CHAPTER 10

NATURAL AND SOCIAL ENVIRONMENTAL STUDIES

10. NATURAL AND SOCIAL ENVIRONMENTAL STUDIES

10.1 Natural Environmental Study

10.1.1 General

This Chapter summarizes the initial environmental examination (IEE) for the engineering options (i.e., three route alternatives, named Routes A, B and C, respectively), regarding the study on natural environment, and potential environmental issues associated with the implementation of each alternative option.

Firstly, the current baseline of the environmental condition surrounding the study site is described. The study area is located between Lake Victoria and the on-going construction site in Bujagali Dam, so that the current local environmental topics, linking both sites, were also studied. Technical site inspections were carried out in November and December 2008 and February and March 2009. Based on the major findings obtained from the technical site inspections and the review of available reports, the baseline environmental information, regarding the natural environment surrounding the study area, was collected.

Based on the baseline environmental information and the engineering features of each alternatives, prepared by the study, the IEE was carried out. Basically, the IEE was carried out in two steps. In the first step, a preliminary IEE for two scenarios was carried out: (i) Do - Nothing scenario, and (ii) Do – Project scenario for all prepared route alternatives (i.e., Routes A, B and C); for which preliminary scenarios analysis was conducted. In the second step, a more detailed, route-specific IEE was carried out using more specific engineering information prepared in March 2009, and possible adverse environmental impacts that may occur during and/after the construction of works for each alternative alignment option was summarized.

10.1.2 Descriptions of Environment (Bio-Physical)

(1) Geography and Climate

Jinja is the second largest City in Uganda, connecting Kampala with the Kenyan Border (Kampala – Nairobi Route) and is located within the Lake Victoria Basin. It is about 80 km from Kampala, the country's capital, and approximately 125 km from Tororo, on the border with neighbouring Kenya. Lake Victoria Basin is predominantly lowland interspersed with remnants of upland surface. The general elevation of the land gradually decreases northward, varying between 1,100 and 1,300 meters above sea level. Abundant fluvial deposits overlie the broad valley.

The most important geographic features around the study area are Lake Victoria (with equilibrium water level of about 12.2 m based on Jinja Pier Gauge), the River Nile (with average flow rate ÷ 1,200 m3/sec, varying between 300 and 1,700 m3/sec), the railway bridge crossing the River Nile (constructed in 1931), the Owen Falls Dam Complex consisting the Nalubaale and Kiira Dams (constructed in 1954 and 2000, respectively), and the Nile Gorge. In general, the local flow condition and level of the River Nile and around the study site, in particular, depends on the dam operation of Nalubaale and Kiira Dams (see the hydrological section of this report for more detailed information). No tributaries merging into the River Nile exist around the study site, and several water intake facilities are located along the River Nile.

The City of Jinja and Njeru Town are located across a relatively flat, hilly terrain at the East and Westside of River Nile, respectively. The annual rainfall in the study area is about 1,400 mm/year. Normally, there are two rainy seasons in Jinja (March – May and September – December). The current urban drainage system in Jinja City was developed by the British, considering the natural drainage pattern of run-off waters due to occurrence of several tropical storm [This Study, 2009]. Basically, the surface runoff water is discharged into the river Nile by regional natural drainage system. Some portions of Routes A, B and C Options would intercept the regional runoff water. In particular, Route C Option has the longest approach roads at both sides of the river, so that the occurrence of possible adverse impacts on the regional drainage would be more significant, than Routes A and B Options. Most of the riverbank terrains are used as crop land (see Appendix 5 for site photos) for all the route options. Black cotton soil are reported to exist around both riversides of Route A (see Geological Section of the Progress Report of this study for more detailed information).

The annual average temperature is 12.4 °C, the highest at 15.5 °C (April) and the lowest at 12.4 °C (December). The relative humidity varies between 48% (February) and 84% (May and August). Monthly-averaged wind speed varies between 7.7 m/sec and 18.0 m/sec (This Study, 2009) and the predominant wind direction is South (World Bank, 2006). More detailed information about the regional climate are described in Chapter 7 of Progress Report of this study.

