questionnaire at the local stakeholder meeting showed that more than 90% preferred a route through the protected area, taking into account the damage to the existing bridge and the possibility of early construction.</li> <li>• Project Duration: If the protected area is completely avoided, the project is expected to be delayed due to delays in land acquisition and resettlement, whereas if the bridge is replaced near the existing bridge, no land acquisition or resettlement is required and construction can start earlier. Furthermore, if the protected area is completely avoided, it is expected that the construction of a large bridge such as a cable-stayed bridge will take about seven years, whereas if the bridge is replaced near the existing bridge, the construction period will be 2.7 years for the construction of the bridge. The urgency of replacing the existing Karuma Bridge is very high and the project needs to be implemented quickly, but the option to avoid the protected area altogether will not meet the challenge.</li> <li>• Economic Efficiency: If the protected area is completely avoided, the project cannot be implemented with Japan's Grant Aid due to the scale of the project, and with an EIRR of 2.7%, which does not exceed the social discount rate of 12%, the criterion for determining investment, it would be difficult to implement the project with loans. In contrast, replacing the bridge near the existing bridge is more advantageous, as the project can be implemented with Japan's Grant Aid and the EIRR is 20.6%, which is more than 12% of the social discount rate.</li> </ul>
(2) Development in the Designated Area shall be legally acceptable by the host country's domestic laws:	<p>□ Uganda's legislation (e.g. Wildlife Act) and the guidelines for the implementation of development in protected areas and other areas based on it allow the construction of roads and bridges in protected areas, provided that an appropriate environmental assessment is carried out and approved. The ESIA prepared by UNRA in 2014 for the construction of the new Karuma Bridge (the route passing approximately 400 m downstream of the existing Karuma Bridge) was approved by NEMA in 2016, confirming that the project is permitted</p>



Conditions		Evaluation Results
		<p>under Ugandan national law.</p> <p>In addition, Uganda's national laws relevant to the case include the following:</p> <ul style="list-style-type: none"> <li>Wildlife Act 2019: It states that “economic activities are permitted in national parks and wildlife reserves provided an environmental impact assessment is carried out” (items 26, 5e and 6f). There is no definition of “economic activities” in the Decree, but according to the UWA it is interpreted as “including the construction of hotels and road infrastructure necessary for tourism”.</li> <li>Murchison Falls National Park (Karuma Wildlife Reserve, Bugungu Wildlife Reserve) ((Murchison Falls Protected Area)) General Management Plan (2013 - 2023: plan still valid in 2024) July 2014/UWA: Management plan under Wildlife Act 2019, Section 17(3b) “The Executive Director of UWA shall be responsible for the development and implementation of management plans for conservation areas or for species and classes of species of wildlife populations”. The area around the existing Karuma Bridge is classified as a Tourism Zone, which is described as “The Zone represents areas in Murchison of spectacular scenery and wild game for visitor enjoyment”, and where roads and other facilities necessary for sport fishing and tourism are provided. (4.1 The Tourism Zone)</li> <li>Operational Guidelines for Developments in Wildlife Protected Areas/UWA: Operational Guideline under Wildlife Act 2019, Section 17(3b) “The Executive Director of UWA shall be responsible for the development and implementation of management plans for conservation areas or for species and classes of species of wildlife populations”. It states that “i. Main roads, access roads, pipelines, electricity transmission lines, and any other infrastructure shall be limited to only those that are approved. As much as possible, pipelines and electricity transmission shall be subsurface. In case of unforeseen access roads, the developer shall undertake Environmental and Social Impact Assessments in accordance with the National Environment Act 2019 and Wildlife Act 2019.” and “ii. Routing of approved access roads, power lines, shall be approved by UWA so as to avoid ecologically sensitive ecosystems and impacts on tourism activities”. (Described in 3. The Guidelines / 3.3 Infrastructure / 3.3.1 Construction and Operation of Roads and Pipelines”).</li> </ul>
(3) Project proponents etc., shall comply with the laws, ordinance concerning the Designated Area and management plan of the protected zones	<input type="checkbox"/>	<p>Project proponents must comply with the laws and ordinances concerning the Protected Area and adhere to the management plan of the protected zones. Recognizing the need to conform to the zoning plan and operational guidelines of the Protected Area Management Plan, UNRA, with assistance from the JICA Survey Team, conducted an environmental assessment in accordance with applicable laws, regulations, and guidelines.</p> <ul style="list-style-type: none"> <li>National Environmental Act 2019</li> <li>National Environment Regulation 2020</li> <li>Wildlife Act 2019</li> <li>Murchison Falls National Park General Management Plan (2013-2023) 2014</li> <li>Operational Guidelines for Developments in Wildlife Protected Areas 2020</li> <li>JICA Guidelines for Environmental and Social Considerations 2010</li> </ul>
(4) Project proponents etc., shall form a consensus about project implementation with stakeholders including organizations responsible for managing the Designated Area, local communities through consultations	<input type="checkbox"/>	<p>The project implementing agency (UNRA) has consulted with the agency responsible for the management of the protected area (UWA), the local community in the vicinity, and other relevant stakeholders. An agreement has been reached on the project's implementation. Historically, UNRA conducted a legally compliant environmental assessment in 2015 and achieved consensus with local communities and other stakeholders. Additionally, during the ESIA update, two local stakeholder meetings were held, reaching a basic agreement on the project's implementation. A questionnaire regarding the preferred alternative route showed that more than 90% of respondents favoured the project under the route that replaces the bridge near the existing location.</p> <p>The management body for the protected area is the Uganda Wildlife Authority (UWA), and the National Environment Management Authority (NEMA) is the approving body for the environmental assessment. NEMA will review the contents of the Environmental and Social Impact Statement (ESIS) prepared in this study, hold discussions with the project operator, and grant its approval.</p>
(5) Project proponents etc., shall perform additional programmes, where necessary, to ensure that the Designated Area is effectively	<input type="checkbox"/>	<p>To ensure the protected area is managed effectively in accordance with its conservation objectives, additional programs will be implemented by the project implementing agencies and others as required. UNRA will implement mitigation measures as requested by the Protected Area Management Authority (UWA) and the Approving Authority (NEMA) during the environmental assessment process.</p> <p>The Environmental Management Plan (EMP) contained in the Environmental and Social Impact Statement (ESIS) prepared under this study includes these mitigation measures and</p>

Conditions	Evaluation Results
managed for its conservation	monitoring plans. Furthermore, UNRA and UWA plan to collaborate on environmental monitoring, including studies, forecasts, and assessments related to the environmental assessment to enhance the nature reserve. Additional mitigation measures and monitoring may also be considered based on the monitoring results.

Source: ANSWERS TO FREQUENTLY ASKED QUESTIONS ABOUT JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)'S GUIDELINES FOR ENVIRONMENTAL AND SOCIAL CONSIDERATIONS (20 July 2011 (Revised on 5 February 2016))

With regard to the above requirements ((2) Development in the Designated Area shall be legally acceptable by the host country's domestic laws), Table 7.1.3 shows a review of Ugandan laws and regulations and the interpretation of relevant laws and regulations for development of protected area given from UWA shown below;

**Table 7.1.3 Law, Regulation and Guidelines regarding development in protected areas and Uganda's Interpretations**

Relevant legislations	Description (Excerpts)	UWA's Interpretations on legislations
Wildlife Act 2019	<p>(1) The UWA is specified to control and monitor (h) industry, energy development, mining, oil and gas exploration, development and production, and related activities in wildlife conservation areas as follows</p> <p>6. Functions of the Authority.</p> <p>(h) to control and monitor industrial, energy development, mining, oil and gas exploration, development and production, and related activities in wildlife conservation areas;</p> <p>In addition, national parks and wildlife conservation area shall be permitted to conduct economic activities under the following requirements.</p> <p>26. Description of wildlife conservation area.</p> <p>(5) A national park declared under subsection (2)(a) shall be an area in which the following activities may be permitted—</p> <p>(e) any other compatible economic activity subject to this Act and after an environment impact assessment study has been conducted"</p> <p>(6) A wildlife reserve declared under subsection (2)(b) shall be an area in which the following activities are permitted—</p> <p>(f) any other compatible socio-economic activity subject to this Act and after an environment impact assessment study has been carried out.</p>	<p>Summary from letter issued by UWA</p> <p>(1) The Kampala-Karuma-Pakwach road and the Karuma bridge already exist and the construction of the bridge is only a renovation of the existing bridge.</p> <p>(2) The bridge connects the north and southern areas of Uganda and is a major tourism industry, specially enhancement of visitations to MFNP and this will in turn contribute to enhanced revenues that will support conservation activities. UWA is therefore in support of this development.</p> <p>(3) Uganda Wildlife Act, 2019 (Section 26 5(e) &amp; 6(f)) provides for economic activities that are compatible with wildlife conservation to be undertaken within wildlife protected area after an environmental impact study (EIA) has been conducted.</p> <p>(4) Infrastructure such as roads and bridges are necessary for the management and operations of protected areas, if such infrastructure is subjected to an ESIA with the attendant mitigation measure appropriately addressed.</p> <p>(5) UWA is already aware of the above and participated in ESIA consultations spearheaded by the Uganda National Roads Authority (UNRA) regarding propose Karuma Bridge and UWA is also aware that the National Environmental Management Authority (NEMA) cleared the Project EIA prepared in 2015 subject to mitigation measures being implemented.</p>
<p>Murchison Fall National Park (Karuma Wildlife Reserve, Bugungu Wildlife Reserve) ((Murchison Falls Protected Area)) General Management Plan (2013-2023) July 2014/UWA</p>	<p>The Project area belongs to Tourism Zone and its definition is as follows</p> <p>4.1 The Tourism Zone</p> <p>This Zone represents areas in Murchison of spectacular scenery and wild game for visitor enjoyment. (UWA explains that the area is also allowed to build hotels and road infrastructure necessary for tourism, however there is no clear statement in the plan.)</p> <p>However, objectives of construction of infrastructures are mentioned as follows.</p> <p>8.2 PA Infrastructure</p> <p>Objective: To ensure well developed and maintained protected area infrastructure and facilities by end of planned period.</p>	<p>Summary from letter issued by UWA</p> <p>(1) Management Plans is developed under the legal requirement of the Uganda Wildlife Act 2019. Section 17(3b) states that "the Executive Director shall be responsible for Development and implementation of management plans for conservation areas".</p> <p>(2) The area where the bridge is planned to be constructed is at the interface of the tourism and administration zones of MFNP and KWR where tourism (roads, bridges, trails, tracks) and protected area staff infrastructure are allowed.</p> <p>Note: Administrative zones are defined as administrative infrastructure areas that primarily include protected area operations and visitor accommodations.</p>

Relevant legislations	Description (Excerpts)	UWA's Interpretations on legislations
Operational Guidelines for Developments in Wildlife Protected Areas/UWA <sup>15</sup>	<p>1.2 Objectives</p> <p>The objectives of these guidelines are to:</p> <ul style="list-style-type: none"> <li>i. guide, coordinate and regulate activities of developers within wildlife protected areas</li> <li>ii. minimize long and short - term negative impacts of developments on the integrity of protected areas and associated ecological processes.</li> <li>iii. minimize negative impacts of development activities on tourism.</li> <li>iv. enhance awareness and appreciation of conservation among the various developers.</li> </ul> <p>*1 "Dual management areas" These are areas that are managed by more than one partner</p> <p>3 The Guidelines</p> <p>3.3 Infrastructure</p> <p>3.3.1 Construction and Operation of Roads and Pipelines</p> <ul style="list-style-type: none"> <li>i. Main roads, access roads, pipelines, electricity transmission lines, and any other infrastructure shall be limited to only those that are approved. As much as possible, pipelines and electricity transmission shall be subsurface. In case of unforeseen access roads, the developer shall undertake Environmental and Social Impact Assessments in accordance with the National Environment Act 2019 and Wildlife Act 2019.</li> <li>ii. Routing of approved access roads, power lines, shall be approved by UWA so as to avoid ecologically sensitive ecosystems and impacts on tourism activities.</li> </ul>	<p>Management Plans is developed under the legal requirement of the Uganda Wildlife Act 2019. Section 17(3b) states that "the Executive Director shall be responsible for Development and implementation of management plans for conservation areas".</p>

In addition, the conditions for determining whether or not the project impact area is a critical natural habitat and the conditions for implementing the project if it is determined to be a critical natural habitat are also specified in the JICA Guideline FAQs.

The table below shows the status of compliance with the conditions based on the results of the ESIA. Although the project area is part of a protected area, it is not considered to be in compliance with each condition and is not considered to be a critical natural habitat. In addition, considering the risk side, the possibility of the project area being classified as a critical natural habitat was also considered to be extremely low.

**Table 7.1.4 Criteria for determining Important Natural Habitats and Conditions for the Project Implementation in Cases where the project is judged as Important Natural Habitats**

Definition	Condition	Evaluation based on the ESIA
Is the project area a "critical natural habitat"?	<p>(1) Habitats important for the species that are classified into "Critically Endangered (CR)", "Endangered (EN)", "Vulnerable (VU)", and "Near Threatened (NT)" under the International Union for Conservation of Nature (IUCN) Red List of Threatened Species</p> <p style="text-align: center;">□</p>	<p>The project area and its surroundings are considered to be part of the range and feeding grounds of the African Elephant (EN), Hippopotamus (VU), African Water Gypsy (NT), Patas Monkey (NT), Bateleur (EN), Martial Eagle (EN), Crowned Eagle (NT). However, it is not considered critical habitat as there are no limited feeding areas, breeding grounds or seasonal migration routes in the affected area. The Central African Rock Python (EN) has been found outside the impact area. Although similar habitat is assumed to exist in the project area, the project area is not considered critical habitat because similar habitat is widespread in other areas.</p> <p>As for fish species, Elephant Snout (EN) has been observed</p>

<sup>15</sup> These guidelines have been prepared by UWA for the development and management of infrastructure within the protected area. The Karuma Bridge is an infrastructure located within the protected area and will be managed in accordance with these guidelines.

Definition	Condition		Evaluation based on the ESIA
			through interviews with fishermen, but it is located about 2 km downstream from the project area, and it is considered difficult to stay in the project area where the current water speed is high, so it is not considered a critical habitat. Among the plant species, African Mahogany (VU) was found in the vicinity of the project area, but there was no impact from the project. On the other hand, Iroko (NT) was found within the project area, but the same species is expected to grow in the surrounding area. Therefore, the project area is not considered a critical habitat.
	(2) Habitats important for endemic species and/or limitedly distributed species	<input type="checkbox"/>	The species listed on the left are considered to be absent from the survey results.
	(3) internationally important habitats that support migratory species and/or flock-forming species	<input type="checkbox"/>	Same as above
	(4) critically endangered ecosystems and/or unique ecosystems	<input type="checkbox"/>	Same as above
	(5) areas related to important evolutionary processes	<input type="checkbox"/>	Same as above
	(6) areas that local communities traditionally think should be protected	<input type="checkbox"/>	The survey results (local stakeholders meetings and focus group discussions) have not specifically mentioned any areas within the project and impacted areas that fall under the left column.
Are there impacts to critical natural habitats?	(1) Projects shall not exert significant adverse impacts on biodiversity values existing in "critical natural habitats" and key functions of the ecosystems:	<input type="checkbox"/>	The situation is that the current approach road and bridge have already been constructed since 1964 within a maximum distance of 50 m from the project area. After the construction of the new Karuma Bridge and approach road, the current Karuma bridge and approach road will be gradually closed, and the ecological impact on the ecosystem will gradually reach the same level as today. As a result, impacts on feeding areas, breeding grounds, limited migration routes, etc. would not be significant and would be minimized through the implementation of mitigation measures that would further reduce impacts. Therefore, there would be no significant negative impacts on main ecosystem functions compared to today.
	(2) Over a reasonable period of time, projects shall not cause net reduction in endangered species population listed below: Of "Threatened" species listed on the IUCN Red List of Threatened Species, species classified into "Critically Endangered (CR)", and "Endangered (EN)", or those that fall under such classifications in accordance with the host country's rules and regulations	<input type="checkbox"/>	Although the project area is part of the feeding ground for African elephants (EN), it is not likely to be a critical habitat because it is not a breeding ground or an important area for seasonal migration, and therefore, it is not expected to cause a net decrease in the population of the elephants.
	(3) Long-term and effective mitigation measures and monitoring shall be put in place be performed with regard to Nos. (1) and (2) above.	<input type="checkbox"/>	Since the project will be implemented in a government-designated national park, monitoring will be conducted during construction and for a certain period of time when the project is in operation.

Source: ANSWERS TO FREQUENTLY ASKED QUESTIONS ABOUT JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)'S GUIDELINES FOR ENVIRONMENTAL AND SOCIAL CONSIDERATIONS (20 July 2011 (Revised on 5 February 2016))

## CHAPTER 8 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

### [Summary of the Chapter 8]

This chapter presents the mitigation measures indicated as necessary based on the impact forecasts from the project presented in Chapter 6, as well as the budget for these measures. It also presents the monitoring and observation/survey items and budget for the implementation of those mitigation measures. 'Environmental monitoring' shall be conducted during the construction period of approximately 3 years and continuously for 3 years after construction. Furthermore, in order to ensure the implementation of these mitigation measures and environmental monitoring, an organizational framework for environmental management, implementation of environmental monitoring, a liaison system and a complaints and appeals framework are presented.

### 8.1. Mitigation Measures

The Environmental and Social Management Plan (hereinafter referred to as “EMP”) consists of mitigation measures and environmental monitoring plan in general.

Mitigation measures are prepared for minimizing the adverse negative impacts during and after construction. Necessary mitigation measures based on the result of impact forecasts during construction, at the end of construction completion and after construction are shown in Table 8.1.1 to Table 8.1.3.

In addition, the project will also take into account and implement the mitigation measures prepared in the approved 2016 ESIA by NEMA and 2018 ESIA prepared by UNRA.

The mitigation measures of 2016 ESIA and 2018 ESIA are also integrated into Table 8.1.1 and Table 8.1.3.

The specific quantities of mitigation measures to be implemented during construction will be discussed again during detailed design, but in principle they will be considered to mitigate impacts to a minimum. The effectiveness of the mitigation measures will be continuously monitored during construction and compared to the quantitative prediction results to verify the effectiveness of the measures. It is also expected that the accumulation of such monitoring data will lead to the implementation of appropriate mitigation measures in the future.

The implementation of formulated EMP comes with a cost, so the budgeting of EMP is necessary and also the financial source that will provide this budget are discussed in this section. In general, the cost of mitigation measures during construction are included as construction cost except some items such as deployment of UWA officers, continuous monitoring by archaeological expert as shown in Table 8.1.4.

**Table 8.1.1 Environmental and Social Mitigation Measures during Construction (Integrated Mitigation Measures for 2016, 2018 and 2024 ESIA)**

Table 3.11: Environmental and Social Mitigation and Draft Mitigation Measures during Construction (Integrated Mitigation Measures for 2016, 2018 and 2024 ESIA)								
Area	No.	Item	ESIA version	Negative Impacts Or Purpose	Draft Mitigation Measures		Responsibility	
					During Construction		Implementation Body/Agency	Responsible Agency
Pollution	1	Air pollution	2024	Dust from construction activities	1)	Water sprinkling and/or surface treatment shall be carried out on earth construction road and construction yard near the residential area. Additionally, surface treatment of the earth road should be considered, if required.	Contractor (Construction Company)	UNRA
			2)		Periodical cleaning shall be done on paved road used as construction road.			
			3)		Watering the project site to reduce the dust			
	2	Water pollution	2024	Turbid water and polluted water from construction site, construction machines and related facilities	4)	Cover construction materials (sand, gravel, cement, etc) on transit and on site.	Contractor	UNRA
					5)	The speed limit should not exceed 40km/hr during construction for not to cause dusts.		
					6)	Cover trucks transporting construction materials for not to cause dusts.		
			2016		7)	Avoid open stock piling	Contractor	UNRA
					8)	Turbid water from unpaved construction area shall be treated in sedimentation pond and discharged into the river, if required.		
					9)	Waste oil of construction machines shall be stored and disposed through a licensed agent.		
					10)	Construction machines shall be maintained so as not to leak oil in the base camp site and construction site.		
					11)	Provision of sanitation facilities at the basecamps and construction site. Also, the location of camps should avoid water sources such as springs and wells.		
					12)	Domestic wastewater and night soil from basecamp shall be treated and/or discharged of at designated sites and facilities.		
					13)	Use portable toilet in the construction area and disposed the night soil at the designated dumping site.		
2018	14)	Install oil trapping equipment in areas when there a likelihood of oil spillage such as during the maintenance of construction equipment.	Contractor	UNRA				
	15)	After completing the bridge, cleaning up whole temporary constructions on shore as well as under the river, including steel, redundant concrete, surrounding frame and equipment such as excavators, bucket, crane, etc.						
	16)	Minimize of effects to surface water and deposit.						
3	Waste	2024	Construction waste (Waste soil, cut trees, waste oil and hazardous materials) and Domestic waste including night soil from base camp and offices	17)	Enforce buffer distance regulations from surface water sources.	Contractor	UNRA	
		18)		Design vehicle wash areas so as not to contaminate the environment.				
			2024		19)	Waste soil from the cutting section is reused for embankment material for road section. However, Waste soil shall be disposed at the designated site, if such waste soil is generated from the construction area.	Contractor	UNRA
			2016		20)	Cut trees are used as manure, building materials and for other purposes.		
					21)	Waste oil of the construction machines is collected and disposed through a licensed agent.		
					22)	Waste chemical and hazardous material are stored at the base camp site and disposed through a licensed agent.		
					23)	Domestic solid waste from base camp shall be collected and disposed at the designated disposal site.		
					24)	Domestic wastewater and night soil shall be treated though septic tank and discharged of into the natural stream. Water quality of the effluent shall be confirmed before discharging it into natural water body.		
					25)	Ensure promptly cleaning of construction wastes.	Contractor	UNRA
					26)	Reusable construction wastes should be piled up in the scope of site clearance for collection and the transportation to designated re-use site.		
					27)	Non-reusable construction wastes should not be kept in the construction area and to be transported to designated site.		
					28)	Strictly forbidding all actions of burning at project site.		
					29)	To provide regulation on solid waste management at construction site, specifying strict prohibition of discharging solid wastes in uncontrolled manner to the surrounding environment and to the river flows.		



Area	No.	Item	ESIA version	Negative Impacts Or Purpose	Draft Mitigation Measures	Responsibility	
					During Construction	Implementation Body/Agency	Responsible Agency
Natural Environment					30) Provide camp site with portable toilets, collect sludge from septic tank and remove toilets after finishing construction. 31) Collecting waste into proper storage yard, keeping temporarily and transporting the waste to designated sites – dump sites or waste treatment points. 32) Ensure efficient use of construction materials to avoid unnecessary waste.		
					33) Locate worker's camps and equipment yards away from communities. 34) Transportation and disposal of hazardous waste will be undertaken by licensed transporters to facilities licensed for storage and disposal of hazardous waste. 35) Develop onsite sewage management systems 36) Hazardous waste should be stored in facilities designed and licensed for storage of hazardous waste by NEMA 37) Wherever feasible, waste recovery and reuse will be undertaken.	Contractor	UNRA
		4	2024	Polluted soil and quarry from or to out of project site	38) Excavated soil shall be analyzed, and it shall be confirmed if the quality is below standard values. Polluted soil shall be used as construction material after treatment or disposed/ or stored at the designated site if excavated soil is polluted. 39) Borrow soil from outside of project area shall be inspected not polluted before carrying into the project area. 40) Construction machines shall be maintained so as not to leak oil in the base camp site. 41) Waste oil of the construction machines is collected and disposed through a licensed agent. 42) Waste chemical and hazardous material shall be stored at the base camp site and disposed through a licensed agent.	Contractor UWA (inspection of borrow soil quality from out of protected area)	UNRA UWA (inspection of borrow soil quality from out of protected area)
			2016		43) Install oil trapping equipment in areas when there a likelihood of oil spillage such as during the maintenance of construction equipment.	Contractor	UNRA
	5	Noise and vibration	2024	Construction noise and vibration from construction machines and activities	44) Construction activities and operation of construction machines shall be limited in the daytime. 45) Construction machines shall be well-maintained and checked every day. 46) Information disclosures, such as construction schedule and activities, shall be carried out in advance to the surrounding community, if the residential area is located near construction area.	Contractor	UNRA
			2016		47) Ensure regular servicing of construction equipment. 48) Use low noise generating equipment	Contractor	UNRA
			2018		49) Ensure vehicle and equipment maintenance schedules are followed. 50) Vehicles and equipment generating excessive noise shall not be operated on the project.	Contractor	UNRA
	6	Ground subsidence	2024	-	No mitigation measures are necessary because ground subsidence is not expected	-	-
	7	Odor	2024	Bad odor from domestic waste, night soil and chemicals in the construction site, base-camp site and other related facilities.	51) Domestic waste from basecamp and accommodation shall be stored properly by separated garbage boxes. 52) Domestic solid waste is collected and disposed at the nearest designated disposal site. 53) Domestic wastewater and night soil shall be treated through septic tank or/and portable toilet and discharged into the natural stream or/and collected and disposed through a licensed agent. 54) Waste oil of the construction machines is collected and disposed through a licensed agent. 55) Waste chemical and hazardous material are stored at the base camp site and disposed through a licensed agent.	Contractor	UNRA
	8	Sediment	2024	-	See No4. Soil contamination	Contractor	UNRA
	9, 10	Protected area and ecosystem	2024	Deterioration of habitat of the fauna and flora species in the project area and surrounding area	56) Affected area shall be marked and all relevant construction workers and communities shall be informed not to conduct development outside of the project area. 57) Waste oil shall be stored and disposed to the designated site or disposed by the licensed agent so as not to leak into the water body and on land. 58) Domestic waste in the construction area shall be stored properly for not to attract wild animals and disposed at the designated site.	Contractor  (*1) Implemented with coordination of UWA	UNRA

Area	No.	Item	ESIA version	Negative Impacts Or Purpose	Draft Mitigation Measures	Responsibility	
					During Construction	Implementation Body/Agency	Responsible Agency
					59) Tree replantation shall be carried out. (*1) 60) Borrow soil from out of project area shall be inspected not included alien plant species before carrying into the protected area. 61) Prohibition of blasting and adoption of lower noise and vibration construction methods 62) Construction area shall be restored as the original condition after construction. 63) Lighting in the nighttime shall be minimized at night-time so as not to cause adverse impacts on the wild animals such as Hippopotamus and Elephant. 64) Avoid to park construction machines in the protected area for not to disturb crossing animals. 65) Obstacles such as tall fences shall not be installed in the vicinity of project site and the road embankment shall provide for gentle slopes as possible in order not prevent animals from crossing the road. 66) Relocate and/or induce valuable species to escape out of the construction area before construction activities begin with assistance of UWA rangers. (*1)		
				Increasing of poaching and conflicts with wild animals	67) Poaching by construction workers shall be prohibited. Policy and regulations regarding natural environmental protection shall be instructed. 68) UWA rangers shall be deployed near the project site for emergency case such as encountering with wild animals.		
				Increasing of roadkill	69) Construction machines shall maintain speed limit of less than 40km/h not to cause roadkill in the construction area 70) Limit construction to as short a time as possible and it should take place during the daytime when the visual range is substantial.		
			2016	Deterioration of habitat of the fauna and flora species in the project area and surrounding area	71) Clearing should not exceed areas not used for construction specifications. 72) Construction workers should not clear vegetation for use as fuel wood as it will exacerbate more clearing. 73) Re-vegetate/planting of trees	Contractor	UNRA
				Increasing of poaching and conflicts with wild animals	74) Illegal hunting of wildlife by construction workers as a source of food should be strictly prohibited.		
				Increasing of roadkill	75) Limit vehicle speeds during delivery of construction materials to the site. Speeds should be controlled within prescribed KWR sections.		
			2018	Deterioration of habitat of the fauna and flora species in the project area and surrounding area	76) Construction related facilities such as Base-camps, borrow pits, quarry site and wells should not be constructed in the construction area and protected area 77) Do not stockpile near sensitive environments along the river. 78) Restore all ecologically sensitive sites after construction phase using spoil. 79) Manage the existing invasive plant species spread through sensitizations. 80) Ensure no foreign plant species are introduced in the Wildlife Reserve by Quarantine and treating equipment before introducing them into the conservation area. 81) Efforts through mechanical elimination of invasive plants within the project areas should be made. 82) Ensure no foreign plant species are introduced in the Wildlife Reserve by Quarantine and treating equipment before introducing them into the conservation area. 83) Solid waste disposal sites will be located away from watercourses and have restricted access. 84) Use low noise and vibration equipment. 85) No night works	Contractor	UNRA

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Area	No.	Item	ESIA version	Negative Impacts Or Purpose	Draft Mitigation Measures		Responsibility	
					During Construction		Implementation Body/Agency	Responsible Agency
				Increasing of poaching and conflicts with wild animals	86) Sensitization of workers on dangers of poaching 87) Code of conduct to ensure workers do not engage in poaching, trading, and consumption of game meat. 88) Maintain a realistic buffer distance from the animals. 89) Locate worker's camps and equipment yards away from KWR and sensitive ecosystems.			
				Increasing of roadkill	90) Install speed humps at interval of 0.2-0.5 km along the approaching routes. 91) Install appropriate road signage on speed limits and animal crossing corridors. 92) Mark off all identified animal crossing points			
				Securing of irrigation channel and stream in the construction area	93) Diversion of streams shall be set up if the project activities give impacts on such streams			
				Slope failure	94) The slope gradient for earthwork section is designed in accordance with the applicable design manual. 95) Implementation of slope protection methods such as turf work, seed spraying treatment, shotcrete, etc.			
	11	Hydrology	2024	Slope failure	96) Protect road embankments and slopes with stone walls, Gabions, erosion control mats.	Contractor	UNRA	
	12	Topography and geology	2018	Slope failure		Contractor	UNRA	
Social Environment	13	Involuntary Resettlement	2024	Not required because no land acquisition nor resettlement are planned.	-	-	-	-
	14	Poverty Group	2024	Worsening poverty in the local community	97) Provide equal job opportunities for the local people as construction workers. 98) Announce the schedule, conditions, requirements, duration, etc. for recruiting all skilled, semi-skilled, and unskilled labors in places where the local people can easily observe, such as the town centre, local council office, and meeting places. 99) Priority will be given to employ the local people whenever possible and minimize the influx of construction workers from other areas.	Contractor	UNRA	
	15	Ethnic group	2024	Discrimination of the basis of the ethnicity in recruitment related to the Project	100) Ensure a clear principle of no discrimination based on the ethnicity in the selection process of construction workers. 101) Provide equal job opportunities for the local people as construction workers. 102) Announce the schedule, conditions, requirements, duration, etc. for recruiting all skilled, semi-skilled, and unskilled labors in places where the local people can easily observe, such as town center, local council office, and meeting places. 103) Priority will be given to employ the local people whenever possible and minimize the influx of construction workers from other areas.	Contractor	UNRA	
	16	Local economy such as employment and livelihood	2024	Disruption of local economic activities	104) Information on the detailed construction plan, including schedule, location construction area and related facilities, and traffic control area, should be disseminated in advance. 105) Ensure access to the entrances of shops, restaurants, etc. in the vicinity of construction area, related facilities, and traffic control area. 106) Provide equal job opportunities for the local people as construction workers. 107) Establish a GRM to resolve complaints received from the local people.	104) to 106) Contractor 107) UNRA	UNRA	
			2016	Increase of positive impact on the local economy	108) Ensure people from local community are given priority where appropriate. 109) Provide information about the availability of employment opportunities and qualifications needed. 110) Provide on-the-job training to construction workers recruited from the local community. 111) Encourage and motivate contractors to buy locally available construction materials.	108) to 110) Contractor, 111) UNRA	UNRA	
	17	Land use and utilization of local	2024	Disruption of the access to land and local resources	112) Information on the detailed construction plan, including schedule, location of construction area and related facilities, and traffic control area should be disseminated in advance.	112) to 115) Contractor	UNRA	

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Area	No.	Item	ESIA version	Negative Impacts Or Purpose	Draft Mitigation Measures	Responsibility	
					During Construction	Implementation Body/Agency	Responsible Agency
		resources			113) In order to avoid traffic disruption due to the complete closure, the existing Karuma Bridge will be maintained, and traffic will be kept on the existing Karuma Bridge during construction of the new bridge. 114) Provision of detour to the river, as necessary. 115) Construction workers should not extract local resources such as fish and firewood. 116) Establish a GRM to resolve complaints received from the local people.	116) UNRA	
	18	Water usage	2024	Disruption of water access	117) Priority will be given to employ the local people whenever possible and minimize the influx of construction workers from other areas. 118) The contractor should prepare water supply plan for construction including drinking water and obtain the Water Abstract Permit from Directorate of Water Resource Management. 119) Establish a GRM to resolve complaints received from the local people.	117) to 118) Contractor 119) UNRA	UNRA
			2018	Disruption of the water access	120) The contractor should develop a water supply plan and consult with the local authority (Local Council) prior to using existing water sources.	Contractor	UNRA
	19	Existing social infrastructures and services	2024	Disruption of the access to the existing infrastructures	121) Information on the detailed construction plan, including schedule, location of construction area and related facilities, and traffic control area, should be disseminated in advance. 122) In order to avoid traffic disruption due to the complete closure, the existing Karuma Bridge will be maintained, and traffic will be kept on the existing Karuma Bridge during the construction of new bridge. 123) Traffic guides will be deployed in the vicinity of construction area, related facilities, and traffic control area. 124) Provide detour to the existing social infrastructures and services, as necessary. 125) Establish a GRM to resolve complaints received from the local people.	121) to 124) Contractor 125) UNRA	UNRA
	20	Social institutions such as local decision-making institutions	2024	No negative impacts	Not required.	-	-
	21	Unequal distribution of positive and negative impacts of the Project	2024	Appropriate provision of positive impact to the local people by the Project	126) Establish a GRM for the Project by harmonizing the existing similar system. 127) Explain the GRM for the Project to the local people in continuous public consultations. 128) Provide equal job opportunities to the local people as construction workers. 129) Priority will be given to employ the local people whenever possible and minimize the influx of construction workers from other areas. 130) Provide guidance to construction workers hired from other areas to avoid conflict with the local people.	126) UNRA 127) UNRA and Contractor 128) to 130) Contractor	UNRA
			2018	Appropriate provision of positive impact to the local people by the Project	131) The contractor will encourage potential workers to get recommendation from local leaders (LC) to be eligible in the hiring of construction workers to ensure that those hired do not have criminal records. 132) Ensure fair wages of construction workers hired for the Project. 133) Information on the Project will be disseminated transparently to the local community. 134) Continue to communicate with the local community from the survey period to ensure that all concerns are addressed.	Contractor	UNRA
	22	Local conflict of interests	2024	Appropriate provision of positive impact to the local people by the Project	See No.21 Unequal distribution of positive and negative impacts of the project	See No.21 Unequal distribution of positive and negative impacts of the project	See No.21 Unequal distribution of positive and negative impacts of the project

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Area	No.	Item	ESIA version	Negative Impacts Or Purpose	Draft Mitigation Measures	Responsibility	
					During Construction	Implementation Body/Agency	Responsible Agency
	23	Cultural heritage	2024	Loss/ damage/ disruption of the cultural/ historical resources	135) Consult with cultural leaders in advance to minimize disruption and concern to the local people, and to avoid unanticipated damage to symbolic trees and rocks, and other important resources that are objects of worship or those used in rituals.	Contractor	UNRA
					136) Develop and follow a “ <i>Chance Finds Procedure</i> ” to prevent damage to archaeological and historical resources.		
					137) <u>Conduct continuous monitoring by the Contractor during earthworks.</u>		
					138) Provide training on cultural site and archaeological and historical resources to the construction workers.		
	24	Landscape	2016	Loss/ damage/ disruption of the cultural/ historical resources	139) <u>Install signage to the signboard of the Sir Samuel and Lady Florence historical trail.</u>	Contractor	UNRA
					140) Project activities involving earthworks must include an approved “Chance Finds Procedure” in construction contracts, to cover the possibility of discovering physical cultural heritage in the course of excavation.		
	24	Landscape	2024	Change in landscape	141) Adoption of colour of the bridge harmonized with the surrounding current landscape	Contractor	UNRA
			2018	Change in landscape	142) Landscaping along the road in the Karuma Wildlife Reserve.	Contractor	UNRA
	25	Gender	2024	Discrimination of the basis of gender	143) Development of the Code of Conduct for Contractors in conformity with gender policy and Employment Act, Cap 219.	143) to 145) Contractor 146) to 150) UNRA	UNRA
					144) Provide equal job opportunities and fair salary regardless of gender (including positive segregation mechanism to ring fence some jobs for women)		
					145) Install sanitary facilities in considering gender at construction area and related facilities (including basecamp).		
					146) <u>Provide the educational training on gender issues to the construction workers.</u>		
					147) <u>Sensitize the local people on gender issues.</u>		
					148) Ensure a certain distance between the local community and basecamp		
					149) Establish a GRM to resolve complaints received from the local people with several options for submitting complaints (including the option that the local people can access to the local NGOs).		
					150) Ensure anonymity to protect privacy when submitting complaints, if requested by the complainant.		
	26	Rights of children	2018	Discrimination of the basis of gender	151) Female workers will be sensitized on their sexual rights.	UNRA, Contractor	UNRA
					152) Have policies to promote non-discrimination and equal opportunities.		
					153) Establish zero tolerance policies and codes of conduct related to violence against women and girls.		
					154) Explain and educate construction workers about laws prohibiting sex work.		
					155) Consider the gender for facilities for construction workers such as restrooms and bathrooms.		
					156) Pay equal wages for work of equal value by women and men.		
					157) Follow relevant national legal frameworks on children's rights such as the Children Act, Cap 59 and international standards such as IFC Performance Standard 2.		
					158) Include a strict “no child labor” rule in contractors’ contract.		
	23	Cultural heritage	2024	Loss/ damage/ disruption of the cultural/ historical resources	159) When selecting construction workers, identification card, etc. will be checked to verify age.	Contractor	UNRA
					160) <u>Provide educational training to construction workers not to buy goods from children, not to have inappropriate relationship with boys and girls, not to use school facilities such as toilets and water systems, and encourage children to go to school when children are gathered at the construction site to see the work, etc.</u>		
					161) <u>Sensitize the local people and schools.</u>		
					162) Install security facilities such as signboard in the vicinity of construction area and related facilities.		
	24	Landscape	2016	Loss/ damage/ disruption of the cultural/ historical resources	163) The contractor will develop a child protection plan and provide it to the local stakeholders.	UNRA, Contractor	UNRA
					164) Prevent contractors from hiring children as construction workers.		
	25	Gender	2024	Discrimination of the basis of gender	165) Ensure that the local community has access to and know of and report abuse using the national child abuse hotline		
	26	Rights of children	2018	Threats to children’s right			

Area	No.	Item	ESIA version	Negative Impacts Or Purpose	Draft Mitigation Measures	Responsibility	
					During Construction	Implementation Body/Agency	Responsible Agency
					116. 166) Keep children off construction area to ensure controlled interaction between children and construction workers. 167) Ensure close monitoring of construction workers' behavior and conduct. 168) Parents/ guardians should be sensitized and held accountable for children leaving and arriving home before dark.		
	27	Infectious diseases	2024	Threats to the health and safety of workers and the local communities	169) Follow relevant national legal frameworks on infectious diseases such as the Occupational Safety and Health Act No. 9 (2006) and international standards such as IFC Performance Standard 2. 170) Prevent the creation of vector mosquito habitats by installing adequate drainage facilities in the construction area and related facilities (including basecamp). 171) <u>Take appropriate precautionary measures such as mosquito nets and provision of purified water to construction workers.</u> 172) <u>Provide adequate sanitation facilities, as well as trash boxes.</u> 173) <u>Enforce medical screening and periodical medical check for construction workers.</u> 174) Not to discriminate against HIV/ AIDS infected persons in hiring construction workers. 175) <u>Provide the educational training on prevention of infectious disease to the construction workers.</u> 176) <u>Sensitize the local people about the infectious diseases.</u> 177) <u>Provide condoms in sanitary facilities in the construction area and related facilities (including basecamp).</u>	UNRA, Contractor	UNRA
			2018	Threats to the health and safety of workers and the local communities	178) Maintain a strict "no socializing" policy to prevent basecamps from becoming hotspots for prostitution or illicit sexual relations. 179) HIV/AIDS sensitization programs shall be conducted at the basecamps.	Contractor	UNRA
	28	Labor Environment and Safety	2024	Threats to the health and safety of workers	180) Follow the relevant national legal frameworks for the work environment such as the Occupational Safety and Health Act No. 9 (2006) and international standards such as IFC Performance Standard 2. 181) Establish a response system in the event of an accident due to construction, patient transportation, or other emergencies. 182) Implement countermeasures against "Tsetse fly."	Contractor	UNRA
			2016	Threats to the health and safety of workers	183) Use of Person Protection Equipment (PPE) such as earplugs and masks to those working in the vicinity of construction area and related facilities. 184) Establish safety regulations in the construction area and related facilities. 185) Install first aid kit. 186) Provide adequate training on safety measures for construction workers. 187) Prepare emergency rescue plans.	Contractor	UNRA
			2018	Threats to the health and safety of workers	188) Develop and implement a health and safety plan. 189) Provide construction workers with appropriate ear protection. 190) Implement health and safety training programs for construction workers. 191) Develop and implement a security management plan that includes clear measures to protect construction workers. 192) Develop and implement an occupational health and safety plan in line with the "Occupational Safety and Health Act (2016)." 193) Hire and assign a professional safety manager. 194) Assign an occupational safety committee for the Project. 195) Develop an emergency and contingency plan. 196) Develop and communicate policies to construction workers, supervisors and supervisory personnel to promote non-discrimination and to promote equal treatment.	Contractor	UNRA



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					During Construction	Implementation Body/Agency	Responsible Agency
					197) No decisions regarding employment, working conditions, pay, benefits, or termination will be based on discriminatory grounds.		
Others	29	Accident	2024	Potential accident risks related to the local people/ community	198) Traffic guides will be assigned to construction area, related facilities, and traffic control area. 199) Install safety signs including speed limits, in the construction area, related facilities, and traffic control area. 200) Install night lighting facilities in the vicinity of construction area, related facilities, and traffic control area. 201) Limit traffic speed to less than 40km/h in the vicinity of construction area, related facilities, and traffic control area. 202) Provide the safety training to construction workers. 203) Establish a response system in the event of an accident due to construction, patient transportation, or other emergencies. 204) Sensitize to the local people and schools.	Contractor	UNRA
					205) Install signs and warnings in the hazardous areas of construction area and related facilities.	Contractor	UNRA
					206) Screen offsite to prevent intrusion from the local community. 207) Install storage for fuels. 208) Install fire suppression systems. 209) Install necessary road signs along the constructed roads. 210) Install humps and speed control measures.	Contractor	UNRA
	30	Cross Boundary Impacts and Climate Change (Green House Gases (CO2))	2024	According to quantitative forecast on CO <sub>2</sub> , the project gives positive impact compared with the without project case. However, implementation of mitigation measures can minimize adverse impacts.	211) Prohibition of unnecessary idling/operation of construction machines 212) Periodical (daily, weekly and monthly) checking, and maintenance of construction machines shall be done.	Contractor	UNRA
			2018		213) All combustion equipment on site including operational machinery and generators should be serviced regularly. 214) All on site burning should be done and controlled properly. 215) Avoid cutting trees as much as possible	Contractor	UNRA

Source: JICA Survey Team

**Table 8.1.2 Environmental and Social Mitigation Measures Post Construction Phase (At the end of construction completion/ Decommissioning Phase)**

Area	No.	Item	ESIA version	Negative Impacts Or Purpose	Draft Mitigation Measures	Responsibility	
					At the end of Construction Period	Implementation Body/Agency	Responsible Agency
Natural Environment	1	Waste	2024	Remaining Construction Wastes may give negative impacts	1) All construction wastes such as waste soil, chemicals, domestic waste and night soil from construction yard/offices shall be removed from the project site.	Contractor (Construction Company)	UNRA
	2	Ecosystem	2024	Deterioration of habitat for fauna, flora species and ecosystem	2) Cut and developed area by the project shall maintain as natural grass and trees can grow.	Contractor	UNRA
Social Environment	3	Cultural Heritage	2024	Construction may cause lack of attention to the signboard of the Sir Samuel and Lady Florence historical trail	3) The signage to the signboard should be installed, if the project gives negative impacts to the board.	Contractor	UNRA
Others	4	Accident	2024	Excavated holes may cause accidents for inhabitants and wild animals	4) Developed and excavated holes and sharp slopes shall be backfilled or made flat not to cause accidents	Contractor	UNRA
	5	-	2024	Generation of construction wastes and alternation of land may give adverse impacts on humans and wildlife	5) A decommissioning and restoration plan shall be prepared and implemented in accordance with the National Environmental Regulations 2020. The decommissioning plan shall include the mitigation measures above.	Contractor	UNRA

Source: JICA Survey Team

**Table 8.1.3 Environmental and Social Mitigation Measures after Construction (Integrated Mitigation Measures for 2016, 2018 and 2024 ESIA's)**

Area	No.	Item	ESIA version	Negative Impact Or Purpose	Draft Mitigation Measures	Responsibility	
					After Construction	Implementation Body/Agency	Responsible Agency
Pollution	1	Air pollution	2024	No negative impacts are expected.	Not required. -	-	-
	2	Water pollution	2024	Deterioration of water quality due to increase of traffic volume	1) Patrol and monitoring of illegal dumping in the rivers	UNRA, UWA, Uganda Police Force (UPF) and UPDF (Uganda People's Defense Force)	UNRA and Local Governments (Kiryandongo and Oyam District)
			2016		2) Install oil trap in the connected drainage.	UNRA	UNRA
	3	Waste	2024	Illegal dumping	3) Patrol and monitoring of illegal dumping in the rivers.	UNRA, UPF and UPDF (Uganda People's Defense Force)	UNRA and Local Governments (Kiryandongo and Oyam District)
	4	Soil contamination and Sediment	2024	Soil contamination by borrow from the out of protected area	4) Borrow soil from outside of the project area for maintenance shall be inspected not polluted before carrying into the project area.	UNRA, UWA	UNRA, UWA
	5	Noise and vibration	2024	Deterioration of noise and vibration level by increase in traffic number and travelling speed	5) Uganda government shall control the driving speed on the road (UNRA requests to police department regarding strict speed control).	UNRA, UPF	UNRA, UPF
	6	Ground subsidence	2024	Not required	-	-	-
	7	Odor	2024	Increase waste volume due to increase in the number of tourist	6) Appropriate waste management and periodical monitoring is recommended by local government.	UNRA and Local Governments (Kiryandongo and Oyam District), UPF	UNRA and Local Governments (Kiryandongo and Oyam District)
	8	Sediment	2024	See No4. Soil contamination	-	-	-
Natural Environment	9, 10	Protected area and ecosystem	2024	Deterioration of habitat of the fauna and flora species in the project area and surrounding area	7) Monitoring of movement of wild animals and management of individuals which intrude to the residential area	UNRA	UNRA
				Increasing of poaching and conflicts with wild animals	8) Setting up sign board of speed limit 40km/h and no-horn at the crossing points of wild animals such as monkeys and African Elephant		

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Area	No.	Item	ESIA version	Negative Impact Or Purpose	Draft Mitigation Measures	Responsibility	
					After Construction	Implementation Body/Agency	Responsible Agency
				Increasing of roadkill	9) Installation of speed limit board and humps for prevention of roadkill and mitigate noise impacts to the wild animals. 10) Installation of animal corridor under embankment of the approach road for crossing small mammal, reptile, amphibian species. 11) Setting up of LED light in the bridge section so as not to attract insects. 12) Setting up of light with cover so as not to irradiate the river surface and outside of the road in keeping with sound lifecycle of fishes. 13) Setting up sign board of speed limit 40km/h and no-horn at the crossing points of wild animals such as monkeys and African Elephant		
	11	Hydrology	2024	Securing of irrigation channel and stream in the construction area	14) Implementation of appropriate maintenance of drainage along the approach road.	UNRA	UNRA Local Government
	12	Topography and geology	2024	Slope failure	15) Implementation of appropriate maintenance of slope protection.	UNRA	UNRA
			2018		16) Protect road embankments and slopes with stone walls, Gabions, erosion control mats.		
Social Environment	13	Involuntary Resettlement	2024	Not required	-	-	-
	14	Poverty Group	2024	Not required	-	-	-
	15	Ethnic group	2024	No negative impacts are expected.	Not required.	-	-
	16	Local economy such as employment and livelihood	2024	No negative impacts are expected.	Not required.	-	-
	17	Land use and utilization of local resources	2024	No negative impacts are expected.	Not required.	-	-
	18	Water usage	2024	No negative impacts are expected.	Not required.	-	-
	19	Existing social infrastructures and services	2024	No negative impacts are expected.	Not required.	-	-
	20	Social institutions such as local decision-making institutions	2024	No negative impacts are expected.	Not required.	-	-
	21	Unequal distribution of positive and negative impacts on the Project	2024	No negative impacts are expected.	Not required.	-	-
	22	Local conflict of	2024	No negative impacts	Not required.	-	-

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Area	No.	Item	ESIA version	Negative Impact Or Purpose	Draft Mitigation Measures	Responsibility	
					After Construction	Implementation Body/Agency	Responsible Agency
		interests		are expected.			
	23	Cultural heritage	2024	No negative impacts are expected.	Not required.	-	-
	24	Landscape	2024	No negative impacts are expected.	Not required.	-	-
	25	Gender	2024	No negative impacts are expected.	Not required.	-	-
	26	Rights of children	2024	No negative impacts are expected.	Not required.	-	-
	27	Infectious diseases	2024	Increase of infectious diseases such as Malaria and dengue fever	17) Provide adequate drainage facilities to avoid mosquito habitat. 18) Implement periodical maintenance of drainage facilities.	UNRA	UNRA
	28	Labor Environment and Safety	2024	Not required	-	-	-
Others	29	Accident	2024	Traffic safety	19) Install 40km/h speed limit signs and humps. 20) Install LED lights along approach road and bridge.	UNRA	UNRA
			2016		21) Install signs and signals at appropriate distances and locations, if necessary. 22) Use properly installed guardrails.		
			2018		23) Install road signs and speed limit signs.		
	30	Cross Boundary Impacts and Climate Change (Green House Gases (CO2))	2024	According to quantitative forecast on CO2, the project gives positive impact compared with the without project case. However, implementation of mitigation measures can minimize adverse impacts.	24) Strengthening of speed control by the police department 25) Strengthening of car inspection mechanisms to restrict vehicles from discharging high emissions	Ministry of Works and Transport, UPF	Ministry of Works and Transport, UPF

Source: JICA Survey Team

**Table 8.1.4 Major Costs of Mitigation Measures (Except General Mitigation Measures)**

Area	Phase	Mitigation Measures	Product/ Methodology	Unit	Unit Cost (USD)	Quantity	Cost (USD)	
							Secured by UNRA	Secured by donor
9,10. Protected area and ecosystem	Detailed Design and Construction	59) Tree replantation shall be carried out.	1) Herb /Shrub planting cost in ROW during const. a. Planting herb/shrub on the embankment/slope b. Planting trees in the buffer zone edge of embankment/slope (flat area with app. 5m)	Set	19,000	1		190,000
			2)Planting trees out of ROW but in the other protected area(cutting are in the ROW (2.9ha) x 3 times: 8.7 ha), Note 1	Set	40,000	1	40,000	
	Construction	68) UWA rangers shall be deployed near the project site for emergency case such as encountering with wild animals.	Allowance (Note2) (4persons/day x 36 months)	Person*Year	5,000	12	60,000	
23. Cultural Heritage	Construction	137) Conduct continuous monitoring by the Contractor during earthworks.	Allowance (2persons/day x 8 days/month x 24 months (earthwork period))	Person*day	50	384	19,200	
	Construction	139) Install signage to the signboard of the Sir Samuel and Lady Florence historical trail.	2 Signboards	Set	500	2		1,000
25. Gender	Construction	146) Provide the educational training on gender issues to the construction workers 147) Sensitize the local people about gender issues.	Training by service provider	Lump-sum	200,000	1	200,000	
26. Rights of children	Construction	160) Provide educational training to construction workers not to buy goods from children, not to have inappropriate relationship with boys and girls, not to use school facilities such as toilets and water systems, and encourage children to go to school when children are gathered at the construction site to see the work, etc. 161) Sensitize the local people and schools.	Training by service provider (See, No. 25)	(Included in No.25.)			-	
27. Infectious diseases	Construction	171) Take appropriate precautionary measures such as providing mosquito nets and purified water to construction workers. 172) Provide adequate sanitation facilities, as well as trash boxes. 173) Enforce medical screening and periodical medical check for workers. 175) Provide educational training on prevention of infectious diseases to construction workers. 176) Sensitize the local people about infectious diseases. 177) Provide condoms in sanitary facilities in the construction area and related facilities (including basecamps).	Training by service provider (See, No. 25)	(Included in No.25.)			-	
Sub Total (USD)							319,200	191,000
Total (USD)							510,200	

Note 1: Planting trees out of ROW but in the other protected area: Based on the meeting between UNRA and UWA, planting cost including maintenance cost 5 years is app. 4,600 USD/ha. Planting area 8.7 ha (affected cutting area in the project area 2.9 ha x 3 = 8.7ha) x 4,600 USD = app. 40,000 USD/5 years

Note 2: Allowance for the UWA Ranger: Based on the meeting between UNRA and UWA, the cost for a ranger per year including 1)Salary, 2)Medical, 3)Uniform, 4)Insurance, 5)Gratuity, 6)Workman's compensation, 7)Group life insurance is app. 5,000 USD/ranger/year

Source: JICA Survey Team



## 8.2. Environmental Monitoring Plan

### 8.2.1. Environmental Monitoring Plan during and after Construction

The environmental monitoring plan has established based on the impacted items and the degree of impacts. These monitoring results and implementation of mitigation measures shall be observed and managed by the project proponent, contractor, supervision consultant, environmental authorized agency, local governments, and relevant ministries.

The direct cost of monitoring during and after construction are 80,500 USD and 45,000 USD, respectively.

**Table 8.2.1 Estimated Monitoring Cost**

Cost	Cost (USD)	Remarks
1. Monitoring Cost during Construction (3 years)	80,500	Monitoring is conducted by the Contractor
2. Monitoring Cost after Construction (3 years)	45,000	Monitoring is conducted by UNRA
Total	125,500	

Source: JICA Survey Team

During construction, the Construction Contractor shall prepare the Environmental Management Plan for Construction (CEMP) and obtain permission from PMU and carry out the task under the supervision of the Consultant.

Environmental monitoring plan during the construction phase is proposed as shown in Table 8.2.2 and Table 8.2.3 and the monitoring plan at the end of construction completion is shown in Table 8.2.4. Proposed monitoring period during construction phase is three (3) years of construction period and the monitoring at the end of construction completion is proposed as one time at the end of construction.

The project will also consider the monitoring plan prepared in the 2016 ESIA approved by NEMA and 2018 ESIA prepared by UNRA. They are integrated into the monitoring plan shown in Table 8.2.5 and Table 8.2.6.

**Table 8.2.2 Mitigation Measures Monitoring Plan during Construction (Integrated Mitigation Measures for 2016, 2018 and 2024 ESIA)**

Area	No.	Item	ESIA version	Draft Mitigation Measures	Monitoring Item	Standard Value in Ugandan or International	Monitoring Point / Area	Monitoring Frequency	Implementation Agency	Monitoring Cost (USD)
				During Construction						
Pollution	1	Air pollution	2024	1) Water sprinkling and/or surface treatment shall be carried out on earth construction road and construction yard near the residential area. Additionally, surface treatment of the earth road should be considered, if required.	Implemented or Not	N/A	Construction area, haul roads and facility sites	Monthly	Contractor / UNRA	0*1
				2) Periodical cleaning shall be done on paved road used as construction road.	Implemented or Not	N/A	Construction area, haul roads and facility sites	Monthly	Contractor / UNRA	0
			2016	3) Watering the project site to reduce the dust	Implemented or Not	N/A	Construction area, haul roads and facility sites	Monthly	Contractor / UNRA	0
				4) Cover construction materials (sand, gravel, cement, etc.) on transit and on site.	Implemented or Not	N/A	Construction area, facility sites and dump trucks	Monthly	Contractor / UNRA	0
			2018	5) The speed limit should not exceed 40km/hr during construction for not to cause dusts.	Implemented or Not	N/A	Construction area, haul roads and facility sites	Monthly	Contractor / UNRA	0
				6) Cover trucks transporting construction materials for not to cause dusts.	Implemented or Not	N/A	Construction area, facility sites and dump trucks	Monthly	Contractor / UNRA	0
				7) Avoid open stock piling	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
	2	Water pollution	2024	8) Turbid water from unpaved construction area shall be treated in sedimentation pond and discharged into the river, if required.	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
				9) Waste oil of construction machines shall be stored and disposed through a licensed agent.	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
				10) Construction machines shall be maintained so as not to leak oil in the base camp site and construction site.	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
				11) Provision of sanitation facilities at the basecamps and construction site. Also, the location of camps should avoid water sources such as springs and wells.	Installed or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
				12) Domestic wastewater and night soil from basecamp shall be treated and/or discharged of at designated sites and	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0

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				During Construction						
				facilities.						
				13) Use portable toilet in the construction area and disposed the night soil at the designated dumping site.	Installed or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
				14) Install oil trapping equipment in areas when there a likelihood of oil spillage such as during the maintenance of construction equipment.	Installed or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
				15) After completing the bridge, cleaning up whole temporary constructions on shore as well as under the river, including steel, redundant concrete, surrounding frame and equipment such as excavators, bucket, crane, etc.	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
			2016	16) Minimize of effects to surface water and deposit.	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
				17) Enforce buffer distance regulations from surface water sources.	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
				18) Design vehicle wash areas so as not to contaminate the environment.	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
	3	Waste	2024	19) Waste soil from the cutting section is reused for embankment material for road section. However, Waste soil shall be disposed at the designated site, if such waste soil is generated from the construction area.	Implemented or Not	N/A	Construction area (cutting section)	Monthly	Contractor / UNRA	0
				20) Cut trees are used as manure, building materials and for other purposes.	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
				21) Waste oil of the construction machines is collected and disposed through a licensed agent.	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
				22) Waste chemical and hazardous material are stored at the base camp site and disposed through a licensed agent.	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
				23) Domestic solid waste from base camp shall be collected and disposed at the designated disposal site.	Implemented or Not	N/A	Base-camp site (including relevant offices)	Monthly	Contractor / UNRA	0

Area	No.	Item	ESIA version	Draft Mitigation Measures	Monitoring Item	Standard Value in Ugandan or International	Monitoring Point / Area	Monitoring Frequency	Implementation Agency	Monitoring Cost (USD)
				During Construction						
				24) Domestic wastewater and night soil shall be treated through septic tank and discharged into the natural stream. Water quality of the effluent shall be confirmed before discharging it into natural water body.	Implemented or Not	N/A	Base-camp site (including relevant offices)	Monthly	Contractor / UNRA	0
			2016	25) Ensure promptly cleaning of construction wastes.	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
				26) Reusable construction wastes should be piled up in the scope of site clearance for collection and the transportation to designated re-use site.	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
				27) Non-reusable construction wastes should not be kept in the construction area and to be transported to designated site.	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
				28) Strictly forbidding all actions of burning at project site.	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
				29) To provide regulation on solid waste management at construction site, specifying strict prohibition of discharging solid wastes in uncontrolled manner to the surrounding environment and to the river flows.	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
				30) Provide camp site with portable toilets, collect sludge from septic tank and remove toilets after finishing construction.	Installed or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
				31) Collecting waste into proper storage yard, keeping temporarily and transporting the waste to designated sites – dump sites or waste treatment points.	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
				32) Ensure efficient use of construction materials to avoid unnecessary waste.	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
			2018	33) Locate worker's camps and equipment yards away from communities.	Implemented or Not	N/A	Base-camp and accommodation	Monthly	Contractor / UNRA	0
				34) Transportation and disposal of hazardous waste will be undertaken by licensed transporters to facilities	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0

Area	No.	Item	ESIA version	Draft Mitigation Measures	Monitoring Item	Standard Value in Ugandan or International	Monitoring Point / Area	Monitoring Frequency	Implementation Agency	Monitoring Cost (USD)
				During Construction						
				licensed for storage and disposal of hazardous waste.						
				35) Develop onsite sewage management systems	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
				36) Hazardous waste should be stored in facilities designed and licensed for storage of hazardous waste by NEMA	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
				37) Wherever feasible, waste recovery and reuse will be undertaken.	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
	4	Soil contamination and Sediment	2024	38) Excavated soil shall be analyzed, and it shall be confirmed if the quality is below standard values. Polluted soil shall be used as construction material after treatment or disposed/ or stored at the designated site if excavated soil is polluted.	Implemented or Not (analyzed item is shown in soil contamination monitoring)	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
				39) Borrow soil from outside of project area shall be inspected not polluted before carrying into the project area.	Implemented or Not (analyzed item is shown in soil contamination monitoring)	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
				40) Construction machines shall be maintained so as not to leak oil in the base camp site.	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
				41) Waste oil of the construction machines is collected and disposed through a licensed agent.	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
				42) Waste chemical and hazardous material shall be stored at the base camp site and disposed through a licensed agent.	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
				43) Install oil trapping equipment in areas when there a likelihood of oil spillage such as during the maintenance of construction equipment.	Installed or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
	5	Noise and vibration	2024	44) Construction activities and operation of construction machines shall be limited in the daytime.	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
				45) Construction machines shall be well-maintained and checked every day.	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0