(2) River Nile

1) Morphology

Photo records of the current riverfront condition of the River Nile around the study site are attached in Appendix 5. As shown in the figures, few remnants of tropical forests and bushes exist at both riverbanks and islands located inside River Nile. Typical river cross-sections along River Nile for the upstream side from Nalubaale Dam, obtained from the field survey, is U in shape (see Appendix 5). Maximum water depths around Routes A and B, at times, is as high as approx. 20 m.

Current speed survey of River Nile was measured in five sections in adjacent areas of the three alignment options (see the Natural Condition Section of Progress Report of this study for more detailed descriptions). Results of the measurement for cross sectional velocity profile of the River Nile are attached in Appendix 5.

The cross-sectional velocity profile for Alignment A tends to be parabolic at maximum velocity is of about 0.7 m/s varying from 1.0 m/sec to 2.0 m/sec. Alignment B velocity profile at the upstream side of the existing railway bridge tends to be uniform (i.e., trapezoidal distribution) but less uniform at the downstream side of the bridge. This is due to the local topographic features around Alignment B. The local flow of River Nile around Alignment B is constricted due to the existence of a small peninsula, protruding from the east side riverbank. The geological formation of this peninsula is composed mainly of light-weathered rock (see Geological section of the Progress Report of this study for more detailed

descriptions). After the constricted section of the River Nile, a small bay exist near the peninsula with average depth of about 20 m (see the bathymetric survey results along B2-B3 in Appendix 5). Certain portion of Alignment B bridge plan will pass through this small bay with several bridge piers, to be constructed therein.

According to the topographic and geological survey, conducted, sediment layer exist at the riverbed along the River Nile, and appears to get thinner for Alignments A and B. and Rock formation is, sometimes observed, exposed from River Nile (see the Natural and Geological Section of the Progress Report of this study for more detailed descriptions).

The average flow speed in the vicinity of Alignment C varies between 0.3 m/s and 1.3 m/s, and, sometimes, exceeds 2.0 m/s. In general, the flow downstream of Owen Falls Dam Complex tend to be faster than those upstream due to the difference in hydraulic gradients between both sides of the river.

The river channel in the vicinity of Alignment C is slightly bended towards the Njeru side and the water depth tends to be deeper than the Jinja side (the average depth is about 5 m, see Appendix 5). Many islands exist and the water depth in the vicinity of Alignment C is shallow, as compared with Alignments A and B.

2) Water Quality

Table 10.1.1 summarizes the water quality data, measured in four locations (i.e., Transect 1, Transect 2, Transect 3 and Transect 4, respectively) along River Nile by FIRRI during the SEA study period of Bujagali Dam Construction Project. From the table, it can be seen that several nitrogen and phosphate - related water quality parameters (i.e., NO3, TN and TP) at the downstream side tend to be poorer than the upstream. This may be caused by the discharge of untreated household effluents or agricultural run-off, which generated within its basin. Aquatic biological surveys, to be described later, were conducted at the same four transects location, described in Table 10.1.1, within the vicinity of Bujagali Dam SEA studyarea.

Table 10.1.1 Water Quality Data of the River Nile

	Transect 1 6 km upstream Dumbbell Island	**Transect 2** 1 km downstream Dumbbell Island	**Transect 3** 24 km downstream Dumbbell Island	**Transect 4** 65 km downstream Dumbbell Island
1. DO (ug/L)	4.1 - 10.2	4.8 – 8.8	6.1 - 10.7	5.4 - 8.4
2. Conductivity (uS/cm)	94.9 - 130	95 - 145	95 - 125	95.5 - 129
3. Temperature (℃)	24.7 - 26.6	24.7 - 26.0	24.9 - 26.7	25.3 - 26.6
4. pH	5.7 - 8.7	6.8 - 8.6	5.5 - 8.9	6.2 - 8.5
5. Secchi Disk Transparency (m)	0.6 - 2.2	1.4 - 2.3	1.2 - 2.7	1.2 - 3.8
6. TP (ug/L)	6 - 161	25 - 85	60 - 118	65 - 240
7. NO_3 - N (ug/L)	0 - 129	38 - 157	85 - 178	107 - 252
8. NH_3 – N (ug/L)	0 -138	0 - 178	0 -130	0 - 138
9. TN (ug/L)	61 - 834	76 - 3575	216 - 3459	226 - 5154
10. Chlorophyll-a (ug/L)	2 - 54	8 - 25	1 - 24	1 - 64
11. SS (mg/L)	0 - 10	0 - 3	0 - 10	0 -2
12. Oil & Grease (ug/L)	0.1 - 3.2	0.2 – 2.8	0.22 - 2.6	0.23 - 2.8