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				During Construction						
				46) Information disclosures, such as construction schedule and activities, shall be carried out in advance to the surrounding community, if the residential area is located near construction area.	Implemented or Not	N/A	Surrounding communities	Monthly	Contractor / UNRA	0
			2016	47) Ensure regular servicing of construction equipment	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
				48) Use low noise generating equipment	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
			2018	49) Ensure vehicle and equipment maintenance schedules are followed.	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
				50) Vehicles and equipment generating excessive noise shall not be operated on the project.	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
	6	Odor	2024	51) Domestic waste from basecamp and accommodation shall be stored properly by separated garbage boxes.	Implemented or Not	N/A	Base-camp site and accommodation	Monthly	Contractor / UNRA	0
				52) Domestic solid waste is collected and disposed at the nearest designated disposal site.	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
				53) Domestic wastewater and night soil shall be treated through septic tank or/and portable toilet and discharged into the natural stream or/and collected and disposed through a licensed agent.	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
				54) Waste oil of the construction machines is collected and disposed through a licensed agent.	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
				55) Waste chemical and hazardous material are stored at the base camp site and disposed through a licensed agent.	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
Natural Environment	7	Protected area and ecosystem	2024	56) Affected area shall be marked and all relevant construction workers and communities shall be informed not to conduct development outside of the project area.	Implemented or Not	N/A	Boundary of the Construction area	Monthly	Contractor / UNRA	0
				57) Waste oil shall be stored and disposed to the designated site or disposed by the licensed agent so as not to leak into the	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0



Area	No.	Item	ESIA version	Draft Mitigation Measures	Monitoring Item	Standard Value in Ugandan or International	Monitoring Point / Area	Monitoring Frequency	Implementation Agency	Monitoring Cost (USD)
				During Construction						
				water body and on land.						
				58) Domestic waste in the construction area shall be stored properly for not to attract wild animals and disposed at the designated site.	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
				59) <u>Tree replantation shall be carried out.</u>	Implemented or Not	N/A	Construction area and surrounding area	Monthly	Contractor / UNRA	0
				60) Borrow soil from out of project area shall be inspected not included alien plant species before carrying into the protected area.	Implemented or Not	N/A	Construction area	Monthly	Contractor / UNRA	0
				61) Prohibition of blasting and adoption of lower noise and vibration construction methods	Implemented or Not	N/A	Construction area	Monthly	Contractor / UNRA	0
				62) Construction area shall be restored as the original condition after construction.	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
				63) Lighting in the nighttime shall be minimized at night-time so as not to cause adverse impacts on the wild animals such as Hippopotamus and Elephant.	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
				64) Avoid to park construction machines in the protected area for not to disturb crossing animals.	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
				65) Obstacles such as tall fences shall not be installed in the vicinity of project site and the road embankment shall provide for gentle slopes as possible in order not prevent animals from crossing the road.	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
				66) Relocate and/or induce valuable species to escape out of the construction area before construction activities begin with assistance of UWA rangers	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
				67) Poaching by construction workers shall be prohibited. Policy and regulations regarding natural environmental protection shall be instructed.	Implemented or Not	N/A	Workers of the construction area and facility sites	Monthly	Contractor / UNRA	0
				68) <u>UWA rangers shall be deployed near the project site for emergency case such as encountering with wild animals.</u>	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0

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				During Construction						
				69) Construction machines shall maintain speed limit of less than 40km/h not to cause roadkill in the construction area.	Implemented or Not	N/A	Construction area, facility sites and haul roads	Monthly	Contractor / UNRA	0
				70) Limit construction to as short a time as possible and it should take place during the daytime when the visual range is substantial.	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
			2016	71) Clearing should not exceed areas not used for construction specifications.	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
				72) Construction workers should not clear vegetation for use as fuel wood as it will exacerbate more clearing.	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
				73) Re-vegetate/planting of trees	Implemented or Not	N/A	Construction area and surrounding area	Monthly	Contractor / UNRA	0
				74) Illegal hunting of wildlife by construction workers as a source of food should be strictly prohibited.	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
				75) Limit vehicle speeds during delivery of construction materials to the site. Speeds should be controlled within prescribed KWR sections.	Implemented or Not	N/A	Construction area, facility sites and haul roads	Monthly	Contractor / UNRA	0
			2018	76) Construction related facilities such as Base camps, borrow pits, quarry site and wells should not be constructed in the construction area and protected area	Implemented or Not	N/A	Base-camp site and facility sites	Monthly	Contractor / UNRA	0
				77) Do not stockpile near sensitive environments along the river.	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
				78) Restore all ecologically sensitive sites after construction phase using spoil.	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
				79) Manage the existing invasive plant species spread through sensitizations.	Implemented or Not	N/A	Construction area	Monthly	Contractor / UNRA	0
				80) Ensure no foreign plant species are introduced in the Wildlife Reserve by Quarantine and treating equipment before introducing them into the conservation area.	Implemented or Not	N/A	Construction area	Monthly	Contractor / UNRA	0
				81) Efforts through mechanical elimination of invasive plants within the project areas should be made.	Implemented or Not	N/A	Construction area	Monthly	Contractor / UNRA	0
				82) Develop and implement a waste management plan not to attract wild	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0

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Area	No.	Item	ESIA version	Draft Mitigation Measures	Monitoring Item	Standard Value in Ugandan or International	Monitoring Point / Area	Monitoring Frequency	Implementation Agency	Monitoring Cost (USD)
				During Construction						
				animals.						
				83) Solid waste disposal sites will be located away from watercourses and have restricted access.	Implemented or Not	N/A	Base-camp site and facility site	Monthly	Contractor / UNRA	0
				84) Use low noise and vibration equipment.	Installed or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
				85) No night works	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
				86) Sensitization of workers on dangers of poaching	Implemented or Not	N/A	Workers in the Construction area and facility sites	Monthly	Contractor / UNRA	0
				87) Code of conduct to ensure workers do not engage in poaching, trading, and consumption of game meat.	Implemented or Not	N/A	Workers in the Construction area and facility sites	Monthly	Contractor / UNRA	0
				88) Maintain a realistic buffer distance from the animals.	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
				89) Locate worker's camps and equipment yards away from KWR and sensitive ecosystems.	Implemented or Not	N/A	Base-camp site, accommodation and relevant offices	Monthly	Contractor / UNRA	0
				90) Install speed humps at interval of 0.2-0.5 km along the approaching routes.	Installed or Not Number of road-kill	N/A	Construction area, facility sites and haul roads	Monthly	Contractor / UNRA	0
				91) Install appropriate road signage on speed limits and animal crossing corridors.	Installed or Not Number of road-kill	N/A	Construction area, facility sites and haul roads	Monthly	Contractor / UNRA	0
				92) Mark off all identified animal crossing points	Installed or Not Number of road-kill	N/A	Construction area, facility sites and haul roads	Monthly	Contractor / UNRA	0
	8	Hydrology	2024	93) Diversion of irrigation channels and/or streams shall be set up if the project activities give impacts on such streams and irrigation.	Implemented or Not	N/A	Construction area and facility sites	Monthly	Contractor / UNRA	0
	9	Topography and geology	2024	94) The slope gradient for earthwork section is designed in accordance with the applicable design manuals.	Implemented or Not	N/A	Embankment and slope in the construction area	Monthly	Contractor / UNRA	0
				95) Implementation of slope protection methods such as turf work, seed spraying treatment, shotcrete, etc.	Implemented or Not	N/A	Embankment and slope in the construction area	Monthly	Contractor / UNRA	0
			2018	96) Protect road embankments and slopes with stone walls, Gabions, erosion control mats.	Implemented or Not	N/A	Embankment and slope in the construction area	Monthly	Contractor / UNRA	0

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Area	No.	Item	ESIA version	Draft Mitigation Measures	Monitoring Item	Standard Value in Ugandan or International	Monitoring Point / Area	Monitoring Frequency	Implementation Agency	Monitoring Cost (USD)
				During Construction						
Social Environment	10	Poverty Group	2024	97) Provide equal job opportunities for the local people as construction workers.	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
				98) Announce the schedule, conditions, requirements, duration, etc. for recruiting all skilled, semi-skilled, and unskilled labors in places where the local people can easily observe, such as the town centre, local council office, and meeting places.	Implemented or Not	N/A	Local community in the vicinity of construction area (Diima SC, Karuma TC, and Kamdini SC)	Monthly	Contractor/ UNRA	0
				99) Priority will be given to employ the local people whenever possible and minimize the influx of construction workers from other areas.	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
	11	Ethnic group	2024	100) Ensure a clear principle of no discrimination based on the ethnicity in the selection process of construction workers.	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
				101) Provide equal job opportunities for the local people as construction workers.	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
				102) Announce the schedule, conditions, requirements, duration, etc. for recruiting all skilled, semi-skilled, and unskilled labors in places where the local people can easily observe, such as town center, local council office, and meeting places.	Implemented or Not	N/A	Local community in the vicinity of construction area (Diima SC, Karuma TC, and Kamdini SC)	Monthly	Contractor/ UNRA	0
				103) Priority will be given to employ the local people whenever possible and minimize the influx of construction workers from other areas.	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
	12	Local economy such as employment and livelihood	2024	104) Information on the detailed construction plan, including schedule, location construction area and related facilities, and traffic control area, should be disseminated in advance.	Implemented or Not	N/A	Local community in the vicinity of construction area (Diima SC, Karuma TC, and Kamdini SC)	Monthly	Contractor/ UNRA	0
				105) Ensure access to the entrances of shops, restaurants, etc. in the vicinity of construction area, related facilities, and traffic control area.	Implemented or Not	N/A	In the vicinity of construction area, related facilities, and traffic control area	Monthly	Contractor/ UNRA	0

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Area	No.	Item	ESIA version	Draft Mitigation Measures	Monitoring Item	Standard Value in Ugandan or International	Monitoring Point / Area	Monitoring Frequency	Implementation Agency	Monitoring Cost (USD)
				During Construction						
				106) Provide equal job opportunities for the local people as construction workers.	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
				107) Establish a GRM to resolve complaints received from the local people.	Implemented or Not	N/A	Local community in the vicinity of construction area (Diima SC, Karuma TC, and Kamdini SC)	Monthly	Contractor/ UNRA	0
				108) Ensure people from local community are given priority where appropriate.	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
				109) Provide information about the availability of employment opportunities and qualifications needed.	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
				110) Provide on-the-job training to construction workers recruited from the local community.	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
				111) Encourage and motivate contractors to buy locally available construction materials.	Implemented or Not	N/A	Local community in the vicinity of construction area (Diima SC, Karuma TC, and Kamdini SC)	Monthly	Contractor/ UNRA	0
	13	Land use and utilization of local resources	2024	112) Information on the detailed construction plan, including schedule, location of construction area and related facilities, traffic control area should be disseminated in advance.	Implemented or Not	N/A	Local community in the vicinity of construction area (Diima SC, Karuma TC, and Kamdini SC)	Monthly	Contractor/ UNRA	0
				113) In order to avoid traffic disruption due to the complete closure, the existing Karuma Bridge will be maintained, and traffic will be kept on the existing Karuma Bridge during construction of the new bridge.	Implemented or Not	N/A	Existing Karuma Bridge	Monthly	Contractor/ UNRA	0
				114) Provide detour to the river, as necessary.	Implemented or Not	N/A	Construction area and related facilities	Monthly	Contractor/ UNRA	0
				115) Construction workers should not extract local resources such as fish and firewood.	Implemented or Not	N/A	Construction area and related facilities	Monthly	Contractor/ UNRA	0
				116) Establish a GRM to resolve complaints received from the local people.	Implemented or Not	N/A	Local community in the vicinity of construction area (Diima SC, Karuma TC, and Kamdini SC)	Monthly	Contractor/ UNRA	0

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Area	No.	Item	ESIA version	Draft Mitigation Measures	Monitoring Item	Standard Value in Ugandan or International	Monitoring Point / Area	Monitoring Frequency	Implementation Agency	Monitoring Cost (USD)
				During Construction						
	14	Water usage	2024	117) Priority will be given to employ the local people whenever possible and minimize the influx of construction workers from other areas.	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
				118) The contractor should prepare water supply plan for construction including drinking water and obtain the Water Abstract Permit from Directorate of Water Resource Management.	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
				119) Establish a GRM to resolve complaints received from the local people.	Implemented or Not	N/A	Local community in the vicinity of construction area (Diima SC, Karuma TC, and Kamdini SC)	Monthly	Contractor/ UNRA	0
			2018	120) The contractor should develop a water supply plan and consult with the local authority (Local Council) prior to using existing water sources.	Implemented or Not	N/A	Local community in the vicinity of construction area (Diima SC, Karuma TC, and Kamdini SC)	Monthly	Contractor/ UNRA	0
	15	Existing social infrastructures and services	2024	121) Information on the detailed construction plan, including schedule, location of construction area and related facilities, and traffic control area, should be disseminated in advance.	Implemented or Not	N/A	Local community in the vicinity of construction area (Diima SC, Karuma TC, and Kamdini SC)	Monthly	Contractor/ UNRA	0
				122) In order to avoid traffic disruption due to the complete closure, the existing Karuma Bridge will be maintained, and traffic will be kept on the existing Karuma Bridge during the construction of new bridge.	Implemented or Not	N/A	Existing Karuma Bridge	Monthly	Contractor/ UNRA	0
				123) Traffic guides will be deployed in the vicinity of construction area, related facilities, and traffic control area.	Implemented or Not	N/A	Construction area and related facilities	Monthly	Contractor/ UNRA	0
				124) Provision of detour to the existing social infrastructures and services, as necessary.	Implemented or Not	N/A	Construction area and related facilities	Monthly	Contractor/ UNRA	0
				125) Establish a GRM to resolve complaints from the local people.	Implemented or Not	N/A	Local community in the vicinity of construction area (Diima SC, Karuma TC, and Kamdini SC)	Monthly	Contractor/ UNRA	0



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				During Construction						
	16	Unequal distribution of positive and negative impacts of the Project	2024	126) Establish a GRM for the Project by harmonizing the existing similar system.	Implemented or Not	N/A	Local community in the vicinity of construction area (Diima SC, Karuma TC, and Kamdini SC)	Monthly	Contractor/ UNRA	0
				127) Explain the GRM for the Project to the local people in continuous public consultations.	Implemented or Not	N/A	Local community in the vicinity of construction area (Diima SC, Karuma TC, and Kamdini SC)	Monthly	Contractor/ UNRA	0
				128) Provide the equal job opportunities to the local people as construction workers.	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
				129) Priority will be given to employ the local people whenever possible and minimize the influx of construction workers from other areas.	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
				130) Provide guidance to construction workers hired from other areas to avoid conflicts with the local people.	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
			2018	131) The contractor will encourage potential workers to get recommendation from local leaders (LC) to be eligible in the hiring of construction workers to ensure that those hired do not have criminal records.	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
				132) Ensure fair wages of construction workers hired for the Project.	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
				133) Information on the Project will be disseminated transparently to the local community.	Implemented or Not	N/A	Local community in the vicinity of construction area (Diima SC, Karuma TC, and Kamdini SC)	Monthly	Contractor/ UNRA	0
				134) Continue to communicate with the local community from the survey period to ensure that all concerns are addressed.	Implemented or Not	N/A	Local community in the vicinity of construction area (Diima SC, Karuma TC, and Kamdini SC)	Monthly	Contractor/ UNRA	0
	17	Cultural heritage	2024	135) Consult with cultural leaders in advance to minimize disruption and concern to the local people, and to avoid unanticipated damage to symbolic and/or sacred trees and rocks, and other important resources.	Implemented or Not	N/A	Local community in the vicinity of construction area (Diima SC, Karuma TC, and Kamdini SC)	Monthly	Contractor/ UNRA	0

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Area	No.	Item	ESIA version	Draft Mitigation Measures	Monitoring Item	Standard Value in Ugandan or International	Monitoring Point / Area	Monitoring Frequency	Implementation Agency	Monitoring Cost (USD)
				During Construction						
				136) Develop and follow a “ <i>Chance Finds Procedure</i> ” to prevent damage to archaeological and historical resources.	Implemented or Not	N/A	Construction area and related facilities	Monthly	Contractor/ UNRA	0
				137) <u>Conduct continuous monitoring by the Contractor during earthworks.</u>	Implemented or Not	N/A	Construction area and related facilities	Monthly	Contractor/ UNRA	0
				138) Provide training on cultural site and archaeological and historical resources to the construction workers.	Implemented or Not	N/A	Construction area and related facilities	Monthly	Contractor/ UNRA	0
				139) <u>Install signage to the signboard of the Sir Samuel and Lady Florence historical trails.</u>	Implemented or Not	N/A	Where the signboard will be improved	Monthly	Contractor/ UNRA	0
			2016	140) Project activities involving earthworks must include an approved “Chance Finds Procedure” in construction contracts, to cover the possibility of discovering physical cultural heritage in the course of excavation.	Implemented or Not	N/A	Construction area and related facilities	Monthly	Contractor/ UNRA	0
	18	Landscape	2024	141) Adoption of color of the bridge harmonized with the surrounding current landscape	Implemented or Not	N/A	Bridge designing and color in the Construction area	Monthly	Contractor/ UNRA	0
			2018	142) Landscaping along the road in the Karuma Wildlife Reserve.	Implemented or Not	N/A	Construction area	Monthly	Contractor/ UNRA	0
	19	Gender	2024	143) Development of the Code of Conduct for Contractor in conformity with gender policy and Employment Act, Cap 219.	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
				144) Provide equal job opportunities and fair salary regardless of gender (including positive segregation mechanism to ring fence some jobs for women).	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
				145) Install the sanitary facilities in considering gender at construction are and related facilities (including basecamp).	Installed or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
				146) <u>Provide the educational training on gender to construction workers.</u>	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
				147) <u>Sensitize the local people on gender issues.</u>	Implemented or Not	N/A	Local community in the vicinity of construction area (Diima SC, Karuma TC, and Kamdini SC)	Monthly	Contractor/ UNRA	0

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Area	No.	Item	ESIA version	Draft Mitigation Measures	Monitoring Item	Standard Value in Ugandan or International	Monitoring Point / Area	Monitoring Frequency	Implementation Agency	Monitoring Cost (USD)
				During Construction						
				148) Ensure a certain distance between the local community and the basecamp.	Implemented or Not	N/A	Basecamp	Monthly	Contractor/ UNRA	0
				149) Establish a GRM to resolve complaints received from the local people with several options for submitting complaints (including the option that the local people can access to the local NGOs).	Implemented or Not	N/A	Local community in the vicinity of construction area (Diima SC, Karuma TC, and Kamdini SC)	Monthly	Contractor/ UNRA	0
				150) Ensure anonymity to protect privacy when submitting complaints, if requested by the complainant.	Implemented or Not	N/A	Local community in the vicinity of construction area (Diima SC, Karuma TC, and Kamdini SC)	Monthly	Contractor/ UNRA	0
			2018	151) Female workers will be sensitized on their sexual rights.	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
				152) Have policies to promote non-discrimination and equal opportunities.	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
				153) Establish zero tolerance policies and codes of conduct related to violence against women and girls.	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
				154) Explain and educate construction workers about laws prohibiting sex work.	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
				155) Consider the gender for facilities for construction workers such as restrooms and bathrooms.	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
				156) Pay equal wages for work of equal value by women and men.	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
	20	Rights of children	2024	157) Follow the relevant national legal frameworks on children's rights such as the Children Act (Cap 59), and international standards such as IFC Performance Standard 2.	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
				158) Include a strict "no child labor" rule in the contractor's contract.	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
				159) When selecting construction workers, identification cards, etc. will be checked to verify age.	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0

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				During Construction						
				160) Provide educational training to construction workers not to buy goods from children, not to have inappropriate relationship with boys and girls, not to use school facilities such as toilets and water systems, and encourage children to go to school when children are gathered at the construction site to see the work, etc.	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
				161) Sensitize the local people and schools.	Implemented or Not	N/A	Local community in the vicinity of construction area (Diima SC, Karuma TC, and Kamdini SC)	Monthly	Contractor/ UNRA	0
				162) Install security facilities such as signboard in the vicinity of construction area and related facilities.	Implemented or Not	N/A	Construction area and related facilities	Monthly	Contractor/ UNRA	0
			2018	163) The contractor will develop a child protection plan and provide it to the local stakeholders.	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
				164) Prevent contractors from hiring children as construction workers.	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
				165) Ensure that the local community has access to and know of and report abuse using the national child abuse hotline 116.	Implemented or Not	N/A	Local community in the vicinity of construction area (Diima SC, Karuma TC, and Kamdini SC)	Monthly	Contractor/ UNRA	0
				166) Keep children off construction area to ensure controlled interaction between children and construction workers.	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
				167) Ensure close monitoring of construction workers' behavior and conduct.	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
				168) Parents/ guardians should be sensitized and held accountable for children leaving and arriving home before dark.	Implemented or Not	N/A	Local community in the vicinity of construction area (Diima SC, Karuma TC, and Kamdini SC)	Monthly	Contractor/ UNRA	0
	21	Infectious diseases	2024	169) Follow the relevant national legal frameworks related to the work environment such as the Occupational Safety and Health Act No. 9 (2006), and international standards such as IFC Performance Standard 2.	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0

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Area	No.	Item	ESIA version	Draft Mitigation Measures	Monitoring Item	Standard Value in Ugandan or International	Monitoring Point / Area	Monitoring Frequency	Implementation Agency	Monitoring Cost (USD)
				During Construction						
				170) Prevent the creation of vector mosquito habitats by installing appropriate drainage facilities in the construction area and related facilities.	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
				171) <u>Take appropriate precautionary measures such as providing mosquito nets and purified water to construction workers.</u>	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
				172) <u>Provide adequate sanitation facilities, as well as trash boxes.</u>	Installed or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
				173) <u>Enforce medical screening and periodical medical check for workers.</u>	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
				174) <u>No to discriminate against HIV/ AIDS infected persons in hiring construction workers.</u>	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
				175) <u>Provide educational training on prevention of infectious diseases to construction workers.</u>	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
				176) <u>Sensitize the local people about infectious diseases.</u>	Implemented or Not	N/A	Local community in the vicinity of construction area (Diima SC, Karuma TC, and Kamdini SC)	Monthly	Contractor/ UNRA	0
				177) <u>Provide condoms in sanitary facilities in the construction area and related facilities (including basecamps).</u>	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
			2018	178) <u>Maintain a strict “no socializing” policy to prevent basecamps from becoming hotspots for prostitution or illicit sexual relations.</u>	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
				179) <u>HIV/AIDS sensitization programs shall be conducted at the basecamps.</u>	Implemented or Not	N/A	In the vicinity of basecamps	Monthly	Contractor/ UNRA	0
	22	Labor Environment and Safety	2024	180) <u>Follow the relevant national legal frameworks related to the work environment such as the Occupational Safety and Health Act No. 9 (2006), and international standards such as IFC Performance Standard 2.</u>	Implemented or Not	N/A	In the vicinity of basecamps	Monthly	Contractor/ UNRA	0
				181) <u>Establish a response system in the event of an accident due to construction.</u>	Implemented or Not	N/A	Construction area and related facilities (including	Monthly	Contractor/ UNRA	0

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Area	No.	Item	ESIA version	Draft Mitigation Measures	Monitoring Item	Standard Value in Ugandan or International	Monitoring Point / Area	Monitoring Frequency	Implementation Agency	Monitoring Cost (USD)
				During Construction						
				patient transport, or other emergencies.			basecamps)			
				182) Implement countermeasures against “Tsetse fly.”	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
			2016	183) Use of Person Protection Equipment (PPE) such as earplugs and masks to those working in the vicinity of construction area and related facilities.	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
				184) Establish safety regulations in the construction area and related facilities.	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
				185) Install first aid kit.	Installed or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
				186) Provide adequate training on safety measures for construction workers.	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
				187) Prepare emergency rescue plans.	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
			2018	188) Develop and implement a health and safety plan.	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
				189) Provide construction workers with appropriate ear protection.	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
				190) Implement health and safety training programs for construction workers.	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
				191) Develop and implement a security management plan that includes clear measures to protect construction workers.	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
				192) Develop and implement an occupational health and safety plan in line with the “Occupational Safety and Health Act (2016).”	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
				193) Hire and assign a professional safety manager.	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0



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				During Construction						
				194) Assign an occupational safety committee for the Project.	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
				195) Develop an emergency and contingency plan.	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
				196) Develop and communicate policies to construction workers, supervisors and supervisory personnel to promote non-discrimination and to promote equal treatment.	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
				197) No decisions regarding employment, working conditions, pay, benefits, or termination will be based on discriminatory grounds.	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
Others	23	Accident	2024	198) Traffic guides will be assigned to construction area and related facilities, and traffic control area.	Installed or Not	N/A	Construction area and related facilities	Monthly	Contractor/ UNRA	0
				199) Install safety signs, including speed limits, in the construction area and related facilities, and traffic control area.	Installed or Not	N/A	Construction area and related facilities	Monthly	Contractor/ UNRA	0
				200) Install nighttime lighting facilities in the construction area and related facilities, and traffic control area.	Installed or Not	N/A	Construction area and related facilities	Monthly	Contractor/ UNRA	0
				201) Limit traffic speed to 40 km/h in the vicinity of construction area, related facilities, and traffic control area.	Implemented or Not	N/A	Construction area and related facilities	Monthly	Contractor/ UNRA	0
				202) Provide safety training for construction workers.	Implemented or Not	N/A	Construction area and related facilities	Monthly	Contractor/ UNRA	0
				203) Establish a response system in the event of an accident due to construction, patient transport, or other emergencies.	Implemented or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
				204) Sensitize the local people and schools.	Implemented or Not	N/A	Local community in the vicinity of construction area (Diima SC, Karuma TC, and Kamdini SC)	Monthly	Contractor/ UNRA	0
			2016	205) Install signs and warnings in the hazardous areas of construction area and related facilities.	Installed or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor/ UNRA	0
			2018	206) Screen offsite to prevent intrusion from the local community.	Installed or Not	N/A	Construction area and related facilities (including	Monthly	Contractor/ UNRA	0

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				During Construction						
							basecamps)			
				207) Install storage for fuels.	Installed or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor / UNRA	0
				208) Install fire suppression systems.	Installed or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor / UNRA	0
				209) Install necessary road signs along the constructed roads.	Installed or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor / UNRA	0
				210) Install humps and speed control measures.	Installed or Not	N/A	Construction area and related facilities (including basecamps)	Monthly	Contractor / UNRA	0
	24	Cross Boundary Impacts and Climate Change (Green House Gases (CO <sub>2</sub> ))	2024	211) Prohibition of unnecessary idling/operation of construction machines	Installed or Not	N/A	Construction area, facility site and haul roads	Monthly	Contractor / UNRA	0
				212) Periodical (daily, weekly and monthly) checking, and maintenance of construction machines shall be done.	Installed or Not	N/A	Construction area and facility site	Monthly	Contractor / UNRA	0
			2018	213) All combustion equipment on site including operational machinery and generators should be serviced regularly.	Implemented or Not	N/A	Construction area and facility site	Monthly	Contractor / UNRA	0
				214) All on site burning should be done and controlled properly.	Implemented or Not	N/A	Construction area and facility site	Monthly	Contractor / UNRA	0
				215) Avoid cutting trees as much as possible	Implemented or Not	N/A	Construction area and facility site	Monthly	Contractor / UNRA	0

Source: JICA Survey Team

**Table 8.2.3 Environmental Monitoring Plan Pre and During Construction Phase (3 years)**

Area	No.	Item	Parameter	Method	a) Number of Location / Survey Area	b) Frequency per Year	c) Construction Period (year)	d) Total Number (a) x b) x c)	e) Unit Cost (USD)	Direct Cost (USD) (d) x e)	Conservation Target*3
Natural Environment	1	Air pollution	1) TSP, 2) PM10, 3) PM2.5, 4) Carbon dioxide (CO <sub>2</sub> ), 5) Carbon monoxide (CO), 6) Hydrocarbons, 7) Nitrogen oxides (NO <sub>x</sub> ), 8) Nitrogen dioxide (NO <sub>2</sub> ), 9) Sulphur dioxide (SO <sub>2</sub> ), 10) Sulphur trioxide (SO <sub>3</sub> ), 11) Smoke, 12) Soot	Based on the National Environment (Air Quality Standards) Regulations, 2024 and / or the same methodology of baseline surveys	<b>4 Locations</b> Where baseline monitoring was carried out (Air-01, 02, 03, 04) *Coordinate Air-1: 36N 415989.39 m E, 246481.68 m N Air-2: 36N 414980.01 m E, 247690.21 m N Air-3: 36N 413217.40 m E, 246128.63 m N Air-4: 36N 417499.59 m E, 247407.36 m N	1) Baseline Survey before Construction activities 2) Once / year (dry season)	<b>3.0</b>	<b>16</b> (4 points x 4 times)	<b>1,000</b>  (All parameter)	<b>16,000</b>	<b>*1: The National Environment (Air Quality Standards) Regulations, 2024</b> <b>*2: Environmental, Health, and Safety General Guidelines (IFC, April 30th, 2007)</b> <b>*3: Environmental Quality Standards in Japan - Air Quality 1973</b>  [Air Emissions] Maximum limit values of ambient air quality parameters 1. PM <sub>10</sub> (Ø<10µm) · 24hrs : 60 µg/m <sup>3</sup> *1 2. PM <sub>2.5</sub> (Ø<2.5µm) · 24hrs : 35 µg/m <sup>3</sup> *1 3. CO · 24hrs : 7mg /m <sup>3</sup> (6ppm)*1 4. NO <sub>2</sub> · 24hrs : 50µg /m <sup>3</sup> (0.026ppm)*1 5. SO <sub>2</sub> 24hrs : 20µg/m <sup>3</sup> (0.0008ppm) *1
	2	Water quality	1)BOD, 2)Temperature, 3)E-coli form, 4)Total dissolved solids, 5)Total hardness(as CaCO <sub>3</sub> ), 6)Aluminum (Al), 7)Chloride (Cl), 8)Total Iron (Fe), 9)Sodium (Na), 10)Sulphate (SO <sub>4</sub> ), 11)Zinc (Zn), 12)Magnesium (Mg), 13)Calcium (as Ca), 14)Potassium (K), 15)Colour (TCUa max), 16)Turbidity (NTU), 17)pH, 18)Conductivity (µS/cm), 19) Dissolved Oxygen, 20) Oil and Grease	Based on the Draft Portable waters standards as per the Uganda draft standard for portable water 2014 (Untreated/Natural portable Water Limits) and/or same methodology of baseline surveys	<b>3 Locations</b> Where baseline monitoring was carried out (WQ01, 02, 03) *Coordinates WQ-01: 36N 418784.00 m E, 248320.00 m N WQ-02: 36N 415458.00 m E, 247889.00 m N WQ-03: 36N 410255.00 m E, 245207.00 m N	1) Baseline Survey before Construction activities 2) 2 times / year (Dry and Rainy Season)	<b>3.0</b>	<b>21</b> (3 points x 7 times)	<b>1,000</b>	<b>21,000</b>	<b>*1: Draft Portable waters standards as per the Uganda draft standard for portable water 2014 (Untreated/Natural portable Water Limits)</b> <b>*2: Ministry of Environment in Japan (River Water Quality / Category D River)</b> [Site Runoff and Wastewater Discharges (Construction Phase)] 1. BOD : 8 mg/l*2 2. Total Dissolved Solids: 1,500 mg/l 3. Turbidity: 25 NTU*1 4. pH: 5.5-9.5*1 5. Conductivity: 2,500 µS/cm*1 6. Dissolved Oxygen: >=2 mg/l *2

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Area	No.	Item	Parameter	Method	a) Number of Location / Survey Area	b) Frequency per Year	c) Construction Period (year)	d) Total Number (a) x b) x c)	e) Unit Cost (USD)	Direct Cost (USD) (d) x e)	Conservation Target*3
Natural Environment	3	Waste	Volume of waste soil, cut trees and domestic garbage	Record volume of generated waste in the project area	<u>Base-Camp site and Construction site</u>	<u>12 times (Monthly)</u>	3.0	36	- (including construction cost)	0	Generated construction waste and domestic shall be reused or disposed of at designated site properly.
	4	Soil contamination and sedimentation quality	1) Cadmium, 2) Hexavalent chromium, 3) Mercury, 4) Lead, 5) Arsenic, 6) Cyanide, 7) Selenium, 8) Fluorine, 9) Boron	Same methodology of baseline surveys	<u>2 Locations in the project area (Excavated area)</u> <u>2 Locations (Borrow pits out of project area)</u>	<u>1 time (during construction period) (before excavation and transporting borrow soil)</u>	3.0	12 (4 points x 3 times)	1,000	12,000	There are no law-based criteria nor international guidelines to be followed, thus the following is established as conservation target <u>Japanese Standard: Environmental Quality Standards for Soil Pollution, Ministry of Environment/ 1991)</u> 1. Cadmium: 150 ppm (mg/kg) 2. Hexavalent Chromium: 250 ppm (mg/kg) 3. Mercury: 15 ppm (mg/kg) 4. Lead: 150 ppm (mg/kg) 5. Arsenic: 150 ppm (mg/kg) 6. Cyanide: 50 ppm (mg/kg) 7. Selenium: 150 ppm (mg/kg) 8. Fluorine: 4000 ppm (mg/kg) 9. Boron: 4000 ppm (mg/kg)
	5	Noise	Construction noise (dB(A) <sub>L<sub>Aeq</sub></sub> )	Noise: 24hrs of continuous measurement (at least 10min in an hour x 24hours)	<u>5 Locations</u> Noise-02, 04, 06, 07 and KWR office	Baseline Survey before Construction activities 2) 2 times / year (every 6 month)	3.0	35 (5 points x 7 times)	500	17,500	<u>Uganda: The National Environment (Noise and Vibrations Standards and Control) Regulations (2003)</u> -Residential (6:00-22:00): 60 dB(A) -Commercial (6:00-22:00): 75 dB(A) -Industrial (6:00-22:00): 85 dB(A)  Reference standard in Japan <u>Japan: Ministry of Environment (1998) Environmental Standards for Noise</u> 07:00-19:00: 85 dB(A)  *Conservation target for Noise-07 shall refer to the adopted standard in the impact forecast.
Natural Environment	6	Odor	Oil, chemicals and garbage odor	Sensory evaluation	<u>Base-Camp site and Construction site</u>	<u>12 times (Monthly)</u>	3.0	36	- (including construction cost)	0	There are no law-based criteria nor international guidelines to be followed, thus the following is established as conservation target

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											No significant impact
	7	Protected area and ecosystem	a) Fauna Survey: mammals, birds, reptiles, amphibians, fish, insects b) Flora Survey: Land plants and aquatic plants c) Valuable Fauna species listed up from IUCN Red list shall be surveyed on their habitats such as feeding area, roosting area, breeding area and migration routes for 1) African Savanna Elephant, 2) Hippopotamus, 3) African Buffalo, 4) Pata monkey , 5) Crowned Eagle, 6) Bateleur, 7) Martial Eagle 8) Central Africa Rock Python d) Valuable Flora species listed up from IUCN shall be surveyed on their identified location and growth status as well as the replanting status as necessary 1) Iroko (Milicia excelsa), 2) African Mahogany (Khaya senegalensis)	Fauna: Transect Survey, Point Census, interview Flora: Transect Survey	Transect Survey Area: 500m each alongside of the bridge and approach road Point Census for Birds: 1-2 km by binoculars	Baseline Survey before Construction activities 2) 2 times / year (dry and rainy season)	3.0	7	2,000	14,000	There are no law-based criteria nor international guidelines to be followed, thus the following is established as conservation target  Observed species are not changed before and during construction
	8	Hydrology, Topography and geology	Condition of embankment and soil erosion from the project area	Visual survey (taking picture)	Project Area (approach road, embankment and streams between the project area and Nile River)	<u>12 times (Monthly)</u>	3.0	36	- (including construction cost)	0	There are no law-based criteria nor international guidelines to be followed, thus the following is established as conservation target  Whether Soil erosion, slope failure and landslide are not observed.