Note: Data presented as range of values from four surveys between February and November 2000.
Source: World Bank, 2006

(3) Groundwater

Based on the geotechnical study of Owen Falls Extension Project, the groundwater level distribution along the longitudinal direction of the River Nile is continuous for the water levels of both upstream and downstream sides of the River Nile as well as water levels of several ponds located across the riverbank terrains. Also, the local groundwater level distribution along the direction perpendicular to River Nile tends to decrease towards the river and linked to the water level of River Nile as it approaches River Nile. Based on the regional topographic features across the study site, it can be assumed that most of the regional groundwater flow is a recharged of Lake Victoria, and then discharged into the River Nile gradually while rainwater would contribute to some extent the recharging of the regional groundwater. Based on the proposed bridge construction study, no large-scale earthwork t would interrupt the current regional groundwater flow pattern. Thus, it can be said that adverse environmental impact to the regional groundwater flow will be quite small.

(4) Flora/Fauna

1) Introduction

In general, Uganda is regarded as one of the richest countries in the world in terms of bird species (more than 1,000 species recorded). Lake Victoria Basin (the study area included) is identified as the wintering birds roost. Around the project site, many small remnants of tropical forests and bushes still exist at both riverbanks and at the islands located inside River Nile. Those places are providing favorable habitats for small animals and birds (see Appendix 5 for photo records). There are three forest reserves in Uganda (i.e., Kimaka, Mabira and Namavundu Forest Reserves) and one wildlife conservation area around the study area. Kimaka Forest Reserve is located in the vicinity of Alignment C. Mabira Forest Reserve exists between Jinja and Kampala (7 km away from Jinja on the route to Kampala) on where approximately 300 bird species are recorded. Regarding bird species, there is a close connection among the riverbank natural habitats and the forest reserves (i.e., they can fly to/and from each location). Jinja Wildlife Sanctuary is located along the riverbank of River Nile between Nalubaale Dam and the on-going Bujagali Dam Construction Site. More detailed descriptions of the protected areas are described in later part.

Comprehensive biological environment surveys bar retile and amphibian were conducted within the Bujagali Dam SEA Study [World Bank 2006]. The study area of the dam construction project is very close to the proposed bridge construction project site where most of the environmental field studies were conducted recently (most of the baseline environmental information was gathered around Year 2000). No tributaries are merging into River Nile and no significant ecological discontinuity exists between Bujagali and the study area for the proposed bridge construction project. It can be said that most flora/fauna baseline environmental information, that has been summarized from within the Bujagali Dam SEA study, would be applicable for the proposed bridge construction study.

In this section, based on the current literature review including the Bujagali Dam SEA study, the latest inventory of terrestrial and aquatic flora/faunal conditions around the study area are summarized separately hereunder.

2) Flora

The land around the study site generally composed of intensive settlement and agriculture. The overall vegetation forms an agro-ecosystem with bananas, coffee, maize and vanilla as the main crops. The remnant natural vegetation is characterized as moist, semi-deciduous forest.

In the 1998 floral survey, conducted within the Bujagali Dam SEA Study [World Bank, 2006], a total of 121 species were identified from the five sample sites. None of the species recorded is globally endangered or threatened.

The 2006 survey identified 298 species in total. The most common tree species recorded were Markhamia Lute, Albizia Grandibracteata, Broussonetia Papyrifera, Maesopsis Eminii and Milicia Excelsa. M. Excelsa (Mvule) is categorized as Low Risk/Near Threatened by the IUCN (see Appendix 5 for its image). More detailed descriptions of IUCN Redlist – Status are attached in Appendix 5.

Twenty exotic (non-native) species were recorded of which the notoriously invasive Broussonetia Papyrifera (paper mulberry) and Lantana Camara were the most common. These species are high light-demand and their abundance reflects the absence of large-scale tree cover around the study area.

Along the riverbank, vegetation primarily consists of free-floating plant species such as Echnocroa Pyramidalis, Voscia Cupsidata, Cyperus Dunius, Pollia Mannii, Paspalidium spp., Pistia Stratiotes and Eichhornia Crassipes (Water Hyacinth) as well as semi aquatic plants such as Fiscus Glumosa, Archornea Cordifolia and Cyphostema Adenocaiule.

3) Terrestrial Biological Environment

Land Birds

Two bird surveys were conducted within the Bujagali Dam SEA study in 1998 and 2006, respectively [World Bank, 2006]. In both surveys, 108 species were recorded. None of the species recorded are globally endangered or threatened. However, the following four species recorded are listed as sensitive in East Africa (see Table 10.1.2).

Table 10.1.2 Conservation Importance of Land Bird Species along River Nile

	English Name (Scientific Name)	IUCN-Status
1.	Brown Snake Eagle (*Circaetus Cinereus*) 	Near-Threatened
2	African Marsh Harrier (*Circus Ranivoris*) 	Vulnerable
3	Grey-Capped Warbler (*Eminia Lepida*) 	Regionally Restricted
4	Red-Chested Sunbird (*Nectarinia Erythroceria*) 	Regionally Restricted

Source: World Bank, 2006
Note: all photo images of birds listed in this table are after website of "avibase".

Aquatic Birds

Within the 1998 survey, 17 species were recorded, but none of the species recorded were globally endangered or threatened. However, three recorded species are regionally-listed as endangered (?).(see Table 10.1.3).

Table 10.1.3 Conservation Importance of Aquatic Bird Species along River Nile

	English Name (Scientific Name)	IUCN-Status
1.	Darter (*Anhinga Rufa*) 	Vulnerable
2	White-collared Pratincole (*Dlareola Nordmanni*) 	Vulnerable
3	Grey Heron (*Ardea Cinerea*) 	Near Threatened

Source: World Bank, 2006
Note: all photo images of birds listed in this table are after website of "avibase".

Mammals

Mammal species survey was conducted within the Bujagali Dam SEA Study [World Bank, 2006]. From this study, the following 8 groups of mammals were recorded. As would be expected, the small mammal (mostly rodents) comprises the largest proportion of mammals recorded around the study area (see Table 10.1.4).

Although not specifically surveyed, the presence of Spot-necked Otters (Lutra Maulicollis) was reported by local people as being quite common in the river (see Appendix 5 for its image). This specieis listed as Least Concern in IUCN Red List of Threatened Species (IUCN, 2004). The main threats to this Spot-necked Otters are considered to be siltation due to erosion near the source of the river, cultivation of the riverbank side habitats, indiscriminate bushfire and others. No other species recorded are listed by IUCN as Critically Endangered or Endangered.

All larger species of mammals would find it rather difficult to survive in habits with heavy human presence and therefore have largely disappeared. The last hippopotamus was killed in the vicinity of Jinja by the local people several years ago [NFA Jinja Office, personal communication, 2009].

The results presented here are probably not a fair representation of the entire mammal diversity. Near complete lists of these can only be compiled throughout the long-term, repeated field survey around the study site. It is noted that many more species is expected exist around the study area by continuous survey.

Table 10.1.4 Summary of Mammal Diversity around the Study Area

	Taxonomic Group	Total number of species recorded from the field surveys and historical records from interviews with local people	Total recorded as present in March 2006
1	Artiodactyla (Antelopes)	5	0
2	Carnivora (Carnivores)	6	3
3	Insectivora (Insectivorous Mammals)	1	1
4	Megachiroptera (Fruit Bats)	3	3
5	Microchiroptera (Insect Bat)	3	3
6	Primates (Monkeys)	3	2
7	Proboscidea (Elephants)	1	0
8	Rodentia (Rats, Mice Squirrels & allies)	20	20

Source: World Bank, 2006

Reptile and Amphibian

Table 10.1.5 summarizes the number of herpetological species commonly incurred around the study site. More detailed information such as the scientific and English equivalent name of this herpetological inventory is attached in Appendix 5.