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Social Environment	9	Poverty Group	1) Number of places posting the announcement of the information about employment 2) Number of hired local people	1) Confirming the list of announcements 2) Confirming the list of construction workers	1) Karuma TC, Diima SC, and Kamdini SC 2) Construction area and related facilities	<u>12 times</u> (Monthly)	3.0	36	- (including construction cost)	0	There are no law-based criteria nor international guidelines to be followed, thus the following is established as target.  • Employment opportunity should be equally provided to the local people.
	10	Ethnic groups	1) Contract content of the contractor 2) Number of places posting the announcement of the information about the employment 3) Number of hired local people	1) Confirming the contract 3) Confirming the list of announcements 2) Confirming the list of construction workers	1) and 3) Construction area and related facilities 2) Karuma TC, Diima SC, and Kamdini SC	<u>12 times</u> (Monthly)	3.0	36	- (including construction cost)	0	There are no law-based criteria nor international guidelines to be followed, thus the following is established as target.  • Employment opportunity should be equally provided to the local people.
	11	Local economy such as employment and livelihood	1) Number of meetings organized, and participants per meeting 2) Access status to the entrance of shops, restaurants, etc. in the vicinity of construction area, related facilities, and traffic controlled area 3) Number of hired local people 4) Number of grievances on the access to the entrance of shops, restaurants, etc.	1) Confirming the records of discussions 2) Visual survey (taking pictures) 3) Confirming the list of construction workers 4) Confirming the list of grievance received	1) and 4) Karuma TC, Diima SC, and Kamdini SC 2) Construction area and related facilities 3) Construction area, related facilities, and traffic control area	<u>12 times</u> (Monthly)	3.0	36	- (including construction cost)	0	There are no law-based criteria nor international guidelines to be followed, thus the following is established as target.  • Public consultation meetings prior to the commencement of construction works will be organized at least 2 times, namely, bidding and mobilizing stages of contractors. • Impacts on access to the shops, restaurants, etc. should be minimized and/or detour should be secured. • Employment opportunity should be equally provided to the local people. • A GRM that is accessible to local people should be established.
	12	Land use and utilization of local resources	1) Number of meetings organized, and participants per meeting 2) Maintenance status of the existing Karuma Bridge 3) Number of grievances on the status of detour and access road, and status of grievance 4) Number of hired workers who received the training	1) Confirming the records of discussions 2) Visual survey (taking pictures) 3) Confirming the list of grievances received 4) Confirming the list of construction	1) and 3) Karuma TC, Diima SC, and Kamdini SC 2) and 4) Construction area and related facilities	<u>12 times</u> (Monthly)	3.0	36	- (including construction cost)	0	There are no law-based criteria nor international guidelines to be followed, thus the following is established as target.  • Impacts on access to the local resources should be minimized and/or detour should be secured. • Employment opportunity should be equally provided to the local people.

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Area	No.	Item	Parameter	Method	a) Number of Location / Survey Area	b) Frequency per Year	c) Construction Period (year)	d) Total Number (a) x b) x c)	e) Unit Cost (USD)	Direct Cost (USD) (d) x e)	Conservation Target*3
			(instruction)	workers							
	13	Water usage	1) Number of hired local people 2) Number of grievances on the water use	1) Confirming the list of construction workers 2) Confirming the list of grievance received	1) Construction area and related facilities 2) Karuma TC, Diima SC, Kamdini SC	<u>12 times</u> (Monthly)	3.0	36	- (including construction cost)	0	There are no law-based criteria nor international guidelines to be followed, thus the following is established as target.  • Impacts on access to the water use should be minimized.
	14	Existing social infrastructures and services	1) Number of meetings organized, and participants per meeting 2) Maintenance status of the existing Karuma Bridge 3) Number of assigned traffic guides at construction area, related facilities, and traffic controlled area 4) Number of grievances on the status of detour and access road, and status of grievance	1) Confirming the records of discussions 2) and 3) Visual survey (taking pictures) 4) Confirming the list of grievances received	1) and 4) Karuma TC, Diima SC, and Kamdini SC 2) Existing Karuma Bridge 3) Construction area, related facilities, and traffic control area	<u>12 times</u> (Monthly)	3.0	36	- (including construction cost)	0	There are no law-based criteria nor international guidelines to be followed, thus the following is established as target.  • Impacts on access to the existing social infrastructures and services should be minimized.
	15	Unequal distribution of positive and negative impacts of the project	1) Function status of GRM 2) Number of hired local people 3) Number of hired workers who received the training (instruction)	1) Interview with local councils and confirming the list of grievances received 2) Confirming the list of construction workers 3) Confirming the records of the training	1) Karuma TC, Diima SC, and Kamdini SC 2) and 3) Construction area and related facilities	<u>12 times</u> (Monthly)	3.0	36	- (including construction cost)	0	There are no law-based criteria nor international guidelines to be followed, thus the following is established as target.  • Employment opportunity should be equally provided to the local people.
	16	Local conflict of interests	See No. 15 Unequal distribution of positive and negative impacts of the project	Ditto	Ditto	Ditto	Ditto	Ditto	Ditto	Ditto	Ditto
	17	Cultural heritage	1) Number and content of meetings organized, and participants per meeting 2) Content of "Chance Finds Procedure"	1) Confirming the records of discussions 2) Confirming the developed	1) Karuma TC, Diima SC, and Kamdini SC 2) to 6) Construction area and related facilities	<u>1), 2), 4), 5) 24 times</u> (monthly) <u>3) 104 times</u> (Weekly)	3.0	1), 2), 4), 5) 24 times 3) 104 times	- (including construction and mitigation costs)	0 (the cost is including in the mitigation cost)	The following laws and guidelines shall be followed. 1. The Uganda National Culture Policy reviewed 2019 2. Museums and Monuments Policy



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Area	No.	Item	Parameter	Method	a) Number of Location / Survey Area	b) Frequency per Year	c) Construction Period (year)	d) Total Number (a) x b) x c)	e) Unit Cost (USD)	Direct Cost (USD) (d) x e)	Conservation Target*3
			3) Monitoring status of the Contractor 4) Number of found historical/ archaeological resources 5) Number of hired workers who received the training 6) Installation status of signage to the historical signboard	procedure 3) Confirming the monitoring status of the archaeological materials found 4) Confirming the record of found historical/ archaeological resources 5) Confirming the records of the training 6) Visual survey (taking pictures)		<u>5) 12 times/ year</u>  <u>6) Once when the implement is completed</u>		<b>6) 1 time</b>			(2015) 3. WB Operational Policy 4.11 (Physical Cultural Resources) 4. IFC Performance Standard 8 (Cultural Heritage)
	18	Gender	1) Number of hired local people 2) Payment status for the construction workers 3) Number of installed sanitary facilities 4) Number of trained construction workers 5) Number of sensitized local people 6) Location of basecamps	1) Confirming the list of construction workers by gender 2) Confirming the list of construction workers 3) Visual survey (taking photo) 4) Confirming the records of the training 5) Confirming the records of discussions 6) Visual survey (taking photo, and recording coordinates)	1), 2), 3), 4), and 6) Construction area and related facilities (base camp site)  5) Karuma TC, Diima SC, and Kamdini SC	<b>12 times</b> (Monthly)	<b>3.0</b>	<b>36</b>	- (including construction cost)	<b>0</b>	The following laws and guidelines should be followed. 1. FIDIC 2010 (General Condition) 2. The Uganda Gender Policy (2007) 3. Guidelines for Mainstreaming gender into the road sub-sector (2008) 4. Employment Act, Cap 219
	19	Rights of children	1) Contract content of the contractor 2) Age of Construction workers 3) Number of trained construction workers 4) Number of sensitized local	1) Confirming the contract 2) Confirming the list of construction workers from contractor, and visual survey on site	1) to 3) Construction area and related facilities 4) Karuma TC, Diima SC, and Kamdini SC	<b>12 times</b> (Monthly)	<b>3.0</b>	<b>36</b>	- (including construction cost)	<b>0</b>	The following laws and guidelines should be followed. 1. FIDIC 2010 (General Condition) 2. Children Act, Cap 59 3. Employment Act, Cap 219

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Area	No.	Item	Parameter	Method	a) Number of Location / Survey Area	b) Frequency per Year	c) Construction Period (year)	d) Total Number (a) x b) x c)	e) Unit Cost (USD)	Direct Cost (USD) (d) x e)	Conservation Target*3
			people	3) Confirming the records of the training 4) Confirming the records of discussions							
	20	Infectious diseases	Number of infected patients among construction workers	Confirmation of health check list from the contractor	Construction area and related facilities	12 times/ year	3.0	36	- (including construction cost)	0	The following laws and guidelines shall be followed. 1. The Occupational Safety and Health Act No.9 2006 2. Employment Act, Cap 219 3. IFC's Performance Standard 2 Labor and Working Conditions 4.FIDIC 2010
	21	Labor environment	Health condition of construction workers	Confirming the installed safety facilities and conditions via interviews	Construction area and related facilities	12 times/ year	3.0	36	- (including construction cost)	0	The following laws and guidelines should be followed. 1. The Occupational Safety and Health Act No.9 2006 2. Employment Act, Cap 219 3. IFC's Performance Standard 2 Labor and Working Conditions 4.FIDIC 2010
Other	22	Accident	Number of accidents	Confirming the list of accidents from local government/ police department	Construction area, related facilities, and traffic control area	12 times/ year	3.0	36	- (including construction cost)	0	There are no law-based criteria nor international guidelines to be followed, thus the following is established as conservation target. No accident is caused by construction activities.
Total Cost During Construction: <b>80,500 (USD)*3</b> for 3 years (During Construction)											
Remarks *1: The cost indicates direct cost, not including consultant fee, overhead and personal expense *2: Conservation Target: If quantitative values exist such values prioritized as target based on Ugandan Laws/regulations, International Guidelines and other references. If quantitative values do not exist, qualitative target is established as project base. *3: The cost for mobile equipment such as sound level meter and SS meter necessary for the daily/weekly monitoring is estimated at 6,000 USD and it is included in total cost during construction.											

Source: JICA Survey Team

**Table 8.2.4 Environmental Monitoring Plan Post Construction Phase (At the end of construction completion/ Decommissioning Phase)**

Area	No.	Item	Parameter	Method	a) Number of Location / Survey Area	b) Frequency per Year	c) Construction Period (year)	d) Total Number (a x b) x c)	e) Unit Cost (USD)	Direct Cost (USD) (d x e)	Conservation Target <sup>*3</sup>
Natural Environment	1	Waste	Weigh and volume of construction waste such as waste soil, domestic waste, and night soil	Visual Survey	<u>All construction area and related facilities such as base camp site</u>	Once at the completion of construction / demobilization timing of the contractor	-	1	0	0	All construction wastes such as waste soil, domestic waste and night soil from construction yard/offices shall be removed from the project site.
	2	Ecosystem	Condition of developed and cleared area by the project	Visual Survey	<u>All construction area and related facilities such as base camp site</u>	Once at the completion of construction / demobilization timing of the contractor	-	1	0	0	Cut and developed area by the project shall maintain as natural grass and trees can grow.
Social Environment	3	Cultural Heritage	Condition of installed signage to the signboard of the Sir Samuel and Lady Florence historical trail	Visual Survey	<u>Where the signage is installed</u>	Once at the completion of construction / demobilization timing of the contractor	-	1	0	0	The signage to the original signboard should be installed so that the people easily can find it.
Others	4	Accident	Developed and excavated holes and sharp slopes in the project area and related facilities	Visual Survey	<u>All construction area and related facilities such as base camp site</u>	Once at the completion of construction / demobilization timing of the contractor	-	1	0	0	Developed and excavated holes and sharp slopes shall be backfilled or made flat not to cause accidents

Source: JICA Survey Team

Environmental monitoring survey plan during the operation phase is proposed as follows. Proposed monitoring period is at least three (3) years.

The project will also consider the monitoring plan prepared in the 2016 ESIA approved by NEMA and 2018 ESIA prepared by UNRA. They are integrated into the monitoring plan shown in Table 8.2.5 and Table 8.2.6

**Table 8.2.5 Mitigation Measures Monitoring Plan after Construction (Integrated Mitigation Measures for 2016, 2018 and 2024 ESIA's)**

Area	No.	Item	ESIA version	Draft Mitigation Measures		Monitoring Item	Standard Value in Ugandan or International	Monitoring Point / Area	Frequency	Implementation Agency	Monitoring Cost (USD)	
				After Construction								
Pollution	1	Water pollution	2024	1)	Patrol and monitoring of illegal dumping in the rivers	Implemented or Not	N/A	Project site (bridge and approach road) and surrounding area	Every months	6	UNRA	0 (*1: Conducted by UNRA personnel)
	2016		2)	Install oil trap in the connected drainage.	Implemented or Not	N/A	Project site (bridge and approach road)	Every months	6	UNRA	0	
	2	Waste	2024	3)	Patrol and monitoring of illegal dumping in the rivers.	Implemented or Not	N/A	Project site (bridge and approach road) and surrounding area	Every months	6	UNRA	0
	3	Soil contamination and Sediment	2024	4)	Borrow soil from outside of the project area for maintenance shall be inspected not polluted before carrying into the project area.	Implemented or Not	N/A	Project site (bridge and approach road)	When borrow soil is transported into the project area		UNRA	0
	4	Noise and vibration	2024	5)	Uganda government shall control the driving speed on the road (UNRA requests to police department regarding strict speed control).	Implemented or Not	N/A	Project site (bridge and approach road) and surrounding area	Every months	6	UNRA	0
	5	Odor	2024	6)	Appropriate waste management and periodical monitoring is recommended by local government.	Implemented or Not	N/A	Project site (bridge and approach road) and surrounding area	Every months	6	UNRA	0
Natural Environment	6	Protected area and ecosystem	2024	7)	Monitoring of movement of wild animals and management of individuals which intrude to the residential area	Implemented or Not	N/A	Project site (bridge and approach road) and surrounding area	Every months	6	UNRA/UWA	0
	8)		Installation of anti-poaching signs and reinforcement of anti-poaching patrols	Implemented or Not	N/A	Project site (bridge and approach road) and surrounding area	Every months	6	UNRA	0		
	9)		Installation of speed limit board and humps for prevention of roadkill and mitigate noise impacts to the wild animals.	Implemented or Not Number of roadkill	N/A	Project site (bridge and approach road) and surrounding area	Every months	6	UNRA	0		
	10)		Installation of animal corridor under embankment of the approach road for crossing small mammal, reptile, amphibian species.	Installed or Not Confirmation of passing animals	N/A	Animal corridor under embankment	Every months	6	UNRA	0		
	11)		Setting up of LED light in the bridge section so as not to attract insects.	Installed or Not	N/A	Project site (bridge and approach road)	Every months	6	UNRA	0		

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Area	No.	Item	ESIA version	Draft Mitigation Measures	Monitoring Item	Standard Value in Ugandan or International	Monitoring Point / Area	Frequency	Implementation Agency	Monitoring Cost (USD)
				After Construction						
				12) Setting up of light with cover so as not to irradiate the river surface and outside of the road in keeping with sound lifecycle of fishes.	Installed or Not	N/A	Project site (bridge and approach road)	Every 6 months	UNRA	0
				13) Setting up sign board of speed limit 40km/h and no-horn at the crossing points of wild animals such as monkeys and African Elephant	Installed or Not	N/A	Project site (bridge and approach road)	Once a year	UNRA	0
	7	Hydrology	2024	14) Implementation of appropriate maintenance of drainage along the approach road.	Implemented or Not	N/A	Project site (bridge and approach road) and surrounding area	Every 6 months	UNRA	0
	8	Topography and geology	2024	15) Implementation of appropriate maintenance of slope protection.	Implemented or Not	N/A	Embankment and slope in the project area	Every 6 months	UNRA	0
			2018	16) Protect road embankments and slopes with stone walls, Gabions, erosion control mats.	Implemented or Not	N/A	Embankment and slope in the project area	Every 6 months	UNRA	0
	9	Infectious diseases	2024	17) Provide adequate drainage facilities to avoid mosquito habitat.	Implemented or Not	N/A	Project site (bridge and approach road)	Every 6 months	UNRA	0
Social Environment				18) Implement periodical maintenance on drainage.	Implemented or Not	N/A	Project site (bridge and approach road)	Every 6 months	UNRA	0
Others	10	Accident	2024	19) Install 40km/h speed limit signs and humps.	Installed or Not	N/A	Project site (bridge and approach road)	Once a year	UNRA	0
				20) Install LED lights along approach road and bridge.	Installed or Not	N/A	Project site (bridge and approach road)	Once a year	UNRA	0
			2016	21) Install signs and signals at appropriate distances and locations, if necessary.	Installed or Not	N/A	Project site (bridge and approach road)	Once a year	UNRA	0
				22) Use properly installed guardrails.	Installed or Not	N/A	Project site (bridge and approach road)	Once a year	UNRA	0
			2018	23) Install road signs and speed limit signs.	Installed or Not	N/A	Project site (bridge and approach road)	Once a year	UNRA	0
	11	Cross Boundary Impacts and Climate Change	2024	24) Strengthening of speed control by the police department	Implemented or Not	N/A	Project site (bridge and approach road) and surrounding area	Once a year	UNRA	0
				25) Strengthening of car inspection mechanisms to restrict vehicles from discharging high emissions	Implemented or Not	N/A	Project site (bridge and approach road) and surrounding area	Once a year	UNRA	0

Source: JICA Survey Team

**Table 8.2.6 Environmental Monitoring Plan After Construction Phase (3 Years)**

Area	No.	Item	Parameter	Method	a) Number of Location / Survey Area	b) Frequency per Year	c) Monitoring Duration after Construction (year)	d) Total Number (a) x b) x c)	e) Unit Cost (USD)	Direct Cost (USD) (d) x e)	Conservation Target <sup>*3</sup>
Natural Environment	1	Air pollution	1) TSP, 2) PM10, 3) PM2.5, 4) Carbon dioxide (CO <sub>2</sub> ), 5) Carbon monoxide (CO), 6) Hydrocarbons, 7) Nitrogen oxides (NO <sub>x</sub> ), 8) Nitrogen dioxide (NO <sub>2</sub> ), 9) Sulphur dioxide (SO <sub>2</sub> ), 10) Sulphur trioxide (SO <sub>3</sub> ), 11) Smoke, 12) Soot	Based on the National Environment (Air Quality Standards) Regulations, 2024 and / or the same methodology of baseline surveys	<b>4 Locations</b> Where baseline monitoring was carried out (Air-01, 02, 03, 04) *Coordinate Air-1: 36N 415989.39 m E, 246481.68 m N Air-2: 36N 414980.01 m E, 247690.21 m N Air-3: 36N 413217.40 m E, 246128.63 m N Air-4: 36N 417499.59 m E, 247407.36 m N	1) Once / year (dry season)	<b>3.0</b>	<b>12</b> (4 points x 3 times)	<b>1,000</b> (all parameter)	<b>12,000</b>	<b>*1: The National Environment (Air Quality Standards) Regulations, 2024</b> <b>*2: Environmental, Health, and Safety General Guidelines (IFC, April 30th, 2007)</b> <b>*3: Environmental Quality Standards in Japan - Air Quality 1973</b>  <b>[Air Emissions]</b> <b>Maximum limit values of ambient air quality parameters</b> <u>1. PM<sub>10</sub> (Ø&lt;10µm)</u> · 24hrs : 60 µg/m <sup>3</sup> *1 <u>2. PM<sub>2.5</sub> (Ø&lt;2.5µm)</u> · 24hrs : 35 µg/m <sup>3</sup> *1 <u>3. CO</u> · 24hrs : 7mg /m <sup>3</sup> (6ppm)*1 <u>4. NO<sub>2</sub></u> · 24hrs : 50µg /m <sup>3</sup> (0.026ppm)*1 <u>5. SO<sub>2</sub></u> 24hrs : 20µg/m <sup>3</sup> (0.0008ppm) *1
	2	Noise	Traffic noise (dB(A) <sub>L<sub>Aeq</sub></sub> )	Noise: 24hrs of continuous measurement (at least 10min in an hour x 24hours)	<b>4 Locations</b> Noise-02, 04, 07 and KWR office	Once / year (dry season)	<b>3.0</b>	<b>12</b> (4 points x 3 times)	<b>500</b>	<b>6,000</b>	<b>Uganda: The National Environment (Noise and Vibrations Standards and Control) Regulations (2003)</b> <u>Any building used as hospital, convalescence home, home for the aged, sanatorium and institutions of higher learning, conference rooms, public library, environmental or recreational sites.</u> -Daytime 6:00-22:00: 45 dB(A) -Nighttime 22:00-6:00: 35 dB(A) <u>Residential buildings</u> -Daytime 6:00-22:00: 50 dB(A) -Nighttime 22:00-6:00: 35 dB(A) <u>Mixed residential (with some commercial and entertainment)</u>



Area	No.	Item	Parameter	Method	a) Number of Location / Survey Area	b) Frequency per Year	c) Monitoring Duration after Construction (year)	d) Total Number ( a ) x b ) x c ) )	e) Unit Cost (USD)	Direct Cost (USD) ( d ) x e )	Conservation Target*3
											-Daytime 6:00-22:00: 55 dB(A) -Nighttime 22:00-6:00: 45 dB(A) <u>Residential + industry or small scale production+ Commercial)</u> -Daytime 6:00-22:00: 60 dB(A) -Nighttime 22:00-6:00: 50 dB(A) <u>Industrial</u> -Daytime 6:00-22:00: 70 dB(A) -Nighttime 22:00-6:00: 60 dB(A)  <b>IFC Standard: Environmental, Health, and Safety (EHS) Guidelines Noise Management (April 2007)</b> <u>Residential Area</u> -Daytime 7:00-22:00: 55 dB(A) -Nighttime 22:00-7:00: 45 dB(A) <u>Commercial Area</u> -Daytime 7:00-22:00: 70 dB(A) -Nighttime 22:00-7:00: 70 dB(A) *Noise impacts should not exceed the levels presented above, or result in a maximum increase in background levels of 3 dB at the nearest receptor location off- site  <b>Japan: Ministry of Environment (1998) Environmental Standards for Noise</b> <u>Along the trunk road</u> -Daytime 6:00-22:00: 70 dB(A) -Nighttime 22:00-6:00: 65 dB(A)  *Conservation target for Noise-07 shall refer to the adopted standard in the impact forecast.

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Area	No.	Item	Parameter	Method	a) Number of Location / Survey Area	b) Frequency per Year	c) Monitoring Duration after Construction (year)	d) Total Number (a) x b) x c)	e) Unit Cost (USD)	Direct Cost (USD) (d) x e)	Conservation Target <sup>43</sup>
Natural Environment	3	Protected area and ecosystem	a) Fauna Survey: mammals, birds, reptiles, amphibians, fish, insects b) Flora Survey : Land plants and aquatic plants c) Valuable Fauna species listed up from IUCN Red list shall be surveyed on their habitats such as feeding area, roosting area, breeding area and migration routes for 1)African Savanna Elephant, 2)Hippopotamus, 3)African Buffalo, 4)Patas monkey , 5) Crowned Eagle, 6)Bateleur, 7) Martial Eagle 8) Central Africa Rock Python d) Valuable Flora species listed up from IUCN shall be surveyed on their identified location and growth status as well as the replanting status as necessary 1) Iroko (Milicia excelsa), 2)African Mahogany (Khaya senegalensis)	Fauna: Transect Survey, Point Census, interview Flora: Transect Survey	Transect Survey Area: 500m each alongside of the bridge and approach road Point Census for Birds: 1-2 km by binoculars	2 times / year (dry and rainy season)	3.0	6	2,000	12,000	There are no law-based criteria nor international guidelines to be followed, thus the following is established as conservation target  Observed species do not change after construction
	4	Infectious diseases	Number of cases of infectious diseases (HIV/AIDS, etc.)	Interviews with local government	In the vicinity of the Project site	Twice / year	3.0	6	2,000	12,000	The laws and guidelines below to be followed. The Occupational Safety and Health Act

The Project for Construction of the Karuma Bridge  
Environmental and Social Impact Assessment

Area	No.	Item	Parameter	Method	a) Number of Location / Survey Area	b) Frequency per Year	c) Monitoring Duration after Construction (year)	d) Total Number ( a) x b) x c) )	e) Unit Cost (USD)	Direct Cost (USD) ( d) x e) )	Conservation Target <sup>*3</sup>
											No.9 2006 2. Employment Act, Cap 219 3. IFC's Performance Standard 2 Labor and Working Conditions 4.FIDIC 2010
Other	4	Accident	Number of accidents	Confirmation of accidents list from local government/ police department	Project area	Once / year	3.0	3	1,000	3,000	There are not law-based criteria nor international guidelines to be followed, thus following is established as conservation target  There is no significant occurrence of traffic accidents.
<p>Remarks</p> <p>*1: The cost indicates direct cost, not including consultant fee, overhead and personal expense</p> <p>*2: Conservation Target: If quantitative values exist such values prioritized as target based on Ugandan Laws/regulations, International Guidelines and other references. If quantitative values do not exist, qualitative target is established as project base.</p> <p>Source: JICA Survey Team</p>											<b>Total Cost After Construction : <u>45,000 (USD)</u> for 3 years (After Construction)</b>

### 8.2.2. Collaborated Monitoring during Detailed Design and Construction

As shown in article of impact forecast (6.2.1 Ecosystem and Protected Area), it is predicted that the project activities do not give serious impacts to the valuable species and ecosystems in the project area, however, continuous environmental and social monitoring should be conducted under collaboration with UNRA, UWA, local communities and JICA Consultants during detailed design and construction stage respectively.

In a series of programs, capacity building on the environmental and social impacts assessment (ESIA) and joint environmental monitoring will be done under various stakeholders including local communities.

**Table 8.2.7 Program of Collaborated Monitoring by Stage**

Stage	Major Activities	Venue	Frequency (Total)	Participant
Detailed Design	1. Detailed Planning of Mitigation Measures and Monitoring	On-site (KWR office)	Once (1)	UNRA, UWA(KWR), Consultants (Environmental and Social Consideration)
Construction	2. Environmental Monitoring during Construction	On-site	Once (1)	UNRA, UWA(KWR), Contractor, Local government (Karuma TC and Kamdini SC), Consultant (Resident Engineer, Environmental and Social Consideration)
	3. Final Environmental Monitoring and Evaluation	On-site	Once (1)	

Source: JICA Survey Team

### 8.3. Monitoring Organization

#### 8.3.1. During Construction

The objectives and design of the EMP and Environmental Monitoring Plan are described in the earlier sections of this chapter. There is a necessity to form a proper ‘Institutional Framework’ for the effective implementation of the formulated environmental management and monitoring plan. The elements of this ‘Institutional Framework’ will coordinate and work with each other throughout the project, i.e. during pre-construction, construction and operation stages.