Table 10.1.5 Baseline Herpetological Inventory around the Study Site

	Order	Total number of species recorded
1	Testudines (tortoise, turtles and terrapins)	2
2	Squamata (lizards and worm lizard)	10
3	Crocodylia (crocodiles)	1
4	Squamata (snakes)	41
5	Anura (frogs and toads)	14

4) Aquatic Biological Environment

Within the Bujagali Dam SEA Study (World Bank, 2006), aquatic biological environment survey was conducted at four transectslocations (i.e., Transects 1, 2, 3 and 4, respectively: identical to water quality sampling points, see Table 1) along the River Nile. This survey consists of two parts. The first survey was conducted in 2000 while the second follow-up survey was conducted in 2006. Throughout the survey, baseline information of the phytoplankton, macrophytes, invertebrates and fish of River Nile, downstream of the existing Nalubaale Dam, was gathered. The following is the summary of the aquatic biological environment survey.

Phytoplankton

The Cyanophyceae (blue-green algae/cyanobacteria) were the dominant and most diverse class in all survey sections. The key indicative species were Mycrocystis, Anabaena, Cylindrospermopsis and Planktolyngbya. The degree of Cyanophyte dominance in the study area of the Bujagali Dam ranged from 49% - 78% of cell counts. Chlorophyceae (green algae) were the next dominant class accounting for 12% - 27%, represented mainly by Ankistrodesmus and Scenedesmus. Bacillariophyceae (diatoms) were less common, with Nitzchia the most abundant genus in the class.

Other much less abundant groups occurring at the survey sections were the Cryptophyta, Peridineae and Euglenophyta. The significance of phytoplankton to fisheries is expressed in term of food for zoo plankton and juvenile fishes. Most juvenile tilapia stomachs contained more common phytoplankton (e.g., Cyanophyceae, Chlorophyceae and Bacillariophyceae).

Macrophytes

In 2000, 82 aquatic macrophytes species (70% of obligate aquatic macrophytes, i.e., euhydrophytes) were identified around the study area. In general, macrophytes could be classified into further four major sub-categories as follows:

1. Emergent species (e.g., Papyrus, reeds)
2. Floating and related forms (water hyacinth, Nile cabbage)
3. Semi-terrestrial species (the paper mulberry tree, *Broussenetia papyrifera*, shrubs – *Alcornia* and herbaceous species – *Melanthera*, *Ipomoea*, *Commellina*)
4. Submerged species (Ceratophyllum, Vallisenaria, Potamogeton and Najas)

Within the survey, it was found that the diversity of the macrophyte species tended to increase with distance towards the downstream. The relatively significant impact of human

activities (e.g., cultivation and grazing along the riverbank and islands) appeared to have negative effects on macrophytes development.

The April 2000 survey recorded the total number of 46 macrophyte species in comparison to 41 species of April 2006 survey. In 2000, three upstream transects (i.e., Transects 1, 2 and 3) had 24, 21 and 26 macrophytes species in contrast to 6, 15 and 13 species, respectively, in 2006. Transect 4 (i.e., the most downstream transect) recorded four times more species in 2006 than that of the 2000 survey (9 species).

The dominance pattern, characterized by Vossia cuspidate (hippo grass) and Eichhornia crassipes (water hyacinth) were the same in both surveys.

Invertebrates

- Micro Invertebrate (zoo plankton)

Three taxonomic groups (i.e., Copepoda, Cladocera and Rotifera) dominate the zoo plankton. Within this survey, it was found that the total zoo plankton density tended to decrease toward the downstream side. Copepodas such as cyclopids Mesocyclops and Thermocyclops, followed by rotifers (e.g., Asplachna, Brachionus and Euclanis) registered the highest densities (100 individuals/m3).

Due to the fast current nature of the River Nile, it would have been expected that the upstream site of the river would support lower zoo plankton density and less diversity. However, similar to the density, the highest diversity (12 -17 zoo plankton taxa) was recorded at upstream Transects 1 and 2. The observed density distribution patterns probably reflected habitat structures of the sampled locations, in particular, those associated with sheltered habitats in the embayment, and diversified vegetation pattern. Such habitat diversity, associated with topographical features of the riverbanks, was higher than observed in the downstream (Transect 4), even though the local flow may have been more uniform.