The suggested elements of ‘Institutional Framework’ for implementing EMP during construction will be as follows:

- a) Project Management Unit (PMU) under UNRA
- b) Construction Supervision Consultant (CSC)
  - Project Management Consultant (PMC)
  - Environmental and Social Consultant (ESC)
- c) Project Construction Contractor - Construction Company (PCC)
- d) Authorized Environmental Agency and Other Relevant Key Stakeholders
  - National Environmental Management Authority (NEMA)
  - Uganda Wildlife Authority (UWA)
  - Ministry of Water and Environment (MWE)

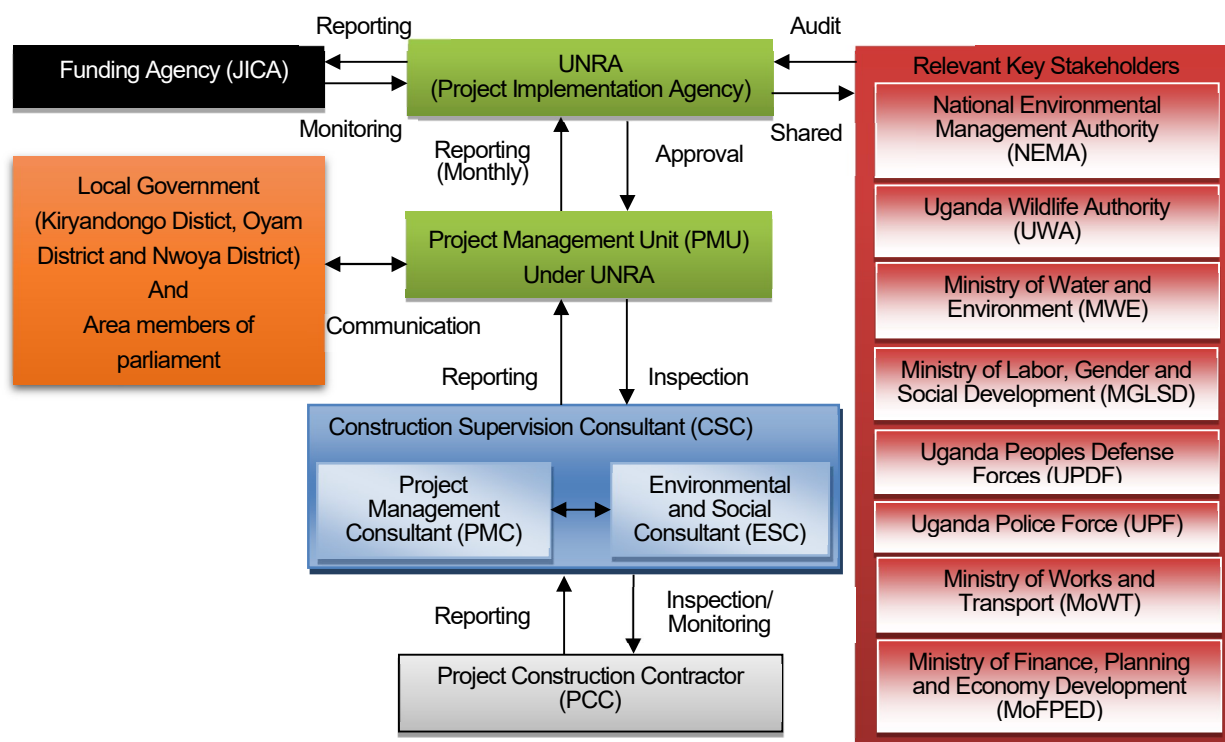
- Ministry of Labor, Gender and Social Development (MGLSD)
  - Uganda Peoples Defense Forces (UPDF)
  - Uganda Police Force (UPF)
  - Ministry of Works and Transport (MoWT)
  - Ministry of Finance, Planning and Economy Development (MoFPED)
- e) Service Provider for implementing mitigation measures related to specific items such as Gender, Right of Children, and Infectious Diseases and Occupational Health.
- f) Local Government
- Kiryandongo District, Oyam District and Nwoya District and Area members of parliament
- g) Funding Agency – JICA

The above stated elements are part of the ‘Institutional Framework’ that will work together to effectively implement the formulated ‘Environmental Management Plan’. The roles and responsibilities of these elements are given in Table 8.3.1.

**Table 8.3.1 Environmental Management Organization during Construction**

Name of Organization	Roles and Responsibilities
a) Project Management Unit under UNRA (PMU)	<ul style="list-style-type: none"> <li>· Initiate the coordination process among the concerned organizations (Elements of Institutional Framework) for EMP implementation.</li> <li>· Oversee the implementation of the EMP by PMU and CSC</li> <li>· Review and approve monthly Environmental Report from CSC and sending the report to NEMA and other relevant key stakeholders</li> </ul>
b) Construction Supervision Consultant (CSC)	<ul style="list-style-type: none"> <li>· CSC works in association with Project Construction Contractor (PCC) &amp; the Environmental and Social Consultant (ESC) on a full-time basis at the project site office.</li> <li>· PMC mainly looks after managing engineering and construction-related activities.</li> </ul>
Environmental and Social Consultant (ESC)	<ul style="list-style-type: none"> <li>· ESC inspects implementation of mitigation measures and environmental monitoring conducted by PCC</li> <li>· ESC reviews and corrects Environmental Monitoring Report (EMR) submitted by PCC and then submit it to PMU after inspection.</li> <li>· SESC monitors the activities of Service Provider hired by the UNRA.</li> </ul>
c) Project Construction Company (PCC)	<ul style="list-style-type: none"> <li>· PCC implements approved EMP (mitigation measures) under observation of PMC &amp; ESC.</li> <li>· PCC submits EMR for all conducted mitigation measures on site to the ESC on weekly and/or monthly basis.</li> </ul>
d) Authorized Environmental Agency (NEMA) and Other Relevant Key Stakeholders	<ul style="list-style-type: none"> <li>· Inspect and audit periodical environmental monitoring report</li> <li>· Inspect the implementation of mitigation measures on site, as required</li> <li>· Request for necessary action and additional surveys and implementation of mitigation measures, if required</li> </ul>
e) Service Provider	<p>The service provider will implement the mitigation measures under a direct contract with UNRA. In addition, the Service Provider should carry out the following tasks with the advice and support of the CSC.</p> <ul style="list-style-type: none"> <li>· Design and conduct a baseline assessment on Gender, Right of Children, and Infectious Disease and Occupational Health, and map the hotspot</li> <li>· Disseminate the findings of the baseline assessment to stakeholders and indicate the scope of interventions under the assignment</li> <li>· Provide training to the construction workers and local communities, etc.</li> </ul>
f) Local Government (Kiryandongo District, Oyam District and Nwoya District and Area members of parliament)	<ul style="list-style-type: none"> <li>· Monitor construction activities</li> <li>· Request for necessary action and additional surveys and implementation of mitigation measures, if required</li> </ul>
g) Funding Agency (JICA)	<ul style="list-style-type: none"> <li>· Review periodical environmental monitoring report</li> <li>· Request for necessary action and additional surveys and implementation of mitigation measures, if required</li> </ul>

Source: JICA Survey Team



Source: JICA Survey Team

**Figure 8.3.1 Environmental Management Implementation Organizations During Construction**

### 8.3.2. After Construction

The major authorities for implementing the EMP after construction are as follows:

- a) UNRA
- b) Local Government
  - Kiryandongo District, Oyam District and Nwoya District and Area members of parliament
- c) Authorized Environmental Agency and Other Relevant Key Stakeholders
  - National Environmental Management Authority (NEMA)
  - Uganda Wildlife Authority (UWA)
  - Ministry of Water and Environment (MWE)
  - Ministry of Labor, Gender and Social Development (MGLSD)
  - Uganda Peoples Defense Forces (UPDF)
  - Uganda Police Force (UPF)
  - Ministry of Works and Transport (MoWT)
  - Ministry of Finance, Planning and Economy Development (MoFPED)

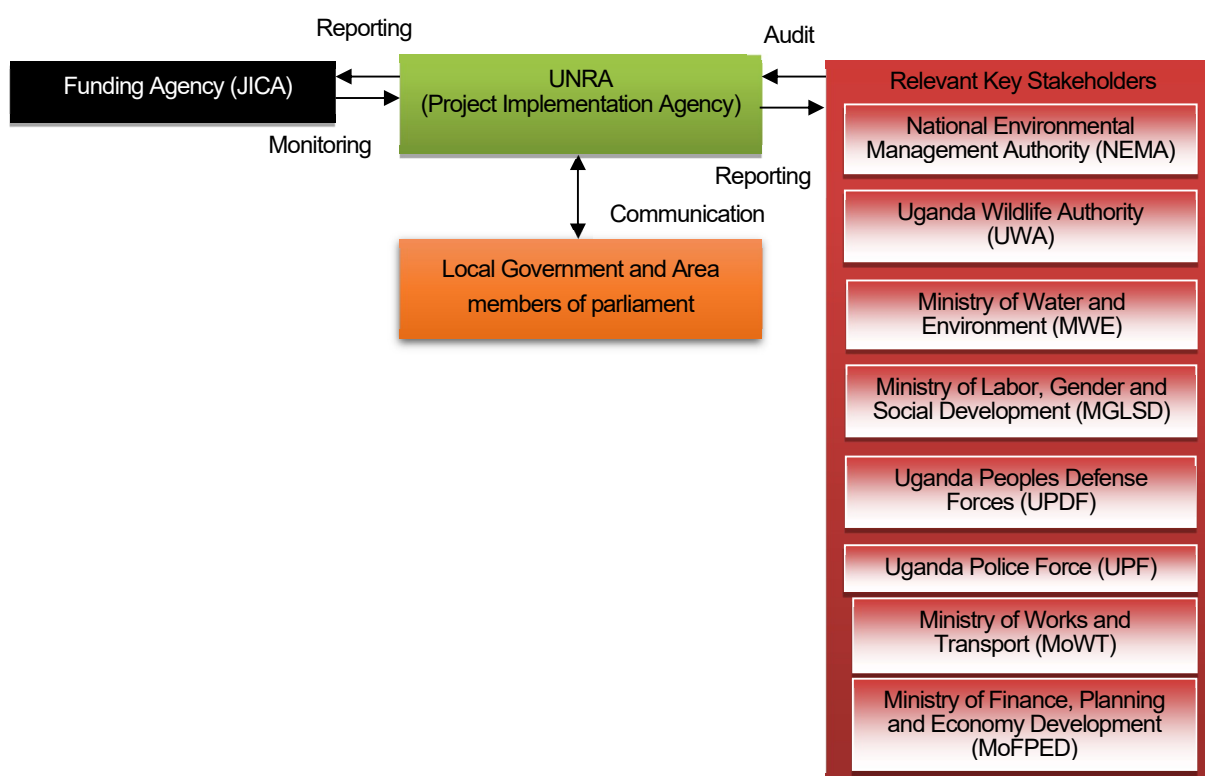
#### d) Funding Agency – JICA

The roles and responsibilities of each organization are shown below:

**Table 8.3.2 Environmental Management Organizations After Construction**

Name of Organization	Roles and Responsibilities
a) UNRA	<ul style="list-style-type: none"> <li>Initiate the coordination process among the concerned organizations (Elements of Institutional Framework) for EMP implementation.</li> <li>Oversee the implementation of the EMP</li> <li>Preparation of Environmental Report and sending the report to NEMA and other relevant key stakeholders</li> </ul>
b) Local Government (Kiryandongo District, Oyam District and Nwoya District and Area members of parliament)	<ul style="list-style-type: none"> <li>Monitor on site situation during project operation</li> <li>Request for necessary action and additional surveys and implementation of mitigation measures, if required</li> </ul>
c) Authorized Environmental Agency (NEMA) Other Relevant Key Stakeholders	<ul style="list-style-type: none"> <li>Inspect and audit the periodical environmental monitoring report</li> <li>Inspect the implementation of mitigation measures on site, as required</li> <li>Request for necessary action and additional surveys and implementation of mitigation measures, if required</li> </ul>
d) Funding Agency (JICA)	<ul style="list-style-type: none"> <li>Review the periodical environmental monitoring report</li> <li>Request for necessary action and additional surveys and implementation of mitigation measures, if required</li> </ul>

Source: JICA Survey Team



Source: JICA Survey Team

**Figure 8.3.2 Environmental Management Implementation Organizations After Construction**



#### 8.4. **Grievance Redress Mechanism**

Complaints and conflicts on construction activities and construction workers may arise during construction. A grievance in the context of this project is defined as a complaint of dissatisfaction, harm, unfairness or mistreatment raised by an individual or a group within project area or beyond affected by project implementation. These complaints and conflicts can be of many kinds. It could be:

- i) Unexpected natural and social adverse impacts by the project construction activities
- ii) Conflicts between construction workers and local community group & individuals
- iii) Process of hiring construction workers from local community, etc.

These complains and conflicts often results into grievances which require to be managed easily and promptly so as not to affect project activities. UNRA developed harmonized guidelines for GRM (2019) for its road projects. Therefore, a possible scheme for grievance redress mechanism for this project is adapted from the Guidelines as well as JICA Guidelines (2010).

##### 8.4.1. **Objectives of GRM**

The aim of the Grievance Redress Mechanisms (GRM) is to ensure that grievances and concerns raised by the other people within the communities can be effectively dealt with in a timely and satisfactory manner. Given the potential for quick and effective resolution on the ground, utilizing local dispute mechanisms as a first step in line with current traditional practices makes the mechanism more effective. Normally, a grievance redress mechanism is developed to ensure that:

- i) All complaints related to natural and social impacts by the project are appropriately dealt with;
- ii) It can be easily access by those who have complaints; and
- iii) Adequate measures are taken to resolve the issues raised.

##### 8.4.2. **Grievances Management Institution**

UNRA promotes the concept of Grievances Management Committees in accordance with UNRA-GRM Harmonized Guidelines (2019). This is a community-based arrangement that seeks to resolve grievances at the lowest level possible using existing or established structures. GMCs are composed of a minimum of 6 persons with the following members;

- i) An observer who is a CBO (Community Based Organization / CSO (Civil Society Organization) representative if available–
- ii) Chairperson LC1 (but not to be elected as chairman of the GMC)–
- iii) 3 Representatives of Residents (at least 1 woman must be elected)–
- iv) An opinion leader (e.g. elder, religious or clan leader) if available.

From the GMC members, an executive is elected composed of chairperson, secretary and mobiliser.

GMCs will be set up with the help of District and sub-county CDOs (Community Development Officer) and LC1 leaders through community meetings before starting construction activities. GMCs will remain active throughout the project life up to the defects

liability period.

Besides the GMCs, UNRA will establish contact points for logging grievances for community members. The UNRA contact channels to be established are the followings.

- i) UNRA headquarters,
- ii) UNRA stations at Gulu and Masindi,
- iii) Project contractor,
- iv) Consultants office

The contacts of the GMCs and UNRA established channels will be disclosed to the local communities through the local stakeholder meetings when the GMCs are established.

A grievance can be submitted by any stakeholder either in writing or verbally through Community GMCs and UNRA established channels. The procedure should respect anonymity for sensitive issues such as sexual harassment.

However, any grievances related to project workers issues such as welfare, working environment etc. shall be raised to the workers council. The workers council should be established after workers are mobilised at the beginning of construction stage.

#### 8.4.3. Grievances Procedure

A possible scheme for grievance redress mechanism adapted from the existing UNRA-GRM Harmonized Guidelines, 2019 is illustrated in Figure 8.4.1 Figure 1 and its process as follows:

**Table 8.4.1 Grievances Process Flow**

Step	Action
1	Parties (individuals, community and business group etc.) can lodge a complaint on the natural and social impacts. The complainant may contact not only GMC but also UNRA, the construction contractor, construction supervision consultant, and relevant CBOs such as NGOs directly from the complainant for filing complaints, consultations, and requests for resolution. A grievance can be submitted either in writing or verbally including the phone calls. The securing for anonymity is confirmed from the complaint submission stage and is taken into account throughout the GRM process.
2	Grievances received will be screened and categorized to establish the nature, type and eligibility of the complaint as illustrated in the Table 2. Once the complaint is screened for eligibility, then a decision will be taken to either drop it or proceed with assessments and investigation, and the complainant will be duly informed. In an event that the registered grievance is categorized as (3) shown in the Table 2 as nature as a criminal case, it will be referred to police.
3-5	Some complaints that are categorized as (0) or (1) shown in the Table 2 are quite straightforward will be resolved on first contact and closed out.
6-7	If a grievance is categorized as (2) shown in the Table 2 and requires further investigation, it will be registered in UNRA or Contractor and by mandate assigned to relevant officers or department as quickly as possible.
8	The further investigation of the complaint will be handled by UNRA or the Contractor by mandate assigned to relevant officers or department.
9	The relevant offices or department assigned will propose a solution to the complainant.
10-12	In case the complainant is satisfied with the proposed solution, the resolution will be effected and grievance closed out. Complainant will sign a grievance closure form witnessed by the UNRA or appointed representative.
13	If the complainant is not satisfied with the resolution at the first tier, it will be proceeded to the second tier.

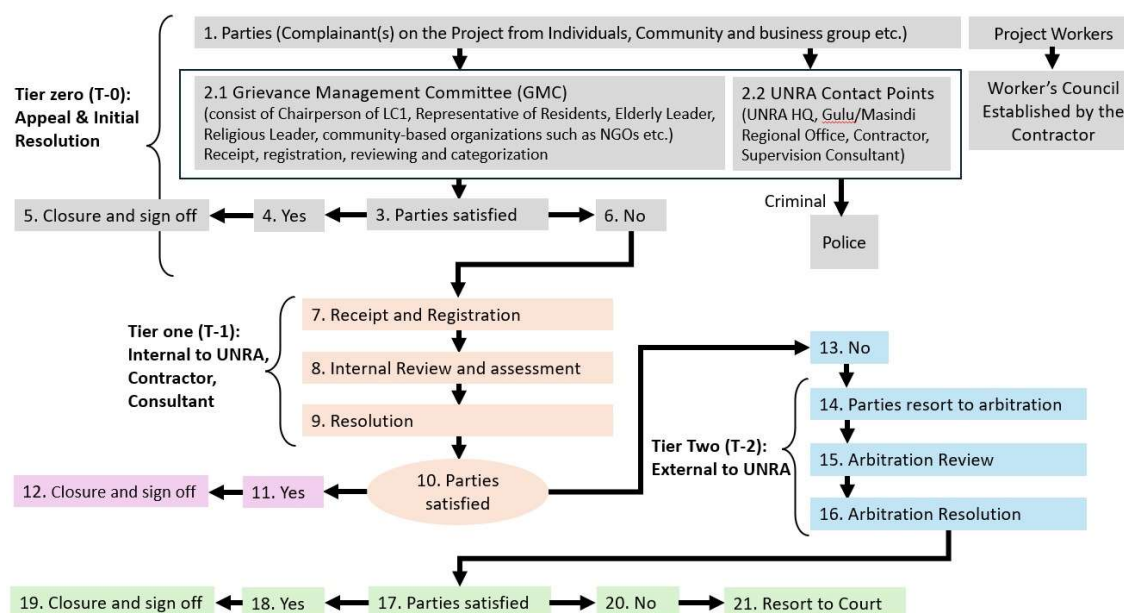
Step	Action
14	In the first step of the second tier, mediator will be identified to mediate between the complainant and UNRA or contractor/consultant. Possible mediators include religious leaders, family/clan leaders, elders and CSO leaders or managers. A grievance will be resort to arbitration.
15-16	Similar with the tier 1, the mediator will investigate the case and propose the solution.
17-19	In case the complainant is satisfied with the mediator proposed solution, the resolution will be effected and grievance closed out. Complainant will sign a grievance closure form witnessed by the mediator or appointed representative.
20-21	In case complainant is not satisfied with the mediation resolution, this GRM provides for recourse to the formal judicial system.

Source : JICA Survey Team based on the UNRA—GRM Harmonized Guidelines, 2019

**Table 8.4.2 Screening and categorization criteria**

Category	Description	Implication
Category 0:	Complaints that are not related to a UNRA project, project workers or any UNRA activity	Out of scope and require immediate feedback /referral and closure
Category 1:	Queries, comments, and suggestions	Require immediate feedback and closure
Category 2:	Complaints and concerns, which are not criminal in nature or do not require the involvement of police	It is within mandate of UNRA in respect to project activities and require processing
Category 3:	Complaints and concerns that involve allegations that require investigation or intervention by the police or other law enforcement authorities.	Require immediate escalation

Source: JICA Survey Team based on the UNRA-GRM Harmonized Guidelines, 2019



Source: JICA Survey Team based on the UNRA-GRM Harmonized Guidelines, 2019

**Figure 8.4.1 Scheme for Grievance Redress Procedure during Construction**

#### 8.4.4. Grievances Management

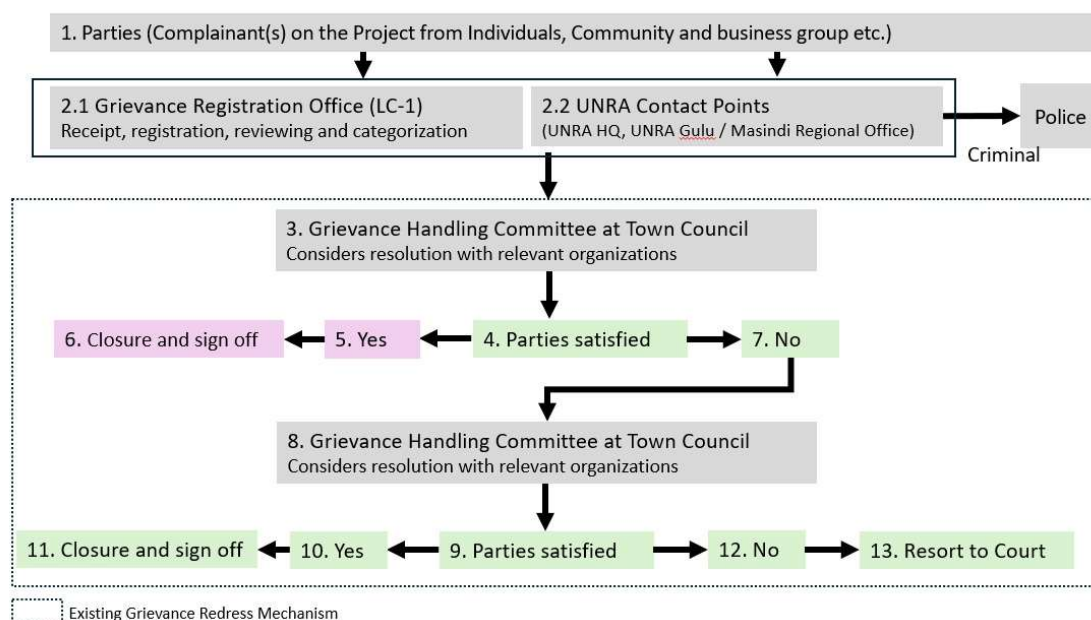
Once grievance are raised in the GMC, UNRA contact point, the contents of the grievances, status of the resolution process shall be recorded until closure of complaint. All grievances received will be registered using the GRM forms and logged onto an established GRM database. The GRM database shall be set up both in UNRA and the Contractor. The complainant should receive an acknowledgment of receipt of the grievance in writing within a reasonable timeframe not exceeding 48 hours. Record forms and log books already in use by the project proponent for road projects will be adapted for this project. Paper copies of the grievance form and the community-reporting template will be made available to GMCs by UNRA when Implementation of this Project.

To promote access to this GRM, grievances can be submitted in the local language. At entry, such grievances submitted in the local language will be translated into English and an equivalent explanation given to the complainant or the representative.

To promote quick response and resolution of grievances, minimum considerations for reception of grievances will apply (names of complainant, address, nature of complaint, time and parties involved, any evidence and witness). However, for sensitive issues such as sexual harassment, the procedure shall consider anonymity. These considerations will continuously be disseminated to the community members through local stakeholder meetings at the planning and implementation phase of this project.

Although above GRM has been explained in the 2nd local stakeholder meetings and agreed already. However, this GRM shall be established before starting construction and explained and be disclosed to the local communities through the local stakeholder meetings before actual construction activities.

While this GRM mentioned above will be applied during construction stage, during operation phase, complaints will be lodged through the existing GRM in each local community and referred to UNRA if they are relevant to the Project as shown below.



Source: JICA Survey Team based on the Existing Grievance Redress Mechanism

**Figure 8.4.2 Scheme for Grievance Redress Procedure after Construction**

## CHAPTER 9 LOCAL STAKEHOLDER MEETINGS

### [Summary of the Chapter 9]

This chapter presents the results of the implementation of the local stakeholder meetings/public consultation/stakeholder engagement required by Ugandan legislation and JICA guidelines as the project is classified as Category A under the JICA guidelines, which were conducted twice, once during the scoping phase and once during the draft ESIA preparation phase. In addition, focus group discussions were conducted with women's groups, religious groups, business groups, and social NGOs, taking into account the characteristics of stakeholders in the project area. As the project will be implemented in a protected area, meetings were also held with UWA, the protected area manager, nature-based NGOs, and experts to gather information and exchange views, which were incorporated into the mitigation measures and other aspects of the project.

### 9.1. Stakeholder Analysis

The term "stakeholders" refers to all people and organizations that directly or indirectly influence the program/project. From the perspective of appropriate project implementation, the purpose of stakeholder analysis is to understand who (people or organizations) have a relationship with the program/project, to learn the characteristics of that relationship, and to control that relationship in order to ensure the success of the program/project.

The purpose of conducting a stakeholder analysis is to know who has a relationship with the program/project, to know the characteristics of that relationship, and to control that relationship to make the program/project successful.

The team profiled the key stakeholders influencing and influenced by the Project, impacted or impacting the project and attempted to inquire about pertinent issues among the key stakeholders and communities close to the proposed project areas. The objective was to obtain their views on potential impact and mitigation measures that will inform the detailed studies and final interventions to mitigate the impacts.

The stakeholders within the project area were identified. Below is the result of the analysis on major stakeholders identified:

**Table 9.1.1 Result of Preliminary Stakeholder Analysis**

Stakeholder	Importance	Relevance to the Project
National Environment management Authority (NEMA)	High	<b>[High]</b> NEMA is the authority to proceed ESIA process and issue the approval of ESIA
Uganda Wildlife Authority (UWA) Including site office	High	<b>[High]</b> The project area is in the Karuma Wildlife Reserve and Murchison Falls National Park. UWA has responsibility to manage such protected areas appropriately and issue approval on the development inside of such protected areas in accordance with the Wildlife Act 2019
Uganda National Road Authority (UNRA)	High	<b>[High]</b> UNRA is the project proponent and recognizes necessity of the project
Uganda Wildlife Education Centre (UWEC)	Low	<b>[Low]</b> UWEC has been established for purpose of education on wildlife assisted by the Uganda Government and the Wildlife Conservation

Stakeholder	Importance	Relevance to the Project
		Society in New York and managed by a Wildlife Trust.
Ministry of Gender, Labour, and Social Development (MOGLSD)	Medium	<b>[Medium]</b> MOGLSD is mandated to handle gender, culture, occupational health and safety, labor issues, and community issues. MOGLSD shall be in a position to support these where necessary on these matters in the project.
Makerere University	Medium	<b>[Medium]</b> Some experts on wildlife may be interested in species in the project area
Karuma TC, Kamdini SC, and surrounding area	High	<b>[High]</b> Council members of Karuma TC, Kamdini SC have some lessons in terms of social and economic impacts from Karuma HPP project. Additionally, they think job opportunities increase during construction.
Citizen of Karuma TC, Kamdini SC, and surrounding area	High	<b>[High]</b> People in Karuma TC, Kamdini SC, and surrounding area have some lessons in terms of social and economic impacts from Karuma HPP project. Additionally, they think job opportunities increase during construction.
Fishery Association / Fishery Group	High	<b>[High]</b> Fishermen worry about adverse impacts on their fishing ground because they do not know what kind of impacts are caused by the project.
Women's group	Medium	<b>[Medium]</b> Karuma TC people including women have some lessons in terms of social and economic impacts from Karuma HPP project. Additionally, they think job opportunities increase during construction.
Youth Group	Medium	<b>[Medium]</b> This group have some concerns on the impacts of the project. At the same time, they are concerned with uplifting income status through increasing of job opportunities during construction.
NGOs	Medium	<b>[Medium]</b> Since the project is located inside of MNFP and KWR, some NGOs may be concerned with conserving wildlife and the Project impacts the conservation area.

Source: JICA Survey Team

## 9.2. Result of Local Stakeholder Meetings

### 9.2.1. Overview of Local Stakeholder Meetings

The local stakeholder meetings for ESIA have been held twice at scoping stage and draft ESIA stage, respectively. The overview such as date and venue for the meetings are shown below. The photos of the LSMs are shown in Table 9.2.2.

**Table 9.2.1 Overview of the Local Stakeholder Meetings**

Objectives of the Meeting (Date and Venue)	Agenda	Major Attendee	Number of Opinions and questions	Methodology
1 <sup>st</sup> Public Consultation in Karuma TC Scoping Stage (Nov 6 <sup>th</sup> , 2023: 15:00~17:00 Karuma Town Council Office	1. Project Outline 2. Alternative Analysis 3. Questionnaire 4. Schedule of the Project 5. Expected Major Impacts and Mitigation measures 6. Information collection on animals 7. Exchange Opinions	Total: 17 (male: 11, female: 6) Local Government	✓ Number of people who raised opinions: 3 ✓ Number of opinions and questions raised: 4	1) Information Disclosure ✓ Posting advertisement (Since 1 month prior to the meetings) ✓ Radio broadcast (1 month before and 2-3 days before the meetings) ✓ Miking (1 month before, 2-3 days before and on the day of the meetings)  2) Language English and Paluo, and Luo
1 <sup>st</sup> Public Consultation in Oyam District Scoping Stage (Nov 7 <sup>th</sup> , 2023: 10:00~12:00 Oyam District Local Government	1. Project Outline 2. Alternative Analysis 3. Questionnaire 4. Schedule of the Project 5. Expected Major Impacts and Mitigation measures 6. Information collection on animals 7. Exchange Opinions	Total: 21 (male: 15, female: 6) Local Government	✓ Number of people who raised opinions: 11 ✓ Number of opinions and questions raised: 10	
1 <sup>st</sup> Public Consultation in Kamdini Town Scoping Stage (Nov 7 <sup>th</sup> , 2023: 14:30 ~ 16:30 Kamdin Town Council Office	1. Project Outline 2. Alternative Analysis 3. Questionnaire 4. Schedule of the Project 5. Expected Major Impacts and Mitigation measures 6. Information collection on animals 7. Exchange Opinions	Total: 28 (male: 22, female: 6) Government: 1, PAPs: 18, NGOs and Community Specific Group: 6, Media: 1, JICA Survey Team: 3	✓ Number of people who raised opinions: 1 ✓ Number of opinions and questions raised: 7	
1 <sup>st</sup> Public Consultation in Karuma TC Scoping Stage (Nov 8 <sup>th</sup> , 2023: 10:30 ~ 14:00 Karuma Town Council Compound	1. Project Outline 2. Alternative Analysis 3. Questionnaire 4. Schedule of the Project 5. Expected Major Impacts and Mitigation measures 6. Information collection on animals 7. Exchange Opinions	Total: 141 (male: 99, female: 42) Government: 1, PAPs: 155, NGOs and Community Specific Group: 6, Media: 1, JICA Survey Team: 3	✓ Number of people who raised opinions: 8 ✓ Number of opinions and questions raised: 8	
1 <sup>st</sup> Public Consultation in Kamdini Town Scoping Stage (Nov 9 <sup>th</sup> , 2023: 10:00 ~ 12:30 at Nora Village, Juma Parish, Kamdini Town Council Township, Mon State)	1. Project Outline 2. Alternative Analysis 3. Questionnaire 4. Schedule of the Project 5. Expected Major Impacts and Mitigation measures 6. Information collection on animals 7. Exchange Opinions	Total: 65 (male: 50, female: 15) Government: 1, PAPs: 155, NGOs and Community Specific Group: 6, Media: 1, JICA Survey Team: 3	✓ Number of people who raised opinions: 9 ✓ Number of opinions and questions raised: 9	
2 <sup>nd</sup> Public Consultation in Karuma TC Draft ESIA Stage (Apr 3 <sup>rd</sup> , 2024: 10:30 ~ 13:30 at Karuma Town Council office	1. Project Outline 2. Result of the Preference on Alternative Analysis in the 1 <sup>st</sup> LSM Meetings 3. Summary of Survey and Forecast Result and Major Mitigation Measures 4. ESIA Implementation Structure 5. Grievance Redress Mechanism 6. Schedule of the Project 7. Exchange Opinions	Total: 238 (male: 173, female: 65) Karuma TC (Leaders of each level), Cultural Leader, Religion Leader, female group Leader, economic activity Leader, general inhabitants, etc	✓ Number of people who raised opinions: 8 ✓ Number of opinions and questions raised: 14	
2 <sup>nd</sup> Public Consultation in Kamdini Town Draft ESIA Stage (Apr 4 <sup>th</sup> , 2024: 10:30 ~	1. Project Outline 2. Result of the Preference on Alternative Analysis in the 1 <sup>st</sup> LSM Meetings	Total: 147 (male: 111, female: 36) Kamdini SC (Leaders	✓ Number of people who raised opinions: 9 ✓ Number of opinions and questions raised: 18	



Objectives of the Meeting (Date and Venue)	Agenda	Major Attendee	Number of Opinions and questions	Methodology
13:30 at Nora village Kamdini Town Council	3. Summary of Survey and Forecast Result and Major Mitigation Measures 4. ESIA Implementation Structure 5. Grievance Redress Mechanism 6. Schedule of the Project 7. Exchange Opinions	of each level), Cultural Leader, Religion Leader, female group Leader, economic activity Leader, general inhabitants, etc.		

Source: JICA Survey Team

**Table 9.2.2 Photos of LSHMs with Local People in the Vicinity of the Project Area**

A large group of people, mostly men, are seated on blue plastic chairs under a large tree. They are facing towards the left side of the frame. The ground is dirt.	A group of people are seated on the ground and on some chairs under a large tree. They are facing towards the left side of the frame. The ground is dirt.
First LSHM in Karuma TC (8 <sup>th</sup> November 2023)	First LSHM in Kamdini SC (9 <sup>th</sup> November 2023)
A large group of people, mostly men, are seated on blue plastic chairs under a large tree. They are facing towards the left side of the frame. The ground is dirt.	A group of people are seated on the ground and on some chairs under a large tree. They are facing towards the left side of the frame. The ground is dirt.
Second LSHM in Karuma TC (3 <sup>rd</sup> April 2024)	Second LSHM in Kamdini SC (4 <sup>th</sup> April 2024)

Source: JICA Survey Team

### 9.3. Summary of Initial Local Stakeholder Meetings

#### (1) 1st Local Stakeholder Meetings at Scoping Stage

1st Local Stakeholder Meetings at Scoping Stage were held. The opinions, questions and answers expressed during the discussion session are presented below;

**Table 9.3.1 Opinions in the 1st Local Stakeholder Meeting in Karuma TC (6th of Nov, 2023)**

No	Major Opinions and Answers				
	Questions / Comments		Answers		Reaction of the Questioner
	Name / Position	Questions / Comments	Name / Position	Answers	
1	Representative of the People with Disabled (PWD) Karuma TC (male)	The Karuma Hydropower Project did not provide for persons with disabilities. Will special consideration be given to persons with disabilities in this project?	JICA Survey Team	Local residents will be given priority in hiring workers during the construction of this project. Also, encourage contractors to hire fairly regardless of gender or disability for the same work.	Accepted the answer
2	Karuma TC Mayor (male)	How can local communities benefit in terms of employment?			

No	Major Opinions and Answers				
	Questions / Comments		Answers		Reaction of the Questioner
	Name / Position	Questions / Comments	Name / Position	Answers	
3	Community Member Karuma TC (male)	What benefits would Route B provide? We believe that Route D would benefit property owners by increasing land values along the roadway.	JICA Survey Team	The advantages of Route B were explained before the survey was conducted. If Route D is considered more desirable, each person's route preference is free to express his/her opinion.	Accepted the answer
4	Resident in Karuma TC (male)	How will Route B and Route D be funded?	JICA Survey Team	We are assuming grant assistance from the Japanese government, but this has not been finalized as we are currently conducting a survey to secure funding.	Accepted the answer

Source: JICA Survey Team

**Table 9.3.2 Opinions in the 1st Local Stakeholder Meeting in Oyam District Local Government (7th of Nov, 2023)**

No	Major Opinions and Answers				
	Questions / Comments		Questions / Comments		Questions / Comments
	Name / Position	Name / Position	Name / Position	Name / Position	
1	President in Oyam District (male)	From a security perspective, passing the road upstream of the dam (Route D) is not recommended.	JICA Survey Team	Comment noted	Accepted the answer
2	Physical planning / District Engineer(male)	Is there any difference in lifetime between Route B and Route D?	-	All of them are planned without changing their Design lifetime.	Accepted the answer
3	Assistant District Chief Administrative Officer Oyam (Female)	In the presentation it mentioned the possibility of the current Karuma Bridge collapsing in 4-5 years, but we have heard from another study that it will be about 7 years. What will happen to traffic if the current bridge collapses before the new Karuma Bridge is built?	JICA Survey Team	If the current Karuma Bridge becomes unusable, a detour will be necessary. Construction planning and environmental assessment have been started to avoid this situation. If the plan proceeds with the current preferred plan, contractor procurement, and construction will begin within a few years.	Accepted the answer
4	Physical planning (male)	When will the construction begin?	JICA Survey Team	According to current tentative plans, construction will begin in a few years.	Accepted the answer
5	District physical planning (male)	I have heard that UNRA is planning to build a highway at the Route D location, but it would be better to merge the two plans.	UNRA	UNRA has initiated a study of a master plan for highway construction, but no conclusions have been reached. Even if the plan were to be implemented, it would take 5-10 years.	Accepted the answer
6	Physical Planning (Female)	What CSR will Oyam County receive?	JICA Survey Team	Not determined at this time, but will be considered by contractor in the future as needed.	Accepted the answer
7	Physical Planning Representative (male)	Has funding from the Japanese government already been secured?	JICA Survey Team	Not yet confirmed, as the situation is currently being studied to secure funding.	Accepted the answer

Source: JICA Survey Team

**Table 9.3.3 Opinions in the 1st Local Stakeholder Meeting in Kamdine Town (7th of Nov, 2023)**

No	Major Opinions and Answers				
	Questions / Comments		Questions / Comments		Questions / Comments
	Name / Position	Name / Position	Name / Position	Name / Position	
1	Town Council Member (male)	The construction schedule for Route D indicates that it will take more than 7 years for land acquisition, etc., but that the current bridge will collapse or be restricted in about 4-5 years. In that case, what will happen to traffic restrictions?	JICA Survey Team	The current Karuma Bridge may be without problems for more than four years, but the situation is being studied quickly. In cases where bridges become impassable due to falling bridges, etc., rapid emergency response measures will be taken, such as the Katonga River bridge on the Masaka Highway that was affected by flooding.	Accepted the answer
2	Town Council Member (male)	Why is the approach road curved even with the Route B design? Wouldn't this eventually increase the number of accidents?	JICA Survey Team	The design is based on safety considerations that meet design standards. It will continue to be reviewed and finalized within the government.	Accepted the answer
3	Town Council Member (male)	When is the construction scheduled to begin?	JICA Survey Team	Not finalized yet, but current plan is to start around 2026-2029.	Accepted the answer
4	Town Council Member (male)	Please install signs or take other measures to improve safety regarding the curve.	JICA Survey Team	We shall consult with design side to install necessary signage.	Accepted the answer
5	Town Council Member (male)	There are concerns about the vibration impact of this project as well, since it was impacted during hydroelectric power generation.	JICA Survey Team	Impact assessment will be conducted in the ESIA and appropriate mitigation measures will be taken as necessary.	Accepted the answer
6	Town Council Member (male)	In my opinion, if we have this much money in the budget, we would like to spend it on community development.	JICA Survey Team	Comment noted	Accepted the answer
7	Town Council Member (male)	How will the CSR regarding this project be conducted? The previously conducted project included the maintenance of wells, etc.	JICA Survey Team	Not determined at this time, but will be considered by contractor in the future as needed.	Accepted the answer
8	Town Council Member (male)	During construction, we expect the project to give priority to hiring local residents under fair terms and conditions.	JICA Survey Team	The contractor will give priority to local residents and hire them when it is determined that they have the required skills.	Accepted the answer

Source: JICA Survey Team

**Table 9.3.4 Opinions in the 1st Local Stakeholder Meeting in Karuma TC (8th of Nov, 2023)**

Table 9.3.4 Opinions in the 1st Local Stakeholder Meeting in Karuma TC (6th of Nov, 2023)					
No	Major Opinions and Answers				
	Questions / Comments		Questions / Comments		Questions / Comments
	Name / Position	Name / Position	Name / Position	Name / Position	
1	Resident (male)	Will there be work opportunities during the construction of this project?	JICA Survey Team	Employment during construction will be determined through Kiryandongo County and Karuma TC, with priority given to the local community.	Accepted the answer
2	Resident (male)	What would the government do if the Karuma Bridge were to suddenly become unusable at present, e.g., due to a fallen bridge?	JICA Survey Team	Currently, the Uganda government and others are conducting a survey to ensure that the new bridge can be constructed quickly. In addition, the government will	Accepted the answer

No	Major Opinions and Answers				
	Questions / Comments		Questions / Comments		Questions / Comments
	Name / Position	Name / Position	Name / Position	Name / Position	
				send contractors and make necessary arrangements for temporary passage in the event of a bridge failure.	
3	Resident (male)	Has funding from the Japanese government already been secured?	JICA Survey Team	A detailed study of Route B will be conducted in the future, and if agreed upon through intergovernmental consultations, construction will be funded by the Japanese government. At this stage, however, a detailed study of Route D and the securing of funding have not yet been determined.	Accepted the answer
4	Resident (male)	If land acquisition is caused by this project, will compensation be provided?	JICA Survey Team	All compensation will be properly paid in accordance with Ugandan law.	Accepted the answer
5	Resident (male)	In my personal opinion, Route D is not desirable from the perspective of community convenience and development since it does not pass through the center of Karuma TC. Therefore, I would like the project to proceed with Route B.	JICA Survey Team	Comment noted	Accepted the answer
6	Resident (male)	I think Route B will have an impact on wildlife.	JICA Survey Team	Comment noted	Accepted the answer
7	Resident(male) chairman(male)	Will there be any mitigation measures during construction to mitigate the impact on business properties along the current road?	JICA Survey Team	Mitigation measures will be considered as necessary after impacts are confirmed in the ESIA.	Accepted the answer
8	Resident (male)	Is there any support planned for vulnerable social groups (women, disabled, etc.)?	JICA Survey Team	Mitigation measures will be considered as necessary after impacts are confirmed in the ESIA.	Accepted the answer
9	Resident (male)	I would like to request CSR hospital construction or hospital equipment upgrade.	JICA Survey Team	We will inform UNRA of such a request.	Accepted the answer
10	Resident (male)	What do you plan to do for CSR? Please share your CSR plan in advance.	JICA Survey Team	No decision has been made at this time. It will be considered by the contractor in the future as needed.	Accepted the answer

Source: JICA Survey Team

**Table 9.3.5 Opinions in the 1st Local Stakeholder Meeting in Kamdini Town (9th of Nov, 2023)**

No	Major Opinions and Answers				
	Questions / Comments		Questions / Comments		Questions / Comments
	Name / Position	Name / Position	Name / Position	Name / Position	
1	Fishermen (male)	There is concern that the proposed bridge will have an impact on the run of certain fish species, but what is the extent of the impact?	JICA Survey Team	Impacts on fish species will be analyzed in the environmental impact assessment. If there is concern about impacts, environmental mitigation measures and other actions will be considered.	Accepted the answer
2	Chairman LC 1 Dichunyi (male)	In the case of Route B, since there is concern about the impact on animals, why not plan it upstream? Also, since accidents are a concern, could the bridge	JICA Survey Team	For Route B, the upstream side of the current bridge location is a high security zone where the Karuma Dam is	Accepted the answer

No	Major Opinions and Answers				
	Questions / Comments		Questions / Comments		Questions / Comments
	Name / Position	Name / Position	Name / Position	Name / Position	
		be designed in a straight form with no curves?		located, so construction must be avoided. The proposed bridge will have a gradual curve and will be designed with safety considerations that meet the design standards.	
3	Resident (male)	Route D is preferable to Route B, which passes through a nature reserve, because of the benefits of compensation for land and increased employment opportunities.	JICA Survey Team	In the alternatives analysis, Route D does not pass through the protected area, but it is expected to have social impacts such as the resettlement of a large number of people.	Accepted the answer
4	Resident/(male)	I would like to know about new bridge types and construction methods. Is the bridge type decided? The same bridge as the Pakwach bridge is preferred.	JICA Survey Team	Bridge type and construction plans are being studied and planned. The bridge type for the Pakwach Bridge will be confirmed and the design team will be informed of the request.	Accepted the answer
5	Resident (male)	In the Karuma Hydropower Project, Chinese contractors constructed schools and hospitals. How about in this project?	JICA Survey Team	Not determined at this time, but will be considered by contractor in the future.	Accepted the answer
6	Resident (male)	What happens if a person is engaged as a laborer during construction and is killed in an accident?	JICA Survey Team	Strict safety measures will be taken to prevent accidents from occurring.	Accepted the answer
7	Resident (male)	In the Karuma Hydropower Project, there were cases where land and property were not compensated. Is there a possibility that such a situation may occur in the project as well?	JICA Survey Team	If there will be impacts on land, housing, etc., they will be designed to minimize them. Land and other property affected by the project will be compensated in accordance with the laws and regulations of Uganda.	Accepted the answer
8	Resident (male)	In the case of Route B, I have concerns about accidents occurring around the local community south of the current Karuma Bridge, and would like to request that humps be installed or other measures taken to ensure that vehicles traveling on the route do not exceed speed.	JICA Survey Team	The plan will be designed to meet design standards and safety considerations, but will include studies such as the installation of signs and other safety considerations.	Accepted the answer
9	Resident (male)	It is important that local residents be given priority for employment. In addition, employment of not only unskilled workers but also skilled workers should be considered depending on the ability of the residents.	JICA Survey Team	Contractors will hire for unskilled/skilled workers when they are determined to have the required skills, with priority given to local areas. In addition, consideration will be given to ensure transparency in the hiring process.	Accepted the answer

Source: JICA Survey Team

## (2) 2nd Local Stakeholder Meetings at Draft ESIA Stage

2nd Local Stakeholder Meetings at Draft ESIA Stage were held. The opinions, questions and answers expressed during the discussion session are presented below;

**Table 9.3.6 Opinions in the 2nd Local Stakeholder Meeting in Karuma TC (3rd of Apr, 2024)**

No	Major Opinions and Answers				
	Questions / Comments		Questions / Comments		Questions / Comments
	Name / Position	Name / Position	Name / Position	Name / Position	
1	Resident (male)	The perspective drawing appears to show no guardrails on the bridge. If a truck or other high vehicle were to hit the side of the bridge, it would probably fall off the bridge.	JICA Survey Team	Since the high railings are designed according to the standard, it's unlikely that there are no guardrails, but we will inform the design team of UNRA and the JICA Survey Team of the opinion.	Accepted the answer
2		The current Karuma Bridge was constructed in 1964. At that time, the Karuma TC Resident was not able to participate in the construction work and did not receive any benefits from it. What kind of benefits can be expected from this project, especially for the elderly who have known the Karuma Bridge since that time?	JICA Survey Team	We will inform the UNRA HQ of such opinions.	Accepted the answer
3		When will the construction begin?	JICA Survey Team	Though the construction of this project has not yet been agreed upon with the Japanese side, if all goes well, construction will begin around 2026.	Accepted the answer
4	Resident (female)	I would like to the CSR to construct a health center or provide job training.	JICA Survey Team	We will inform the UNRA HQ of such opinions.	Accepted the answer
5		I would like to a transparent procedure in hiring workers.	JICA Survey Team	We will inform the UNRA HQ to use fair hiring procedures, including clarification of eligibility requirements for employment.	Accepted the answer
6		I would like to have vocational training as a CSR for children who do not attend school.	JICA Survey Team	We will inform the UNRA HQ of such opinions.	Accepted the answer
7	Resident (male)	Existing bridges could be collapsed if project implementation is delayed.	UNRA	UNRA will conduct health monitoring and maintenance continuously.	Accepted the answer
8		I would like bridges and roads to have no curves to avoid accidents.	UNRA	The new Karuma bridge is designed under UNRA and Japanese standards. In addition, humps and other controls will be installed to avoid accidents and to control speed.	Accepted the answer
9		After the construction of the new bridge, the lower part of that bridge will be overgrown with grass, and elephants and snakes will be found in abundance, so please manage the area properly.	UNRA	The lower part of the new bridge will remain in its current condition and is not expected to change significantly. (Perspective shown and explained)	Accepted the answer
10	Resident (male)	In the Karuma Dam construction project, many Chinese people settled in Karuma TC and returned to their country, leaving behind children born out of wedlock with local females, which was considered a problem. The same problem may occur when Japanese people come to the project.	JICA Survey Team	As a mitigation measure for this ESIA, adequate educational activities for workers and Resident are planned to prevent such impacts.	Accepted the answer
11	Resident (male)	There are areas of beekeeping in the protected area around the project location, will it be affected?	JICA Survey Team	After the meeting, the impact will be confirmed at the site. (As a result of confirmation with UWA, no beekeeping is taking place in the affected area.)	Accepted the answer
12	Resident (male)	In the Karuma Dam construction project, construction of hospitals, schools, etc. was promised for the CSR, but no action was taken in this region. Is there a possibility that this promise will be reneged on this time as well?	JICA Survey Team	We will inform the UNRA HQ of such opinions.	Accepted the answer
13	Resident (male)	Will sidewalks be installed?	JICA Survey Team	Shoulders of sufficient width to be usable as sidewalks will be installed.	Accepted the answer
14	Resident	In the Karuma Dam construction project, the	JICA	We will inform the UNRA HQ of such	Accepted the answer

No	Major Opinions and Answers				
	Questions / Comments		Questions / Comments		Questions / Comments
	Name / Position	Name / Position	Name / Position	Name / Position	
	(female)	construction of an elementary school was promised as CSR. What is assumed as CSR in this project?	Survey Team	opinions and will provide you information when related activities are planned.	answer

Source: JICA Survey Team

**Table 9.3.7 Opinions in the 2nd Local Stakeholder Meeting in (4th of Apr, 2024)**

No	Major Opinions and Answers				
	Questions / Comments		Questions / Comments		Questions / Comments
	Name / Position	Name / Position	Name / Position	Name / Position	
1	Resident (male)	It was explained that humps will be installed in this project to prevent traffic accidents, and it is our request to UNRA to extend the area of installation of the humps to the centre of Kamdini SC (outside the project area). (CSR)	UNRA	Report to UNRA Headquarters. UNRA advises that requests preferably be submitted in document form to the regional contact person.	Accepted the answer
2	Resident (male)	Regarding requests to LC-III leaders, requests such as raised at this meeting at the LC-I level would be requests to the government. Therefore, we would like you to summarize them at the LC-III level and submit them in writing to the government.	LC-III Leader	Comment noted.	Accepted the answer
3		Regarding the design of the bridge, it appears to have no or low guardrails. It would be preferable to have a structure that is more secure for passing vehicles, such as the Pakwach Bridge.	UNRA	The standard-based high railings and guardrails will be installed so that vehicles will not fall under the bridge. However, such requests will be informed to the UNRA Headquarters.	Accepted the answer
4	Resident (female)	Regarding the method of announcement of today's meeting, since some people do not have radios, if conducting meetings like this in the future, please consider the frequency and duration of announcements.	JICA Survey Team	Information about today's meeting was announced through several methods, including (1) advertisements posted at 18 locations approximately three weeks in advance, (2) multiple radio broadcasts approximately three weeks and several days in advance, and (3) miking in the surrounding area on the morning of the meeting. Based on your comments, we will consider further expansion of the methods of announcement in the future.	Accepted the answer
5	Resident (male)	We would like to have fair and transparent disclosure of information regarding the employment of workers. We would also like to see information disclosed as early as possible, not just before the project is implemented.	JICA Survey Team	We will inform the UNRA HQ of such opinions.	Accepted the answer
6		Regarding the number of workers to be employed, it was explained that about 200 workers are expected, but does this include unskilled and skilled workers?	JICA Survey Team	It is expected that about 10% will be Japanese workers, 20~30% will be hired mainly from Kampala as skilled workers, and 60~70% will be unskilled workers hired from the surrounding areas where the project is planned.	Accepted the answer
7		In the explanation, it was explained that the bridge piers will not be installed in the river, but where will the piers be located? Are they really going to be installed outside the river?	JICA Survey Team	(Showing the completed construction plan) The piers will be installed outside of the river, as shown in this drawing, so no construction work will be done in the river.	Accepted the answer
8		Noise and vibration may be caused by blasting and other construction methods during construction work. We would like to request that site management and monitoring be done properly on site, rather than remotely.	UNRA	Blasting will not be used. Requests regarding site management during construction noted.	Accepted the answer
9	Resident (male)	How far is the new bridge from the existing bridge?	UNRA	(Showing the completed construction plan) They are about 50 meters away .	Accepted the answer
10		Since poverty is an issue in this region, could you	UNRA	We will share your comments with the	Accepted the



No	Major Opinions and Answers				
	Questions / Comments		Questions / Comments		Questions / Comments
	Name / Position	Name / Position	Name / Position	Name / Position	
		provide funding for a poverty reduction or livelihood restoration project for this region? (CSR)		UNRA headquarters and share the information with the appropriate authorities regarding the issues related to poverty and livelihoods.	answer
11		In past projects, there was a gap between the employment rate explained in advance and the actual employment rate for local workers. Therefore, it would be desirable to sign an MOU between the appropriate organization and the local community this time.	UNRA	We will report your comments to UNRA Headquarters for consideration.	Accepted the answer
12		There are Residents in the area who make their living mainly from fishing activities, and the construction of the bridge will prevent them from accessing the river, which will impact their economic activities.	JICA Survey Team	As already included in the proposed mitigation measures, if access routes are affected by the project, alternative access routes, etc. will be secured.	Accepted the answer
13	Resident (male)	In past projects such as the Karuma Hydroelectric Power Project, foreigners returned to their countries leaving behind children born out of wedlock with local females, which was viewed as a problem. What measures will be taken to avoid similar problems this time?	JICA Survey Team	As mitigation measures for this ESIA, educational activities for both workers and local Resident are planned to prevent such impacts.	Accepted the answer
14		For CSR such as school construction, hospital construction, etc., please clearly mention only those that have been decided to be implemented. (It seems that some of the past Karuma hydropower projects promised CSR but did not implement them.)	JICA Survey Team	The CSRs requested at this meeting will be informed to the UNRA HQ, and only if the implementation is decided, it will be announced to the public.	Accepted the answer
15		Since there are many unemployed young people in this area, we would like you to consider measures to give them priority employment.	JICA Survey Team	We will inform the UNRA HQ of such opinions.	Accepted the answer
16	Resident (male)	In the past projects such as the Karuma hydroelectric project, the number of children born out of wedlock increased in the surrounding areas, and if such cases occur in this project, we would like to provide livelihood restoration measures for the children and their families.	JICA Survey Team	We will inform the UNRA HQ of such opinions.	Accepted the answer
17	Resident (male)	The LC-I leader submitted the following requests at the Opening Remarks of this meeting and would like to request the following requests again. 1) Since water shortage is a problem in this area, we would like you to install wells as part of the CSR. 2) As the population is expected to increase due to the influx of construction workers, etc., we would like public toilets to be installed for sanitation management as part of the CSR. 3) As the CSR, we would like you to construct a community center. 4) We would like to request that employment be secured as workers for this project. We would also like you to set a target number of employees in each region and ensure that they are hired fairly. 5) As the CSR, we would like to request the establishment of youth centers to provide job training. 6) We would like the workers of this project to use not only the area near Karuma Bridge, but also the markets and stores in the Kamdini area.	UNRA	We will inform the UNRA HQ of such opinions.	Accepted the answer
18	Resident (male)	Regarding the employment of workers in this project, I would like to work as skilled workers,	JICA Survey	We will inform the UNRA HQ of such opinions.	Accepted the answer

No	Major Opinions and Answers				
	Questions / Comments		Questions / Comments		Questions / Comments
	Name / Position	Name / Position	Name / Position	Name / Position	
		not unskilled workers, so I would like to request that the employment conditions for skilled workers be disclosed and available for application, not only in Kampala, but also in this vicinity.	Team		

Source: JICA Survey Team

(3) Results of the response to the opinions and requests in the local stakeholder consultations.

At the meeting, questions and opinions were raised by local residents, but as no objections or problematic opinions were raised, it is understood that a basic agreement on the implementation of the project was reached.

The opinions and requests raised during the local stakeholder consultations, which were reflected in the project, are listed below.

**Table 9.3-8 Opinions in the Local Stakeholder Meeting and Reflections to the Project**

No.	Date of Questions / Comments	Position	Summary of Questions / Comments	Results of the study and results reflected in the project
1.	6th of Nov, 2023	Representative of the People with Disabled (PWD) Karuma TC (male)	Will special consideration be given to persons with disabilities in this project?	Reflected in mitigation measures [During Construction] 106) Providing equal job opportunities for the local people as construction workers. *Fair employment for the same work regardless of gender or disability.
2.	Same as above	Karuma TC Mayor (male)	How can local communities benefit in terms of employment?	Reflected in mitigation measures [During Construction] 108) Ensure people from local community are given priority where appropriate
3.	7th of Nov, 2023	Physical planning in Oyam District (Female)	What CSR will Oyam County receive?	There are no laws or regulations regarding Corporate Social Responsibility (CSR) in Uganda and UNRA projects, and the contractors are free on their own initiative during construction. Therefore, since there are no promises that can be made at the survey stage, it was decided to share the requests with other relevant ministries and agencies of the Ugandan government as the requests of the local government and residents.
4.	Same as above	Kamdini SC Town Council Member (male)	Please install signs or take other measures to improve safety.	Reflected in mitigation measures [After construction] 19) Install 40km/h speed limit signs and humps.
5.	Same as above	Kamdini SC Town Council Member (male)	During construction, we expect the project to give priority to hiring local residents under fair terms and conditions.	Reflected in mitigation measures [During Construction] 106) Providing equal job opportunities for the local people as construction workers. 108) Ensure people from local community are given priority where appropriate 132) Ensure fair wages of construction workers hired for the Project 144) Provision of equal job opportunities and fair salary regardless of gender (including positive segregation mechanism to ring fence some jobs for women)
6.	8th of Nov, 2023	Karuma Resident (male)	Will there be any mitigation measures during construction to mitigate the impact on business properties along the current road?	Reflected in mitigation measures [During Construction] 104) Information disclosure about the detailed construction plan, including schedule, construction area and related facilities, and traffic control areas. 107) Ensure access to the entrances of shops, restaurants, etc around the construction area and related facilities and traffic control areas.
7.	Same as above	Karuma TC	Is there any support planned for	Since there will be no direct negative impact on the vulnerable groups by

No.	Date of Questions / Comments	Position	Summary of Questions / Comments	Results of the study and results reflected in the project
	above	Resident (male)	vulnerable social groups (women, disabled, etc.)?	the implementation of this project, no special support measures such as vocational training are being considered; however, the following mitigation measures are being prepared. [During Construction] For the People with Disabled : See No.1 Gender Related 143) Development of the Code of Conduct for Contractors in conformity with gender policy and Employment Act, Cap 219. 144) Provision of equal job opportunities and fair salary regardless of gender (including positive segregation mechanism to ring fence some jobs for women) 145) Installation of the sanitary facilities in considering gender at construction site and related facilities (including workers' camp). 146) Provision of the educational training to the construction workers about gender issues. 147) Sensitization to the local people about gender issues.
8.	Same as above	Karuma Resident (male)	TC I would like to request CSR hospital construction or hospital equipment upgrade.	Reflected in mitigation measures Same as No.3
9.	9th of Nov, 2023	Kamdini Resident (male)	SC The bridge preferably be the same type (lower road truss bridge) as the Pakwachi Bridge, which would prevent falls from the upper part of the bridge.	Reflected in the design The safety of a bridge is regulated not by the type of bridge, but by the specifications of the safety facilities, such as the height of the railings on the bridge. In this project, the safety facilities have been fully considered and designed.
10.	Same as above	Kamdini Resident (male)	SC It is important that local residents be given priority for employment. In addition, employment of not only unskilled workers but also skilled workers should be considered depending on the ability of the residents.	Reflected in mitigation measures Same as No.5
11.	3rd of Apr, 2024	Karuma Resident (female)	TC I would like to the CSR to construct a health center or provide job training.	Reflected in mitigation measures Same as No.3
12.	Same as above	Karuma Resident (female)	TC I would like to a transparent procedure in hiring workers.	Reflected in mitigation measures Same as No.5
13.	Same as above	Karuma Resident (male)	TC I would like bridges and roads to have no curves to avoid accidents.	Reflected in the design The alignment follows design standards (e.g., Uganda MoWT road design manual).
14.	Same as above	Karuma Resident (male)	TC Will sidewalks be installed?	Reflected in the design Sufficient shoulder is available for sidewalks.
15.	4th of Apr, 2024	Kamdini Resident (male)	SC It is our request to UNRA to extend the area of installation of the humps to the center of Kamdini SC (outside the project area). (CSR)	Although outside the project implementation area, UNRA has decided to consider the installation of safety facilities from the viewpoint of ensuring future traffic safety.
16.	Same as above	Kamdini Resident (male)	SC Regarding the design of the bridge, it appears to have no or low guardrails. It would be preferable to have a structure that is more secure for passing vehicles, such as the Pakwach Bridge(lower-road truss bridge).	Reflected in mitigation measures Same as No.9
17.	Same as above	Kamdini Resident (male)	SC We would like to have fair and transparent disclosure of information regarding the employment of workers. We would also like to see information disclosed as early as	Reflected in mitigation measures [During Construction] 133) Information on the Project will be disseminated transparently to the local community. 134) Continue to communicate with the local community from the survey period to ensure that all concerns are addressed.