It was found that Cyclopopid Copepods and rotifers were consistently the most diverse groups. It is noted that the zoo plankton species composition observed within the study is subject to seasonal changes.

- Macro Invertebrate

Several species were abundant at all surveys. Bellamya sp. (Gastropoda) recorded the greatest species density (3,233 individuals/m2) and consistently recorded the highest density throughout this survey. Other abundant species included the mayfly (Ephemeralla), the bivalves Corbicula sp. and Caelatura sp. Among the Diptera, the key taxa were the midge Chironomus and Povilla.

The dominance of benthic macro-invertebrates in the upper River Nile is similar to that of Lakes Victoria and Kyoga. The introduction of Nile Perch (more detailed description of the translocation of Nile Perch is carried out later), resulted in the decimation of mollusciborous fish, which allowed mollusks to flourish. The orders: Diptera (flies), Trichoptera (caddis flies), Gastropoda (snails) and Bivalvia (bivalve mollusks) had the highest number genera represented throughout all survey periods. However, their abundance and diversity were not seasonally or spatially related. The molluscs were the most diverse group of macro invertebrates and consisted of 8 and 10 genra during most of survey periods.

Macro invertebrate are the vital component in local food webs in the aquatic ecosystem. Within this study, it was found that no clear trends in the invertebrate diversity and those abundances at all four transects, nor apparent seasonal patterns. Consequently, the changes in species diversity and abundance may largely have been due to those life cycle processes as opposed to external conditions.

Fish

Table 10.1.6 summarizes the scientific, English equivalent and vernacular equivalent name of fish species commonly encountered in Uganda.

Table 10.1.6 Commonly Encountered Fish Species in Uganda

	Scientific Name	English Equivalents	Vernacular Equivalents
1	*Lates Niloticus*	Nile Perch	Mputa, sangara
2	*Oreochromis Niloticus*	Nile Tilapia	Ngege
3	*Oreochromis Leucostictus*	Tilapia	Ngege
4	*Tilapia Zillii*	Tilapia, Red-belly tilapia	Kajansi
5	*Bagrus Docmac*	Catfish	Semutundu
6	*Clarias Gariepinus*	Mudfish, Sharp-toothed catfish, North African catfish	Male
7	*Schilbe Intermedius*	Silver catfish, makriel, butter catfish, Silver barbell	Nzere
8	*Protopterus Aethiopicus*	Lungfish	Mamba
9	*Rastrineobda argentea*	Minnow	Mukene/Omena/Dagaa
10	Haplochromines	Cichlids	Nkejje/Mbipi
11	*Barbus Altianalis*	Barbel, Ripon barbell	Kisinja
12	Hydrocynus	Tiger fish	Ngassa
13	Alestes/Brycinus (*B. Jacksonii* included)	Victoria Robber	Nagra/Nsoga
14	*Labeo Victorianus*		Ningu
15	*Marcusenius (= Gnathonemus) Victoriae*	Victoria Stone-basher	Kisoma/Bobo
16	Mormyrids (e.g., *Mormyrus Kannume)*	Elephant-snout fish	Basulu
17	*Synodontis Afrofischeri*	Catfish, Fischer's Victoria Squeaker	Nkolongo

Source: World Bank, 2006

Tilapiines, which include Oreochromis Niloticus and Tilapia Zillii, are the most commercially important and widely distributed fish species in Uganda. O. Niloticus has been introduced to virtually all water bodies including Lakes Victoria and Kyoga, and Koki Lakes. This species is normally restricted to shallow inshore waters. It feeds on phytoplankton and bottom detritus but occasionally ingests crustaceans, insect larvae and zoo plankton. This species spawns in shallow inshore areas over sand bottoms.

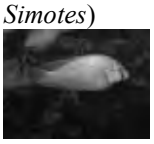
T. Zillii was originally present only in Lake Albert, but has been widely translocated to other water bodies and stocked in ponds as an aquaculture species. It is found in shallow marginal waters with water lilies. It feeds on higher plants but can also ingest bottom deposits.

Before the introduction of Nile Perch, B. Docmac was widespread in Lake Victoria in both shallow and deep waters. However, it is now very rare in Lake Victoria and is virtually absent in Lakes Kyoga and Nabugabo (more detailed explanation of this invasive species in Lake Victoria is described later). However, the stocks of B. Docmac are present in rocky areas along the River Nile and form a major component of fish catches in the area just upstream side of Nalubaale Dam. They feed mostly on insect larvae, crustaceans and small fishes, in particular, haplochromines. They breed in wave-washed rocky shores but juveniles have also been recovered from rivers, rocky shores, and sand beaches.

At least 17 species of Barbus (Kisinja) have been reported in Uganda in which nine have been reported along the River Nile. This species are mainly found in shallow inshore water associated with river systems, where they feed on molluscs aquatic vegetation and fishes (especially haplochromines) and breed in flooded rivers and streams.

Table 10.1.7 summarizes the fish species of the conservation importance along the River Nile.

Table 10.1.7 Conservation Importance of Fish Species along River Nile

	Name of Fish Species	Status	Ecological Features
1	Haplochromine (*Neochromis Simotes*)  (After Image Google)	Critically Endangered	Only has been reported from Ripon Falls (upstream side of Nalubaale Dam) to Kakindu, approximately 50 km downstream side of Dumbbell Islands. Known range of occupancy of this species is estimated to be of approximately 60 km along River Nile.
2	Alestes/Brycinus . *Jacksonii*  (After Fishbase)	Endangered	Both species are found in Lake Victoria Basin, with their principal habitat being bays around the edge of Lake Victoria and other smaller lakes. The main threats to these species are competition and predation from introduced species (principally Nile Perch), water pollution, habitat loss and fisheries exploitation.
3	*Marcusenius (= Gnathonemus) Victoriae*  (After Fishbase)	Endangered	

Source: World Bank, 2006
Note: All photo images of fish listed in this table are after "Fishbase" and "Image Google".

(5) Protected Zone

1) Protected Area

As mentioned in the environmental section of the Progress Report of this study, the riverbanks and waterfront line of the River Nile between Lake Victoria and Lake Albert are declared as the conservation area by the Law of The National Environment (Wetlands, Riverbanks and Lake Shores Management) Regulation of 2000. According to this law, a protection zone is defined as a strip zone of 100 m from the highest water level record of the River Nile. Boundaries of those conservation areas are attached in Appendix 5. Basically, no activity can be permitted within the protection zones without the official permission from the Executive Director of NEMA. Within this study, all route options (i.e., Routes A, B and C) cross this protection zone along the River Nile. In addition, there is Jinja Wildlife Sanctuary (former Jinja Animal Sanctuary) between Nalubaale Dam and Bujagali Dam construction site. This sanctuary was established for the protection of animals except fish. No flora/fauna inventory exists, and it is considered that this sanctuary has several bird species, reptiles and diversity of insects. Entire area of this sanctuary is completely contained within this protected zone.

2) Forest Reserve

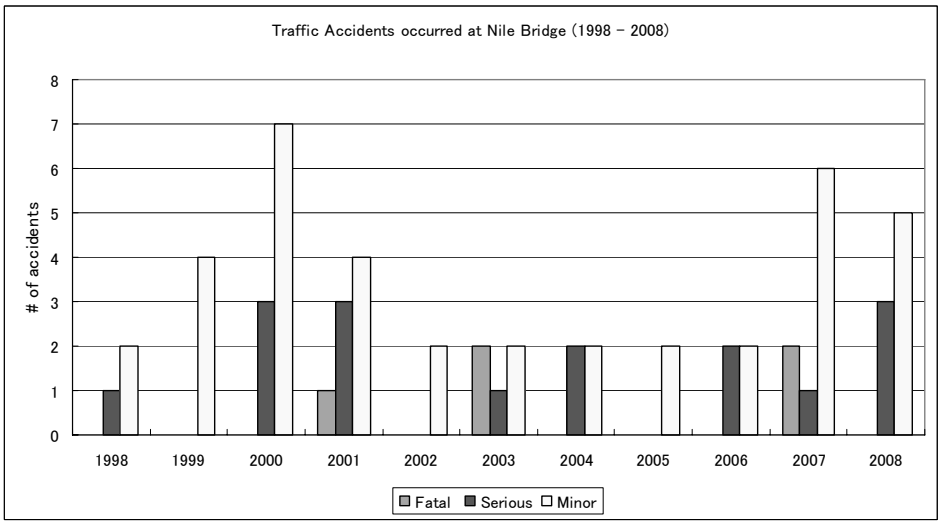
As mentioned earlier, there are three forest reserves around the study site: i.e., Kimaka (urban forest, 47 ha), Mabira (84,571ha) and Namavundu (704 ha) Forest Reserves.