No.	Date of Questions / Comments	Position	Summary of Questions / Comments	Results of the study and results reflected in the project
			possible, not just before the project is implemented.	
18.	Same as above	Kamdini Resident (male)	SC In past projects, there was a gap between the employment rate explained in advance and the actual employment rate for local workers. Therefore, it would be desirable to sign an MOU between the appropriate organization and the local community this time.	Reflected in mitigation measures [During Construction] 107) Establishment of GRM for resolving issues including recording grievances delivered by the local people. 131) The contractor will encourage potential workers to get recommendation from local leaders (LC) to be eligible in the hiring of construction workers to ensure that those hired do not have criminal records.
19.	Same as above	Kamdini Resident (male)	SC Since there are many unemployed young people in this area, we would like you to consider measures to give them priority employment.	Reflected in mitigation measures Same as No.5
20.		Kamdini Resident (male)	SC In the past projects such as the Karuma hydroelectric project, the number of children born out of wedlock increased in the surrounding areas, and if such cases occur in this project, we would like to provide livelihood restoration measures for the children and their families.	Reflected in mitigation measures [During Construction] 143) Development of the Code of Conduct for Contractors in conformity with gender policy and Employment Act, Cap 219. 146) Provide the educational training on gender issues to the construction workers. 147) Sensitize the local people on gender issues.
21.		Kamdini Resident (male)	SC We would like you to install wells, construct a community center, youth centers to provide job training as part of the CSR.	Reflected in mitigation measures Same as No.3
22.		Kamdini Resident (male)	SC Regarding the employment of workers in this project, I would like to work as skilled workers, not unskilled workers, so I would like to request that the employment conditions for skilled workers be disclosed and available for application, not only in Kampala, but also in this vicinity.	Reflected in mitigation measures Same as No.5

Source: JICA Survey Team

#### (4) Results of Opinion Collection on the Route Preference from Local Stakeholders

##### 1) Objectives and Background of Opinion Collection

Based on the discussion points presented in the next table at the JICA Environmental and Social Consideration Advisory Committee Working Group on Scoping Draft held on October 27, 2023, a questionnaire regarding route preferences was conducted at the first local stakeholder meeting.

**Table 9.3-9 Comment from the JICA Environmental Committee Member**

### **1. consideration of alternatives for project implementation inside protected areas**

A committee member pointed out that the Guidelines for Environmental and Social Considerations stipulate that, in principle, projects must be implemented outside protected areas, and that it is not sufficient to simply explain that the feasibility of alternatives outside protected areas is relatively low compared to the proposed route inside protected areas. It was pointed out that it is necessary to present a clear and concrete argument that the off-reserve alternative is not feasible. In addition, it was pointed out that, based on the provisions of the Guidelines, stakeholder consultations should not assume that the proposed route is within the protected

area, but rather that the impacts of implementing the project within the protected area should be fully explained, and alternatives should be considered based on the opinions of the people in the project area and other factors.

Source: Minutes of Meeting for Working Group Meeting for JICA Advisory Committee (27<sup>th</sup> of Oct. 2023)

## 2) Result of Opinion Collection on the Route Preference

In the first local stakeholder consultation, UNRA explained the social, natural, and economic impacts and construction period for each alternative (Without Project, route inside the protected area and route outside the protected area). In addition, the scope of the protected area, purpose of establishment, prohibitions, zoning details, and distribution of wildlife in the surrounding area were explained. After explaining this information, the preferred route and the reasons for it were administered as an unsolicited questionnaire.

The results of the questionnaire are shown below. The overall results of the preference for the route inside the protected area and the route outside the protected area were as follows: inside the protected area: 91%, outside the protected area: 9%.

The results of the questionnaire were explained to the participants at the second local stakeholder meeting, and it was determined that consensus had been reached with the local residents in the project area to proceed with the project via the route within the protected area.

**Table 9.3-10 Result of the Questionnaire Survey on the Route Preference**

District	Route Preference		Total
	Route in the Protected Area (Person/%)	Route outside Protected Area (Person/%)	(Person/%)
Kiryandongo	95 (91%)	9 (9%)	104 (100%)
Oyam	114 (91%)	11 (9%)	125 (100%)
Total	209 (91%)	20 (9%)	229 (100%)

Source: JICA Survey Team

## 9.4. Focus Group Discussions

### (1) FGDs with Target Groups in the Vicinity of the Project Area

In addition to the LSHMs, Focus Group Discussions (FGDs) with several target groups in the vicinity of the Project area have been held (Table 9.4.1). The targeted groups were women, schoolteachers, cultural leaders, and religious leaders.<sup>16</sup>

**Table 9.4.1 List of Held FGDs with Target Groups in the Vicinity of the Project Area**

No.	Date	Venue	Target Group	Main Purpose of Meeting	Participants (excluding Project Side)			Means of Meeting
					Male	Female	Total	
1	8 <sup>th</sup> November 2023	Karuma TC	Women's Group	<ul style="list-style-type: none"> <li>To confirm the situation about gender, child labor, etc.</li> <li>To exchange opinions about proposed Project plan</li> </ul>	-	54	54	Face-to-face
2	9 <sup>th</sup> November 2023	Kamdini SC	Women's Group	<ul style="list-style-type: none"> <li>To confirm the situation about gender, child labor, etc.</li> <li>To exchange opinions about proposed Project plan</li> </ul>	-	66	66	Ditto
3	2 <sup>nd</sup> April 2024	Karuma TC	Teachers of Karuma Primary School	<ul style="list-style-type: none"> <li>To confirm challenges on child labor, gender, etc. related to public projects</li> <li>To exchange the opinions about proposed mitigation measures</li> </ul>	1	7	8	Ditto
4	2 <sup>nd</sup> April 2024	Karuma TC	Teachers of Mutunda Secondary School		2	4	6	Ditto
5	2 <sup>nd</sup> April 2024	Kandini SC	Teachers of Nora Primary School		9	2	11	Ditto
6	2 <sup>nd</sup> April 2024	Kandini SC	Teachers of Marriolate Secondary School		6	1	7	Ditto
7	3 <sup>rd</sup> April 2024	Karuma TC	Cultural leaders	<ul style="list-style-type: none"> <li>To confirm the location of cultural sites and resources</li> <li>To exchange the opinions about proposed mitigation measures</li> </ul>	15	-	15	Ditto
8	4 <sup>th</sup> April 2024	Kamdini SC			8	-	8	Ditto
9	5 <sup>th</sup> April 2024	Karuma TC	Religious leaders	<ul style="list-style-type: none"> <li>To exchange the opinions about proposed mitigation measures</li> </ul>	9	1	10	Ditto
10	5 <sup>th</sup> April 2024	Kamdini SC			14	-	14	Ditto

Source: JICA Survey Team

Table 9.4.2 shows the photos of the FGDs held. Since most of the participants live in the vicinity of the Project area, the same faces were also observed in the LSHMs, as well. However, it was worthwhile to have them in the FGDs again so that they could bring their comments on the Project based on their own attributions and/ or interests.

**Table 9.4.2 Photos of Held FGDs with Target Groups in the Vicinity of the Project Area**

	
Women's Group in Karuma TC (8 <sup>th</sup> November 2023)	Women's Group in Kamdini SC (9 <sup>th</sup> November 2023)

<sup>16</sup> Furthermore, the meetings with economic activity groups (e.g., fishermen group, beekeepers, etc.) in Karuma TC and Kamdini SC were held to confirm the current conditions of their activities, but the meeting were combined with the general LSHMs because most of participants were the same. The detailed discussion contents are provided in Section 9.3.



 <p>Karuma Primary School (2nd April 2024)</p>	 <p>Mutunda Secondary School (2nd April 2024)</p>
 <p>Nora Primary School (2nd April 2024)</p>	 <p>Marriolate Secondary School (2nd April 2024)</p>
 <p>Cultural Leaders in Karuma TC (3rd April 2024)</p>	 <p>Cultural Leaders in Kamdini SC (3rd April 2024)</p>
 <p>Religious Leaders in Karuma TC (5th April 2024)</p>	 <p>Religious Leaders in Kamdini SC (5th April 2024)</p>

Source: JICA Survey Team

The key comments and questions raised during the FGDs with the target groups are shown in Table 9.4.3. In every discussion, the participants freely expressed their concerns about the Project based on their experiences with the previous projects in their community. Majority of the target groups are interested about the job opportunities, CSR, and gender issues related to the construction workers to be hired from other areas. However, there were no objections to the proposed mitigation measures and no participants who disagreed with the Project implementation itself.



**Table 9.4.3 Main Comments and Questions from Target Groups in the Vicinity of the Project Area**

Target Group	Comment and Question (Speaker)	Answer (Speaker)
Women's group in Karuma TC <sup>17</sup>	1. Do you have any activities that depend on the water of the Nile River other than fishing? (JST)	Since the water flow is too fast and dangerous near our community, no activities (including washing clothes, collecting water) are seen. (Women's group)
	2. Have you been employed as construction workers in the previous projects? (JST)	Yes. We have worked as unskilled labors, flagmen, office cleaners, and food preparation staff for construction workers, etc. (Women's group)
	3. Have you experienced wage gap between men and women in the previous projects? (JST)	There was no wage gap when men and women performed the same tasks. However, only men were allowed to work at night. In this case, the wage gaps were caused because wages at night were higher than during the daytime.
	4. Have you observed problems of child labor in previous projects? (JST)	Since Ugandan law prohibits the employment of children, there is no child labor (except for domestic work such as collecting water, etc.). (Women's group)
Women's group in Kamdini SC <sup>18</sup>	5. Do you have any activities that depend on the water of the Nile River other than fishing? (JST)	Since the water flow downstream of the Karuma Dam is relatively slow, activities such as washing clothes, collecting water, and collecting firewood are seen. (Women's group)
	6. Have you been employed as construction workers in the previous projects? (JST)	Yes. We have worked as unskilled labors, flagmen, office cleaners, and food preparation staff for construction workers, etc. (Women's group)
	7. Have you experienced wage gap between men and women in the previous projects? (JST)	There was no wage gap when men and women performed the same tasks. (Women's group)
	8. Have you observed problems of child labor in previous projects? (JST)	Since Ugandan law prohibits the employment of children, there is no child labor (except for domestic work such as collecting water, etc.). (Women's group)
Karuma Primary School	9. Do you think that the Project will give impact on your people/ property/ site? (JST)	<ul style="list-style-type: none"> <li>The Project will cause school dropout because the child will have opportunities to work, e.g., selling items to construction workers as child labor.</li> <li>Construction machinery may attract children or scare them so that they do not come to school.</li> <li>The construction workers can cause early pregnancies because the workers involve the school going girls involved in sexual activities.</li> <li>The Project will cause GBV and cases where husbands may leave their wives because they will get money and marry off new workers. (Teachers)</li> </ul>
	10. What kind of challenges have your people/ property/ site observed from the previous project? (JST)	During a previous project, we experienced an increase in school dropouts, especially elder girls in our school with at least 3 to 5 girls per year. (Teachers)
	11. Have you ever observed any problems of discrimination of your group in previous projects? (JST)	No. Since there is a government policy that government schoolteachers should not leave the school, no teacher can apply to the work as a construction worker and no discrimination is caused. (Teachers)
	12. Have you observed problems of child labor in previous projects? (JST)	Yes. Children were hired as babysitters for construction workers in camps, and as unskilled labor to carry materials. (Teachers)
	13. We would like to receive advice on how to avoid child labor in the Project. (JST)	<ul style="list-style-type: none"> <li>The Project should sensitize the local people to teach them the values of education.</li> <li>It is suggested to give some support to children like school fees or scholastic materials like giving sanitary pads and study materials as CSR. In addition, the Project can provide extracurricular activities to attract children, materials such as balls, sportswear, sports tournaments, and a school feeding program to keep the children in school. (Teachers)</li> </ul>
	14. Do you think the Project will give impacts on any other children's rights? (JST)	<p>The followings are concerned.</p> <ul style="list-style-type: none"> <li>Increase in number of school children since some construction workers will come with their children.</li> <li>Some construction workers will use school facilities such as toilets.</li> <li>Water shortage due to the population inflow of construction workers in the area. (Teachers)</li> </ul>
	15. Have you observed problems related to GBV in this area? (JST)	Yes. We have observed fighting, family separation, child neglect, etc. (Teachers)
	16. Do you think that the Project will give impacts on gender aspects in this area? (JST)	No. (Teachers)
	17. We would like to receive advice or comments on the proposed mitigation measures against gender	The Project should have continuous sensitization to the local people. (Teachers)

<sup>17</sup> Since most of the women participated in the LSHM and gave their comments and questions, there were only a few comments and questions during the FGDs.

<sup>18</sup> Since most of the women participated in the LSHM and gave their comments and questions, there were only a few comments and questions during the FGDs.

Target Group	Comment and Question (Speaker)	Answer (Speaker)
	issues. (JST)	
	18. Have you observed infectious diseases such as HIV/ AIDS in this area? (JST)	Children suffering from such diseases are irregular in our school. At least 3 children have been identified. On the other hand, there are cases of the absenteeism from school because children have to take care their sick parents. (Teachers)
	19. We would like to receive advice or comments on the proposed mitigation measures infectious diseases. (JST)	<ul style="list-style-type: none"> <li>• There is a group that has been trained to do community awareness.</li> <li>• Provision of condoms to the local people. (Teachers)</li> </ul>
Mutunda Secondary School	20. Do you have any other concerns, recommendations, or advice for the Project? (JST)	<ul style="list-style-type: none"> <li>• We would like to request the continuous information sharing.</li> <li>• The Project should implement work with local leaders of the area.</li> <li>• The Project should not discriminate based on tribalism when recruiting people.</li> <li>• As CSR, we would like to request the Project to construct houses for teachers in the school since some even come from Nora side. Out of 16 teachers, only 6 have accommodation at the school.</li> <li>• We would like to request completion of the school fence partially constructed by KHPP. (Teachers)</li> </ul>
	21. Do you think that the Project will give impact on your people/ property/ site? (JST)	Yes. The Project can lead to low school attendance, resulting in school dropouts because our children are attracted to the machinery instead of studying in school. In addition, our students will be involved in child labor to earn money. (Teachers)
	22. What kind of challenges have your people/ property/ site observed from the previous project? (JST)	<ul style="list-style-type: none"> <li>• We are facing low school attendance.</li> <li>• Teachers left school to work on the construction site, expecting higher wages from the project. (It is caused by low school income due to school dropouts especially in private schools.) (Teachers)</li> </ul>
	23. Have you ever observed any problems of discrimination of your group in previous projects? (JST)	No. (Teachers)
	24. Have you observed problems of child labor in previous projects? (JST)	Yes. This is the main reason for dropping out of school. They work as boda-boda and/or taxi drivers, or sell materials, etc. The dropout rate is about 20% per year. (Teachers)
	25. We would like to receive advice on how to avoid child labor in the Project. (JST)	<ul style="list-style-type: none"> <li>• The Project should have age limit, e.g., not below school age (School age is estimated to be between 14 and 20 years).</li> <li>• Employment should be given to those with a minimum education of S6 (for skilled) and not below 30 years of age (for unskilled).</li> <li>• The Project should have interviews with all candidates before employment with the purpose of getting to know their age among other reasons.</li> <li>• The Project should sensitize the local people to teach them the values of education.</li> </ul>
	26. Do you think the Project will give impacts on any other children's rights? (JST)	<ul style="list-style-type: none"> <li>• We are concerned about no access to basic needs since there will be competition due to high population inflow by the Project. Therefore, we propose to enhance agricultural productivity.</li> <li>• Increase of early marriages and accidents at construction site are concerned.</li> <li>• Human trafficking in the area will be caused since most workers will not be known and may convince the children to go to them.</li> <li>• Vice such as use of drugs of construction workers will be copied by children.</li> </ul>
	27. Have you observed problems related to GBV in this area? (JST)	Yes. We observed fighting, family separation, child neglect, etc. (Teachers)
	28. Do you think that the Project will give impacts on gender aspects in this area? (JST)	Yes. We are concerned if the Project employs only or mostly men and causes family separation. (Teachers)
	29. We would like to receive advice or comments on the proposed mitigation measures against gender issues. (JST)	<p>The Project should consider to:</p> <ul style="list-style-type: none"> <li>• Avoid night shifts for construction workers.</li> <li>• Sensitize the local people and train the construction workers.</li> <li>• Provide condoms. (Teachers)</li> </ul>
	30. Have you observed infectious diseases such as HIV/ AIDS in this area? (JST)	We cannot know it because no disclosure of the status. (Teachers)
	31. We would like to receive advice or comments on the proposed mitigation measures against infectious diseases. (JST)	Same as No. 29. (Teachers)
	32. Do you have any other concerns, recommendations, or advice for the Project? (JST)	<ul style="list-style-type: none"> <li>• How does the school benefit from the Project? We may have a negative feeling in case we do not benefit as community. The Project can give seedlings to schools or communities, and rehabilitation center and training for youth, as its CSR.</li> <li>• We propose to plant more trees as compensation for those that will be cut down by the Project.</li> <li>• The Project needs to consider the plan for post-project effects (what</li> </ul>

Target Group	Comment and Question (Speaker)	Answer (Speaker)
		<p>plans does the Project have in cases of family separation, born of extramarital children, etc.).</p> <ul style="list-style-type: none"> <li>• The Project should carry out free blood testing and use alcohol detectors to isolate those who may use drugs. (Teachers)</li> <li>• The Project should not overwork the construction workers for their health. (Teachers)</li> </ul>
Nora Primary School	33. Do you think that the Project will give impact on your people/ property/ site? (JST)	<p>Yes. We are concerned about the following.</p> <ul style="list-style-type: none"> <li>• Girls may be disturbed by male construction workers.</li> <li>• In the previous projects, workers hired from other areas stayed in the community and impregnated many school children, causing them drop out of school. Fear is that a similar scenario may happen. Therefore, the Project is recommended to have strong rules and regulations. (Teachers)</li> </ul>
	34. What kind of challenges have your people/ property/ site observed from the previous project? (JST)	<ul style="list-style-type: none"> <li>• We experienced the increase of dropouts especially girls.</li> <li>• We observed the segregation by gender in recruitment.</li> <li>• The projects did not employ the people due to limited skills or knowledge.</li> <li>• Early pregnancies were also observed.</li> <li>• Theft, interruption with local activity like fishing by construction workers hired from other areas, and tribalism in the recruitment were caused.</li> <li>• We experienced the increase in cost of living due to competition for basic needs like housing. (Teachers)</li> </ul>
	35. Have you ever observed any problems of discrimination of your group in previous projects? (JST)	No. (Teachers)
	36. Have you observed problems of child labor in previous projects? (JST)	Yes. They were involved in manual work and works at hotels or restaurants. (Teachers)
	37. We would like to receive advice on how to avoid child labor in the Project. (JST)	<ul style="list-style-type: none"> <li>• The Project should not allow children near the construction site.</li> <li>• The Project should sensitize the local people.</li> <li>• All the construction workers to be hired from local community should be recommended by LC1 Chairpersons.</li> <li>• When their parents are employed, children will positively get school fees. (Teachers)</li> </ul>
	38. Do you think the Project will give impacts on any other children's rights? (JST)	The number of students is expected to increase as construction workers bring their families with them. (Teachers)
	39. Have you observed problems related to GBV in this area? (JST)	Yes. We observed fighting, family separation, child neglect, etc. (Teachers)
	40. Do you think that the Project will give impacts on gender aspects in this area? (JST)	No. Because the employment will be determined by qualification but not by gender. (Teachers)
	41. We would like to receive advice or comments on the proposed mitigation measures against gender issues. (JST)	The Project should sensitize especially local council members, opinion leaders, and cultural leaders. In addition, the Project should make the payment on time. (Teachers)
	42. Have you observed infectious diseases such as HIV/ AIDS in this area? (JST)	<p>Some children miss school due to diseases such as Malaria. At least 3 children disclosed. Those on medication need proper nutrition which they cannot get at school.</p> <p>Significance of dropping out of school is less than 100 students per year. (Teachers)</p>
	43. We would like to receive advice or comments on the proposed mitigation measures against infectious diseases. (JST)	The Project should sensitize and provide condoms to the local people. (Teachers)
	44. Do you have any other concerns, recommendations, or advice for the Project? (JST)	<ul style="list-style-type: none"> <li>• Teachers may leave the school service because they are better paid as construction workers. Teachers are paid half of what construction workers are paid.</li> <li>• The Project can give CSR such as furniture and fencing around the school just as UEGCL did to build structures for the school.</li> <li>• The Project can provide bursary schemes to those who excel or meet their needs, provide sanitary pads to children, and construct an incinerator (place where to burn used pads). (Teachers)</li> </ul>
	45. What if an accident happens whether on site or outside the site? What will the contractor do? (Teachers)	The Project has designed a policy to take care of this and this is reference to the national laws. (JST)
Marriolate Secondary School	46. Do you think that the Project will give impact on your people/ property/ site? (JST)	Yes. We are concerned about school dropouts, child labor, sexual harassment, intermarriages, child neglect, and pollution especially noise. (Teachers)
	47. What kind of challenges have your people/ property/ site observed from the previous project? (JST)	We observed the increase of cost of living, e.g., rental expenses, food stuff, as well as the competition for basic needs. (Teachers)

Target Group	Comment and Question (Speaker)	Answer (Speaker)
	48. Have you ever observed any problems of discrimination of your group in previous projects? (JST)	Tribalism can be discriminated while recruiting construction workers for the projects. (Teachers)
	49. What kind of advice can you give the Project to avoid such discrimination? (JST)	The Project should have a clear recruitment policy in place that even gives priority to the local community. (Teachers)
	50. In your profession/ affiliation/ area of jurisdiction, do you experience child labor? (JST)	Yes. Children are normally involved in agricultural activities. (Teachers)
	51. Have you observed problems of child labor in previous projects? (JST)	No. Except in small construction projects such as building houses. They were unskilled labor required on-site. (Teachers)
	52. We would like to receive advice on how to avoid child labor in the Project. (JST)	When the Project recruit the local people, the following can be helpful. 1) Recommendation letter issued by local council. 2) Obtaining consensus from parents in case one has no proper identification. (Teachers)
	53. Do you think the Project will give impacts on any other children's rights? (JST)	No. (Teachers)
	54. Have you observed problems related to GBV in this area? (JST)	Yes. We observed fighting, family separation, child neglect, etc. (Teachers)
	55. Do you think that the Project will give impacts on gender aspects in this area? (JST)	Yes. We are concerned about the following. • If only males will be hired for the Project. • If employment is limited for the persons with qualification and experiences. (The Project should also consider "ability" especially for work that involves carrying heavy loads.) (Teachers)
	56. Do you have any advice or comments on the proposed mitigation measures regarding gender issues? (JST)	The Project should also consider the follows. • Limiting working hours for construction workers. • Provision of timely payment to construction workers and financial literacy training, so that the family problems such as fighting, separation, and GBV can be reduced. (Teachers)
	57. Have you observed infectious diseases such as HIV/ AIDS in this area? (JST)	We cannot know it because no disclosure of the status. (Teachers)
	58. We would like to receive advice or comments on the proposed mitigation measures against infectious diseases. (JST)	• The Project should sensitize the local community. • It is recommendable to provide condoms at health centres and conduct free testing or provision self-testing kits. (Teachers)
Cultural leaders in Karuma TC	59. Do you have any other concerns, recommendations, or advice for the Project? (JST)	• We are concerned about the neglect human rights like right to worship when the local people are hired as construction workers. • The Project should ensure gender equality during recruitment. • The Project should employ people around the Project area (Local people should be given priority). • The Project should address water issue in Nora since there is only one borehole and the competition for water will increase when population increases by the Project. • The Project should work with parliament members as well as government officials. • The Project is requested for study tours for school children during the construction. (Teachers)
	60. Do you think that the Project will give impacts on any of your cultural site? (JST)	In reference to the previous project, some trees will be affected that are used for rituals. <sup>19</sup> (Cultural leaders)
	61. What kind of challenges have your people/ property/ site observed from the previous project? (JST)	The projects caused the climate changes i.e., droughts, outbreak of diseases and accidents, workers drowning in the Nile River, as well as abortions. (Cultural leaders)
	62. Have you ever observed any problems of discrimination of your group in previous projects? (JST)	Yes. Local people did not receive chances of employment by the projects. It was noted that even the Government discriminated cultural leaders. (Cultural leaders)
	63. We would like to receive advice on how to avoid such discrimination in the Project. (JST)	The Project needs to recognize local tribes in the Project area and continuous consultations with the cultural leaders are necessary. We appreciate your survey team for not ignoring us and including us in the early period of the Project. (Cultural leaders)
	64. Have you observed problems of child labor in previous projects? (JST)	Yes. Children are involved in prostitution, selling items, etc. (Cultural leaders)
	65. We would like to receive advice on how to avoid child labor in the Project. (JST)	No answer (Cultural leaders)
	66. Do you think that the Project will give impacts on gender aspects in this area? (JST)	The Project may promote gender imbalances since it may employ many men. The pregnant women and wives are not allowed on site. (Cultural

<sup>19</sup> After the FGD with the cultural leaders, the JICA Survey Team confirmed that the trees will not be affected by the Project. However, it should be noted that the Project will again consult with the cultural leaders to confirm whether there is a ritual tree in the Right of Way before commencing the works. In addition, if a ritual tree is accidentally found during the bush clearing, it will be handled according to the "chance find procedure."

Target Group	Comment and Question (Speaker)	Answer (Speaker)
		leaders)
	67. Have you observed infectious diseases such as HIV/ AIDS in this area? (JST)	No answer (Cultural leaders)
	68. We would like to receive advice or comments on the proposed mitigation measures against infectious diseases. (JST)	It should be avoided multi partners. (Cultural leaders)
	69. Do you think that the Project will give impacts on cultural beliefs? (JST)	<ul style="list-style-type: none"> <li>• There are points along the river that have some spiritual meanings.</li> <li>• Some accidents happen and this may be a sign that some rituals have to be performed. (Cultural leaders)</li> </ul>
	70. In case of conflicts among the same group/ tribe, is there any mechanism to resolve them?	Yes. We work with proper organizations such as police. Normally, tribes come together to resolve the conflicts between their persons in problem. In case of conflict and on behalf of the culprit, leaders can apologize to the spirits and culprit is forgiven else the spirits can decide on what to do. (Cultural leaders)
	71. In case of conflicts between other groups/ tribes, is there any mechanism to resolve them? (JST)	Consultations are made with other tribe leaders. Some rituals are performed, and the disputing parties can forgive themselves. (Cultural leaders)
	72. We would like to receive advice or comments on how the Project handles conflicts when they arise. (JST)	The Project need to report to elders so that they will take action. (Cultural leaders)
	73. Do you know of any other cultural/ historical resources and sites near the Project area other than those in our presentation? (JST)	Since we do not know the exact location of the Project area, we would like to visit together to confirm on whether there is cultural/ historical site near the Project area. <sup>20</sup> (Cultural leaders)
	74. We would like to receive advice or comments on the proposed mitigation measures for cultural/ historical resources and site. (JST)	Same as No. 73. (Cultural leaders)
Cultural leaders in Kandini SC	75. Do you have any other concerns, recommendations, or advice for the Project? (JST)	The Project needs to keep the consultations with cultural leaders. (Cultural leaders)
	76. Do you think that the Project will give impacts on any of your cultural site? (JST)	“Gor Gang” along the Nile River will be submerged if the water level is increased by the Project. <sup>21</sup> In addition, we have another cultural site called “Akwiigi.” <sup>22</sup> (Cultural leaders)
	77. What kind of challenges have your people/ property/ site observed from the previous project? (JST)	Our sites were damaged by the projects. (Cultural leaders)
	78. Have you ever observed any problems of discrimination of your group in previous projects? (JST)	We and our cultural aspects are always ignored in the previous projects. (Cultural leaders)
	79. We would like to receive advice on how to avoid such discrimination in the Project. (JST)	Continuous consultations are required. (Cultural leaders)
	80. Have you observed problems of child labor in previous projects? (JST)	Yes. Children sold items, and worked in camps, etc. (Cultural leaders)
	81. We would like to receive advice on how to avoid child labor in the Project. (JST)	In our society, three cows should be paid in case of child labor as a penalty. The leaders are amending our law in which the punishment may go to 10 cows. (Cultural leaders)
	82. Do you think that the Project will give impacts on gender aspects in this area? (JST)	<ul style="list-style-type: none"> <li>• The Project will empower men around the Project area to boost their incomes.</li> <li>• The Project will bring negative impacts to women as we discussed.</li> <li>• Construction workers will have monthly income and be able to take over people's wives. (Cultural leaders)</li> </ul>
	83. Have you observed infectious diseases such as HIV/ AIDS in this area? (JST)	<ul style="list-style-type: none"> <li>• HIV/AIDs are a serious problem everywhere. With continuous sensitization around, people have reformed.</li> <li>• In the past, when a man died, his brother would take his widow. Nowadays, because of HIV/ AIDs, this does not happen anymore. (Cultural leaders)</li> </ul>
	84. We would like to receive advice or comments on the proposed mitigation measures against infectious diseases. (JST)	<ul style="list-style-type: none"> <li>• The Project should sensitize the local people.</li> <li>• The Project should enhance one partner and should not enhance sexual exploitation. (Cultural leaders)</li> </ul>
	85. Do you think that the Project will give impacts on	• No. (Cultural leaders)

<sup>20</sup> After the FGD with cultural leaders, the JICA Survey Team brought the leaders to confirm the location. As a result, there is no sites to be affected.

<sup>21</sup> After the FGD with cultural leaders, the JICA Survey Team visited the site to confirm the exact location. As a result, it was confirmed that it will not be directly and physically affected by the Project because it is located at least 2 km away from the alignment and the Project will not raise the water level of the Nile River.

<sup>22</sup> It is located at least 1 km away from the existing Karuma Bridge on the west side (within protected area). Therefore, the direct physical impacts are not anticipated (see, No.89).

Target Group	Comment and Question (Speaker)	Answer (Speaker)
	cultural beliefs? (JST)	
	86. In case of conflicts among the same group/ tribe, is there any mechanism to resolve them? (JST)	<ul style="list-style-type: none"> <li>We have a local cultural government that starts from local chief to clan chief, then to supreme clan chief.</li> <li>Under one tribe, there more than 100 clans. If the conflicts within the tribe (or among such clans) are raised, the tribe has their own structures to handle them. In addition, clan chiefs are responsible for any conflicts. (Cultural leaders)</li> </ul>
	87. In case of conflicts between other groups/ tribes, is there any mechanism to resolve them? (JST)	There are structures to handle conflicts. (Cultural leaders)
	88. We would like to receive advice or comments on how the Project handles conflicts when they arise. (JST)	If the conflicts are based on cultural aspects, they should be taken to cultural leaders. (Cultural leaders)
	89. Do you know of any other cultural/ historical resources and sites near the Project area other than those in our presentation? (JST)	<ul style="list-style-type: none"> <li>"Gor Gang" is a place where our ancestors went in cases of epidemics, famine, etc.</li> <li>"Akwiwi" is a place for infertile women and when taken there, the women conceive in less than 2 months, but it will not be affected. (Cultural leaders)</li> </ul>
	90. We would like to receive advice or comments on the proposed mitigation measures for cultural/ historical resources and site. (JST)	None. (Cultural leaders)
Religious leaders in Karuma TC	91. Do you have any other concerns, recommendations, or advice for the Project? (JST)	<ul style="list-style-type: none"> <li>If our site is affected by the Project, it should be relocated at the cost of the contractor.</li> <li>As CSR, something should be done for the cultural institutions of the area. We would like to suggest constructing some houses for orphans or abandoned people who are taken care by the cultural institutions.</li> <li>"Gor Gang" was a powerful site for the region. It should not be undermined.</li> <li>Before construction begins, cultural rituals should be performed to appease the spirits. The leaders know how to do this. For the rituals, sheep, yeast, pots with two mouths, beads, coins, chicken, leopard skin, spears, etc. are needed to perform the prayers. (Cultural leaders)</li> </ul>
	92. Do you think that the Project will give impacts on the people of your religion? (JST)	Yes. The people would not respect the prayer time and religious beliefs. (Religious leaders)
	93. What kind of challenges have your people/ property/ site observed from the previous project? (JST)	<ul style="list-style-type: none"> <li>Prayer time was not respected.</li> <li>In addition, Muslims were forced to cook pork for the Chinese people.</li> <li>Smoking, destruction of prayers with noise, and use of abusive and insulting language were observed. (Religious leaders)</li> </ul>
	94. Have you ever observed any problems of discrimination of your group in previous projects? (JST)	No. (Religious leaders)
	95. We would like to receive advice on how to avoid discrimination in the Project. (JST)	Recruitment should include members of different religions, and regular departmental meetings should be held with construction workers to review any forms of discrimination that may exist in the Project area. (Religious leaders)
	96. Have you observed problems of child labor in your religion? (JST)	No. (Religious leaders)
	97. Have you observed problems of child labor in previous projects? (JST)	Yes. Children were involved in jobs such as collection of scrap by their parents or even themselves.
	98. We would like to receive advice on how to avoid child labor in the Project. (JST)	There should be sensitization to parents and the contractor, and strict enforcement of the child labor law. (Religious leaders)
	99. Do you think the Project will give impacts on any other children's rights? (JST)	<ul style="list-style-type: none"> <li>Employment school going children will lead to dropouts.</li> <li>Impregnating of schoolgirls that will deny them a right to education.</li> </ul>
	100. Have you observed problems related to GBV in this area? (JST)	Yes. We observed fighting in families, family separations, child neglect, and the burning of homesteads. (Religious leaders)
	101. Do you think that the Project will give impacts on gender aspects in this area? (JST)	<ul style="list-style-type: none"> <li>This includes GBV in cases where married men fight with their wives over cheating with the construction workers.</li> <li>Early pregnancies among the community leading to abortions, which is against the religious norms. (Religious leaders)</li> </ul>
	102. We would like to receive advice or comments on the proposed mitigation measures against gender issues. (JST)	The contractor should avoid retaining married women at the workers' camp and stopping exchange of sex for jobs. (Religious leaders)
	103. Have you observed infectious diseases such as HIV/ AIDS in this area? (JST)	Since the community health clinic is always busy, the risk of spread is high. (Religious leaders)
	104. We would like to receive advice or comments on the proposed mitigation measures against infectious diseases. (JST)	The mitigation measures proposed in the ESIA report should be followed. (Religious leaders)

Target Group	Comment and Question (Speaker)	Answer (Speaker)
	105. Do you think that the Project will give impacts on your affiliation? (JST)	For avoiding it, the contractor should have respect for religious beliefs. (Religious leaders)
	106. In case of conflicts among the same group/ tribe, is there any mechanism to resolve them? (JST)	Our procedures for resolving conflicts are followed, i.e., from the bottom up, depending on the issue to be resolved. (Religious leaders)
	107. In case of conflicts between other groups/ tribes, is there any mechanism to resolve them? (JST)	Inter-religion conflicts have never been witnessed. For conflict resolution, there was segregation among religions in the previous projects. (Religious leaders)
	108. We would like to receive advice or comments on how the Project handles conflicts when they arise. (JST)	It is recommended to form the task force committee with all the religious leaders brought on board. In addition, the representatives of religious leaders should be included in the proposed GRM of the Project. (Religious leaders)
	109. Do you have any other concerns, recommendations, or advice for the Project? (JST)	<ul style="list-style-type: none"> <li>The Project should consider CSR at the request of religious organizations.</li> <li>The Project should respect the recognize religious impact days such as Christmas, Eid, Easter, etc.</li> <li>A community prayer should be held during the commissioning of the Project to bless its smooth operation.</li> <li>Waste collection and disposal should be on weekly basis. (Religious leaders)</li> </ul>
Religious leaders in Kamdini SC	110. Do you think that the Project will give impacts on the people of your religion? (JST)	<ul style="list-style-type: none"> <li>Overpopulation given that many people may come around and worship places may not be enough.</li> <li>Inter marriages between religions and if not protected, may lead to disease.</li> <li>If people must work on Sunday, they will miss out on worship time.</li> <li>The Project will increase early pregnancies and accidents outside the sites. But positively, it will also bring development in the community.</li> <li>If people come into the community with their beliefs, the indigenous religions will be destroyed or empowered. (Religious leaders)</li> </ul>
	111. What kind of challenges have your people/ property/ site observed from the previous project? (JST)	<ul style="list-style-type: none"> <li>Churches were not considered in the Project.</li> <li>We experienced the impersonation during payments, working without contracts, and the use of drugs in the community. (Religious leaders)</li> </ul>
	112. Have you ever observed any problems of discrimination of your group in previous projects? (JST)	No. However, corruption was noted during the recruitment. (Religious leaders)
	113. We would like to receive advice on how to avoid discrimination in the Project. (JST)	<ul style="list-style-type: none"> <li>The Project should have a clear policy for recruitment.</li> <li>The priority should be given to the local people. The same reason why people steal from sites is that they are discriminated. We advised on previous projects, but things were changed by the selected few when the Project started. (Religious leaders)</li> </ul>
	114. Have you observed problems of child labor in your religion? (JST)	No. (Religious leaders)
	115. Have you observed problems of child labor in previous projects? (JST)	Yes. (Religious leaders)
	116. We would like to receive advice on how to avoid child labor in the Project. (JST)	<ul style="list-style-type: none"> <li>The Project should consider the labor policy and the national ID should be confirmed for age verification before recruiting.</li> <li>All leaders oppose the employment of children and recommend that recruitment be done with the endorsement of local leaders.</li> <li>The Project should have continuous sensitization and open communication. (Religious leaders)</li> </ul>
	117. Do you think the Project will give impacts on any other children's rights? (JST)	<ul style="list-style-type: none"> <li>We are concerned about sound pollution which may lead abortions, and road crossing would be a problem since many vehicles may be used.</li> <li>In addition, children may be interested in new behaviours from the construction workers. (Religious leaders)</li> </ul>
	118. Have you observed problems related to GBV in this area? (JST)	We have observed fighting between couples, and unfaithfulness when partners go with other people. This is caused by poverty, drinking alcohol, and there are some factors that are spiritual. (Religious leaders)
	119. Do you think that the Project will give impacts on gender aspects in this area? (JST)	<ul style="list-style-type: none"> <li>Females may think that they cannot work if they are pregnant, which can lead to abortions.</li> <li>Men may fail to do marital duties due to overwork. (Religious leaders)</li> </ul>
	120. We would like to receive advice or comments on the proposed mitigation measures against gender issues. (JST)	<ul style="list-style-type: none"> <li>Counselling the couples in trouble is necessary.</li> <li>The Project should sensitize the local people. (Religious leaders)</li> </ul>
	121. Have you observed infectious diseases such as HIV/ AIDS in this area? (JST)	<ul style="list-style-type: none"> <li>Problems came from parents who did not teach their children about the causes of HIV/ AIDS.</li> <li>People do not want to disclose their status and are afraid to take medication.</li> </ul>



Target Group	Comment and Question (Speaker)	Answer (Speaker)
	122. We would like to receive advice or comments on the proposed mitigation measures against infectious diseases. (JST)	<ul style="list-style-type: none"> <li>Some die because of ignorance. (Religious leaders)</li> <li>It is recommended praying and fasting to avoid such diseases.</li> <li>Testing before relationship is required.</li> <li>The Project should sensitize local people and consult with churches. (Religious leaders)</li> </ul>
	123. Do you think that the Project will give impacts on your affiliation? (JST)	<ul style="list-style-type: none"> <li>There are some points along the Nile River with natural spirits that need to take care before the construction.</li> <li>Religious leaders must be consulted before any work is started, and the Project should consult the soldiers around the Karuma Bridge.</li> <li>In a previous project, foreigners consulted with Owinyo Cute (Senior Witch) in the hope the spirits would accept the project. (Religious leaders)</li> </ul>
	124. In case of conflicts among the same group/ tribe, is there any mechanism to resolve them? (JST)	There are leaders who preside over the committee to resolve such conflicts. (Religious leaders)
	125. In case of conflicts between other groups/ tribes, is there any mechanism to resolve them? (JST)	Among different religions, leaders can meet and resolve the conflicts. (Religious leaders)
	126. We would like to receive advice or comments on how the Project handles conflicts when they arise. (JST)	<ul style="list-style-type: none"> <li>In Uganda, there are many religions, and in the community, all the worshipers cooperate.</li> <li>The Project should sensitize the local people to follow the teachings of the religious books.</li> <li>It is recommended that the Project consult with the leaders in the event of a problem.</li> </ul>
	127. Do you have any other concerns, recommendations, or advice for the Project? (JST)	<ul style="list-style-type: none"> <li>It is requested that the Project explains for mosques, churches, and health clinics since they anticipate an increase in population.</li> <li>Construction workers should be allowed to observe their prayers, whether daily for the case of Muslims.</li> <li>It is recommended that the prayers must be said before any works are done.</li> <li>Our people should be given priority when hiring.</li> <li>The Project should employ the people depending on their ability and/or education qualification.</li> <li>The Project should deploy traffic wardens for school going children to cross the road.</li> <li>The Project should not allow children near the construction site especially for orphans and street children.</li> <li>It is recommended to construct a learning centre for the children, as CSR.</li> <li>The Project should sensitize the local people to avoid the GBV issues.</li> </ul>

Source: JICA Survey Team

## (2) FGDs with NGOs

In addition to the above FGDs with target groups, the JICA Survey Team had meetings with local NGOs (Table 9.4.4). Both organizations are registered as “Community Based Organization (CBO)” in accordance with the national law.

**Table 9.4.4 List of Held FGDs with Local NGOs**

No.	Date	Venue	Target Group	Main Purpose of Meeting	Participants (excluding Project Side)			Means of Meeting
					Male	Female	Total	
1	8 <sup>th</sup> January 2024	Karuma TC	KHALCO	<ul style="list-style-type: none"> <li>To confirm challenges in the local community and information about the activities</li> </ul>	5	1	6	Face-to-face
2	10 <sup>th</sup> January 2024	Kamdini SC	Ignite Change	<ul style="list-style-type: none"> <li>To obtain advice, recommendation, and suggestion to the Project</li> </ul>	1	3	4	Ditto

Source: JICA Survey Team

**Table 9.4.5 Summary of Local NGOs operating in the Vicinity of the Project Area**

Item	KHALCO (Karuma Hydro Power Project Local Community Organization)	Ignite Change
Registration Status	NGO as CBO	NGO as CBO
Establish Year	1997	2019
Target Area	Karuma TC	Kamdini SC
Summary of the Organization	<ul style="list-style-type: none"> <li>Originally called “Local Councils and Elders Committee (LEC),” it was formed to defend the rights</li> </ul>	<ul style="list-style-type: none"> <li>It is a Christian organization that was originally founded in 2017 in the United States and started working in Uganda in</li> </ul>

Item	KHALCO (Karuma Hydro Power Project Local Community Organization)	Ignite Change
	<p>of the local community and to raise awareness among the local people.</p> <ul style="list-style-type: none"> <li>The name was changed when it was KHPP, and it was a bridge between the residents and the project side.</li> <li>The organization continues to conduct activities in the same area today after KHPP.</li> </ul>	<p>2019.</p> <ul style="list-style-type: none"> <li>Their main activities are education and technical/vocational training for vulnerable groups such as widows, orphans, single mothers, and street youth.</li> </ul>
Website	None	<a href="https://www.ignitechange.com/">https://www.ignitechange.com/</a>

Source: JICA Survey Team

The key comments and questions raised during the FGDs with the above organizations are shown in Table 9.4.6. In particular, both organizations requested continued information sharing with them, as they are working in the same area as the Project. However, there were no participants who disagreed with the Project implementation itself.

**Table 9.4.6 Main Comments and Questions from Local NGOs**

Organization	Comment and Question (Speaker)	Answer (Speaker)
KHALCO	1. What activities/ projects have been conducted in this area, so far? (JST)	The organization was involved in KHPP's land acquisition and ESIA survey. In particular, it played a role in linking the project and the local people through awareness raising activities. In addition to the project mentioned above, the organization also supports activities related to agriculture and beekeeping by linking the district office with local residents. (KHALCO)
	2. What challenges does your organization see in this area so far from the perspective of your area of expertise? (JST)	During the previous project, local people were unable to find work as the construction works. In addition, workers came from other parts of Uganda and from China. Therefore, we are concerned that the Project will be in the same situation and the poverty population will be affected. (KHALCO)
	3. Do you think that the Project will give impacts on the poverty group? (JST)	We believe the Project will promote local economic activity in the area. (KHALCO)
	4. Do you think that the Project will give impacts on indigenous and ethnic minorities in this area? (JST)	There is a cultural site called <i>Manana</i> along the Nile River. Therefore, there will be people who will be affected. *
	5. Do you think that the Project will give impacts on other vulnerable groups in this area? (JST)	<p>We think that the Project will increase the population and improve the social livelihoods of the vulnerable groups. We also consider that people who fish downstream of the existing Karuma Bridge will be affected both positively and negatively by the Project. Regarding negative impacts, there is concern about the change in water flow.</p> <p>↓</p> <p>In this regard, the JICA Survey Team provided the following explanation.</p> <p>On the downstream side, only KFA members are allowed to fish by the UWA, and their fishing is 2 km away from the existing Karuma Bridge. As for the new bridge, the piers will not be constructed in the water.</p> <p>↓</p> <p>Based on the above information, KHALCO members concluded that "there would be no significant impacts and only minor impacts from the Project."</p>
	6. Do you think that the Project will give impact on the local economy, including employment and means of livelihood in this area? (JST)	Job creation, social development, and financial circulation are enhanced, resulting in a positive impact on vulnerable groups. The Project can stimulate local businesses. (KHALCO)
	7. Is there a problem of wage disparity between men and women despite doing the same job in this area? (JST)	There is no such a gap in payment. If the work is the same, payment should be equal. However, payment may vary depending on whether the work requested is skilled or unskilled. KHALCO (or the town council) will work with the contractor to avoid such concerns; KHALCO has a human resources department that can handle such matters. (KHALCO)
	8. Have you seen any other differences in rights between men and women in this area? (JST)	No. (KHALCO)
	9. Do you think that the Project will give impacts on gender issues in this area? (JST)	In the previous project, there were several cases of construction workers impregnating local girls pregnant and leaving the community after the project was completed. At present, our area is facing problems related to the children born in the area, such as parents not taking care of them and not educating them. Therefore, the Project should not do the same. (KHALCO)
	10. Have you observed child labor issues in this area?	Yes (Case details are provided in No. 13). (KHALCO)

Organization	Comment and Question (Speaker)	Answer (Speaker)
	(JST)	
	11. We would like to receive advice on how to avoid child labor in the Project. (JST)	When contractors hire local people, they must verify the candidate's age with a national ID card; there is a "labor law" that prohibits child labor under the age of 16. KHALCO and Karuma TC members can also instruct parents not to allow their children to participate in work. In the previous project, candidates were only tested to see if they could carry heavy stones with a given time limit, but there was no age limit. Therefore, this should not be done in the Project. (KHALCO)
	12. Do you think the Project will give impacts on any other children's rights? (JST)	Sometimes children do not go to school and wander around the construction site. For this reason, if children come to see, the Project should instruct the children to go to school.
	13. Do you have any other concerns, recommendations, or advice for the Project? (JST)	<ul style="list-style-type: none"> <li>• With regard to employment, local people should be considered the top priority.</li> <li>• Due to the need for a new bridge, we request that the Project be started as soon as possible.</li> <li>• Safety system should be enhanced to save lives of local people and avoid accidents during construction.</li> <li>• KHALCO requests continuous information sharing to enlighten local people. (KHALCO)</li> </ul>
Ignite Change	14. Will the bicycle pathway be provided? (Ignite Change)	The shoulder will be secured along the route that cars travel. This allows bicyclists to use it as well. (JST)
	15. What will the elevation of the new bridge be? (Ignite Change)	It will be higher than the existing bridge. (JST)
	16. Will the existing bridge be closed to traffic during construction? (Ignite Change)	The plan is not to close the road to traffic during the construction period. (JST)
	17. In our experience, we have seen projects that explain that local people will benefit from the projects when they are planned, but when it comes time to implement the projects, non-local people were brought in (hired as construction workers). We are concerned that the same thing will happen in the Project. (Ignite Change)	IF the ESIA report proposes to employ local people, the Project must be implemented accordingly. UNRA is also responsible for monitoring local activities and reporting the results to JICA. (JST)
	18. What activities/ projects have been conducted in this area, so far? (JST)	<p>Currently, the four most focused activities are as follows.</p> <ol style="list-style-type: none"> <li>1) Community engagement addressing child protection and GBV</li> <li>2) Moving out of poverty with a focus on youth and young mothers</li> <li>3) Skilling program focused on community training</li> <li>4) Establishment of training centers focused on skills training</li> </ol> <p>We chose Kamdini SC as the site for our activities because of the local challenges we see with human rights, child labor, sex workers, due to transportation accessibility, poaching, conflicts with elephants and other animals, and the nature of the grassroots communities. (Ignite Change)</p>
	19. What challenges does your organization see in this area so far from the perspective of your area of expertise? (JST)	<p>In related to the previous project experience, the following challenges can be observed.</p> <ol style="list-style-type: none"> <li>1) Increase in commercial sex workers</li> <li>2) Early teenage pregnancies</li> <li>3) Disposable income as construction workers (⇒ improper income management)</li> </ol> <p>In fact, the Ignite Change office has received cases specifically related to sexual harassment. (Ignite Change)</p>
	20. Do you think that the Project will give impacts on the poverty group? (JST)	This question was already answered. (Ignite Change)
	21. Do you think that the Project will give impacts on indigenous and ethnic minorities in this area? (JST)	Same as No. 20. (Ignite Change)
	22. Do you think that the Project will give impacts on other vulnerable groups in this area? (JST)	Same as No. 20. (Ignite Change)
	23. Do you think that the Project will give impact on the local economy, including employment and means of livelihood in this area? (JST)	Local people should be given priority in hiring construction workers. (Ignite Change)
	24. Is there a problem of wage disparity between men and women despite doing the same job in this area? (JST)	Yes. In the previous project, such a problem was observed. (Ignite Change)
	25. We would like to receive advice on how to avoid wage disparity in the Project. (JST)	In the previous project, the majority of men stayed at the workers' campsites, while the majority of women stayed their homes (outside of the campsites). This meant that women did not receive the same benefits as men, such as free meals, free lodging, and transportation. Therefore, the same benefits should be given to both men and women. In addition,

Organization	Comment and Question (Speaker)	Answer (Speaker)
		to avoid the disparity, consideration should be given to working hours for workers who stay outside the campsite.
	26. Have you seen any other differences in rights between men and women in this area? (JST)	Same as No. 25. (Ignite Change)
	27. We would like to receive advice on how to avoid gap between men and women in the Project. (JST)	Education of the local people on culture and gender is essential. (Ignite Change)
	28. Do you think that the Project will give impacts on gender issues in this area? (JST)	Particularly in the previous project, it was observed that men with increased income from the project abandoned their wives and children. In addition, some women did the same. The same situation may happen through the Project. (Ignite Change)
	29. Have you observed child labor issues in this area? (JST)	During the previous project, we observed children working in food stalls.
	30. We would like to receive advice on how to avoid child labor in the Project. (JST)	The Project should include the concept of awareness-raising for child protection. For example, if construction workers buy food from children, the issue of child labor cannot be avoided. Awareness-raising is therefore important. Awareness-raising on HIV, GBV, etc. is also necessary since children under 18 years of age are more susceptible to these issues. The organization's policies on sex education and child education need to be in place. These also need to be clearly stated in the contract. (Ignite Change)
	31. Do you think the Project will give impacts on any other children's rights? (JST)	Same as No. 30. (Ignite Change)
	32. Do you have any other concerns, recommendations, or advice for the Project? (JST)	<ul style="list-style-type: none"> <li>• The Project should be implemented on time.</li> <li>• Home savings schemes should be encouraged for construction workers.</li> <li>• Construction workers should be hired locally to enhance a sense of belonging.</li> <li>• There should be CSRs to support local people. For example, the previous project has developed infrastructure for schools and health centres. (Ignite Change)</li> </ul>

Note: \* It was confirmed that there will be no impact on the site called Manana by the later field survey.

Source: JICA Survey Team

## **APPENDIX**

## 1. Environmental Monitoring Form (base on the JICA Guidelines)

**Table-1 Monitoring Form during construction (draft)**

### I. Communication with local government and inhabitants

Item	Contents to be monitored
Meeting with local stakeholders	Date, time, agenda, minutes of meeting(s) with attendance list and photo, Number of female and male

### II. Natural Environment

#### 1. Pollution Item (Air Quality, Water Quality, Soil Quality and Noise)

1. Pollution Item (Air Quality, Water Quality, Soil Quality and Noise)																
Item	Parameter	Data						Ugandan Standard		Reference Standard			Monitoring Frequency and timing in the Environmental Monitoring Plan			
		Measured Date		Location				Unit	Value	Unit	Ref.	Value	Unit	Baseline Survey before Construction	Times/Year	Period (Years)
Air Quality	PM10	2024 Feb	Air-01	Air-02	Air-03	Air-04	25	µm/m3	60	µm/m3(24hrs)	FC	150	µm/m3(24hrs)	1	1	3
	PM2.5	2024 Feb	21	19	20	22	35	µm/m3	35	µm/m3(24hrs)	FC	75	µm/m3(24hrs)	1	1	3
	CO	2024 Feb	1.1	1.08	1.04	1.06	6	ppm	6	ppm(24hrs)	FC	None	-	1	1	3
	NO2	2024 Feb	0.0025	<0.01	<0.01	<0.01	0.026	ppm	0.026	ppm(24hrs)	FC	200	µm/m3(1hr)	1	1	3
	SO2	2024 Feb	<0.001	<0.001	<0.001	<0.001	0.008	ppm	0.008	ppm(24hrs)	FC	125	µm/m3(24hrs)	1	1	3
Water Quality			WQ-01	WQ-02	WQ-03											
	pH	2023 Nov	rainy	6.5	6.9	6.7	-	5.5-9.5	-	JPN	6.5-8.5	-	1	1	3	
		2024 Feb	dry	7.4	7.5	7	-	5.5-9.5	-	JPN	6.5-8.5	-	1	1	3	
	Turbidity (NTU)	2023 Nov	rainy	4.2	5.1	4.8	NTU	25	NTU	JPN	NA-	-	1	1	3	
		2024 Feb	dry	3.1	4.3	4.7	NTU	25	NTU	JPN	NA-	-	1	1	3	
	TDS	2023 Nov	rainy	75	72	73	mg/l	1,500	mg/l	JPN	NA-	-	1	1	3	
		2024 Feb	dry	86	85	86	mg/l	1,500	mg/l	JPN	NA-	-	1	1	3	
	SS	2023 Nov	rainy	13	9	12	mg/l	NA	mg/l	JPN	100	mg/l	1	1	3	
		2024 Feb	dry	17	10	15	mg/l	NA	mg/l	JPN	100	mg/l	1	1	3	
	BOD	2023 Nov	rainy	3	3.8	5	mg/l	NA	mg/l	JPN	8	mg/l	1	1	3	
		2024 Feb	dry	2	3	3	mg/l	NA	mg/l	JPN	8	mg/l	1	1	3	
	Conductivity	2023 Nov	rainy	107	103	104	µS/cm	2,500	µS/cm	JPN	NA-	-	1	1	3	
		2024 Feb	dry	123	122	123	µS/cm	2,500	µS/cm	JPN	NA-	-	1	1	3	
	DO	2023 Nov	rainy	5.5	1.8	2.8	mg/l	NA	mg/l	JPN	>=2	mg/l	1	1	3	
		2024 Feb	dry	7	4.8	4	mg/l	NA	mg/l	JPN	>=2	mg/l	1	1	3	
Soil Quality	E-Coliform	2023 Nov	rainy	210	340	45	CFU/100ml	NA	CFU/100ml	JPN	NA-	-	1	1	3	
		2024 Feb	dry	310	133	21	CFU/100ml	NA	CFU/100ml	JPN	NA-	-	1	1	3	
			SQ-01	SQ-02												
	Arsenic	2023 Nov	<0.001	<0.001			mg/kg	NA-	JPN	150	mg/kg	1	-	-		
	Selenium	2023 Nov	<0.001	<0.001			mg/kg	NA-	JPN	150	mg/kg	1	-	-		
	Cyanide	2023 Nov	0	0			mg/kg	NA-	JPN	50	mg/kg	1	-	-		
	Hexavalent chromium	2023 Nov	3.66	5.12			mg/kg	NA-	JPN	250	mg/kg	1	-	-		
	Mercury	2023 Nov	<0.001	<0.001			mg/kg	NA-	JPN	15	mg/kg	1	-	-		
Noise	Fluorine	2023 Nov	1.2	2.2			mg/kg	NA-	JPN	4000	mg/kg	1	-	-		
	Boron	2023 Nov	0.23	1.66			mg/kg	NA-	JPN	4000	mg/kg	1	-	-		
	Lead	2023 Nov	0	0			mg/kg	NA-	JPN	150	mg/kg	1	-	-		
	Cadmium	2023 Nov	0	0			mg/kg	NA-	JPN	150	mg/kg	1	-	-		
			N-02	N-04	N-06	N-07										
Noise		2024 Feb	Day	33	56	56	76	dB(A)6-22hr	60	dB(A)6-22hr	FC	70	dB(A)7-22hr	1	2	3
			Night	not measured	47	42	69	dB(A)22-6hr	50	dB(A)22-6hr	FC	70	dB(A)22-7hr	1	2	3

### 2. Waste

Item	Area	Volume/month
Waste Soil	Project site	
Cutting Tree	Project site	
Domestic Waste	Project site and other facilities	
Night Soil	Project site and other facilities	
Waste Oil	Project site and other facilities	
Other Construction Waste	Project site and other facilities	

Other facilities: Base-camp, offices, borrow pit quarry, batching plant, accommodation (including sub-contractor's facilities)

### 3. Odor

Item	Area	Result of Monitoring
Bad odor	Project site and other facilities	

Other facilities: Base-camp, offices, borrow pit quarry, batching plant, accommodation (including sub-contractor's facilities)

#### 4. Ecosystem

Item	Area	Results of Monitoring
Valuable Species and habitat	Project site and surrounding area	
Number of Road-kill	Surrounding roads used for construction	
Number of conflicts with wild animals	Project site and other facilities	

#### 5. Hydrology, Topography and geology

Item	Area	Results of Monitoring
Condition of embankment and soil erosion from the project area	Project site and surrounding area (Approach road, embankment and streams between the project area and Nile River)	

### III. Social Environment

#### 6. Poverty Group

Item	Results of Monitoring
Number of places posting the announcement of the information about employment	
Number of hired local people	

#### 7. Ethnic groups

Item	Results of Monitoring
Contract content of the contractor	
Number of hired local people	
Number of places posting the announcement of the information about the employment	

#### 8. Local economy

Item	Results of Monitoring
Number of meetings organized, and participants per meeting	
Maintenance status of the existing Karuma Bridge	
Access status to the entrance of shops, restaurants, etc. in the traffic-controlled area	
Number of hired local people	
Number of grievances on the access to the entrance of shops, restaurants, etc.	



#### 9. Land use and utilization of local resources

Item	Results of Monitoring
Number of meetings organized, and participants per meeting	
Maintenance status of the existing Karuma Bridge	
Number of grievances on the status of detour and access road, and status of grievance	
Number of hired workers who received the training (instruction)	

#### 10. Water usage

Item	Results of Monitoring
Number of hired local people	
Content of water supply plan of contractor	
Number of grievances on the water use, and status of grievance	

#### 11. Existing social infrastructures and services

Item	Results of Monitoring
Number of meetings organized, and participants per meeting	
Maintenance status of the existing Karuma Bridge	
Number of assigned traffic guides at construction site and traffic-controlled area	
Number of grievances on the status of detour and access road, and status of grievance	

#### 12. Unequal distribution of positive and negative impacts of the project

Item	Results of Monitoring
Function status of GRM	
Number of hired local people	
Number of hired workers who received the training (instruction)	

#### 13. Cultural heritage

Item	Results of Monitoring
Number and content of meetings organized, and participants per meeting	
Number and termination period of hired archaeological experts	
Number of hired workers who received the training	
Number of found historical/archaeological resources	
Improvement status of historical signboard	

#### 14. Gender

Item	Results of Monitoring
Number of hired local people	
Number of installed sanitary facilities	
Number of trained construction workers	
Number of sensitized local people	

#### 15. Rights of children

Item	Results of Monitoring
Contract content of the contractor	
Age of Construction workers	
Number of trained construction workers	
Number of sensitized local people	

#### 16. Infectious diseases

Item	Results of Monitoring
Number of infected patients among construction workers	

#### 17. Labor Environment

Item	Results of Monitoring
Health condition of construction workers	

#### 18. Accident

Item	Results of Monitoring
Number of accidents and reason	

#### 19. Others (unforeseen impacts)

Item	Results of Monitoring	Additional Mitigation Measures (if any)
(Added if unforeseen adverse impacts is observed)		

Source: JICA Study Team

**Table-2 Monitoring Form after construction (draft)**

**I. Natural Environment**

**1. Pollution Item (Air Quality and Noise)**

Item	Parameter	Data								Ugandan Standard		Reference Standard			Monitoring Frequency and timing	
		Measured Date		Location				Unit	Value	Unit	Ref.	Value	Unit	Times/Year	Period (Years)	
Air Quality	PM10	2024 Feb		Air-01	Air-02	Air-03	Air-04	25	µm/m3	NA -	IFC	150	µm/m3(24hrs)	1	2	
	PM2.5	2024 Feb		21	19	20	22	µm/m3	NA -	IFC	75	µm/m3(24hrs)	1	2		
	CO	2024 Feb		1.1	1.08	1.04	1.06	ppm	9 ppm(8hrs)	IFC	None	-	1	2		
	CO2	2024 Feb		4.18	4.21	4.21	4.2	ppm	9 ppm(8hrs)	IFC	None	-	1	2		
	NO2	2024 Feb		0.0025	<0.01	<0.01	<0.01	ppm	0.1 ppm(24hrs)	IFC	200	µm/m3(1hr)	1	2		
	SO2	2024 Feb		<0.01	<0.01	<0.01	<0.01	ppm	0.15 ppm(24hrs)	IFC	125	µm/m3(24hrs)	1	2		
Noise		2024 Feb	Day	N-02	N-04	N-06	N-07	76	dB(A)6-22hr	60	dB(A)6-22hr	IFC	70	dB(A)7-22hr	1	2
			Night	not measured	47	42	69	dB(A)22-6hr	50	dB(A)22-6hr	IFC	70	dB(A)22-7hr	1	2	

**2. Ecosystem**

Item	Area	Results of Monitoring
Valuable Species and habitat	Project site and surrounding area	
Number of Road-kill	Surrounding roads used for construction	
Number of conflicts with wild animals	Project site and other facilities	

**3. Accident**

Item	Results of Monitoring
Number of accidents and reason	

**4. Others (unforeseen impacts)**

Item	Results of Monitoring	Additional Mitigation Measures (if any)
(Added if unforeseen adverse impacts is observed)		