Kimaka forest reserve is located on eastside of River Nile and Route C Option may cut through this forest reserve (see Appendix 5).

Mabira Forest Reserve is approximately 7 km west of Jinja, and thus, will not be subjected to any direct impacts from the proposed bridge construction project. Similarly, Namavundu Forest Reserve, located around Kalagala, approximately 20 km downstream from Nalubaale Dam at the eastside of the River Nile, will not also be subjected to any direct impact from the proposed project.

(6) Traffic Accidents

Figure 10.1.1 shows the past 10-year traffic accidents records (1998 – 2008) of the existing Nile Dam Bridge. As shown in the figure, it appears that trend is quite constant. Minor accidents seem to be common and less dominant for fatal injuries.



Source: Uganda Police Headquarter, 2009

Figure 10.1.1 Traffic Accidents Statistics of Nile Bridge (1998 – 2008)

(7) Current Environmental Issues

1) Bujagali Dam

One of the popular environmental issues around Jinja is the construction of Bujagali Falls Dam, located 15 km downstream of Jinja. The rapid currents of River Nile between the Nalubaale Dam and Bujagali Dam, is one of world's best white water rafting current, will disappear if the operation of Bujagali Dam, currently under the construction, will start in 2011. According to the hydrological study of Bujagali Dam Project, the future water level of River Nile around Route C will increase to 1,112.00 EL-m [World Bank, 2006]. More detailed description of this study result is attached in the hydrological section of this interim report.

2) Fall of Water Level of Lake Victoria

Another environmental concern around Jinja is the falling water level of Lake Victoria. In 2006, Lake Victoria's water level reached a 40-year low, due to several environmental and social factors such as the regional long-term drought. Currently, several inter-state projects such as Lake Victoria Environmental Management Project (LVEMP) of 2006, funded by the World Bank, to analyze regional hydrological balance and tackle the issue, are in progress.

3) Water Quality Degradation of Lake Victoria

It is reported that the water quality of Lake Victoria has been greatly degraded in the past several decades, mainly due to the eutrophication arising from increased loading of nutrients into the lake. Nutrient loadings have been increased two to three-fold since 1950. Some tributaries discharging into the lake are particularly polluted by municipal and industrial effluent discharges. Millions of litres of untreated sewage and industrial waste flow into the Lake Victoria every day from Kisumu, Kenya's third largest city, and from Mwanza in Tanzania. Watershed degradation and agricultural run-off also contribute accelerated loadings of chemicals, nutrients into the lake.

Concentrations of phosphorus have risen significantly in the deeper part of the lake water body. According to the current water quality-biomass simulation studies, it is reported that there has been a five-fold increase in algal growth since 1960, with a shift in the composition towards the domination by a blue-green algae. Increased primary production is causing de-oxygenation of the water body. Then, there is an associated increase in sickness for both human and animal by drinking the lake water. Also, the clogging of the water intake filters became one of the major water supply-related issues. As a result, the chemical treatment costs for urban water-supply system were increased.

Aside from the near-total loss of deepwater species, the de-oxygenation of the lake's bottom waters now poses a constant threat, even to fish living in shallower portions of the lake, as periodic upwelling of hypoxic water causes massive fish kills. The increased nutrient loads have also probably exacerbated the water hyacinth infestations. The impact caused by the water hyacinth will be described later.

In addition, massive blooms of algae have developed, and come increasingly to be dominated by the potentially toxic blue-green variety. The distance at which a white disc is visible from the water surface (i.e., transparency index measuring alga abundance) has been decreased from 5 m in the early 1930s to 1 m or less for most of the year in the early 1990s. Outbreaks of water-borne diseases have become more frequent. Over-fishing and oxygen depletion at deeper part of the lake water body threaten the artisanal fisheries and biodiversity (over 200 indigenous species are said to be facing possible extinction).

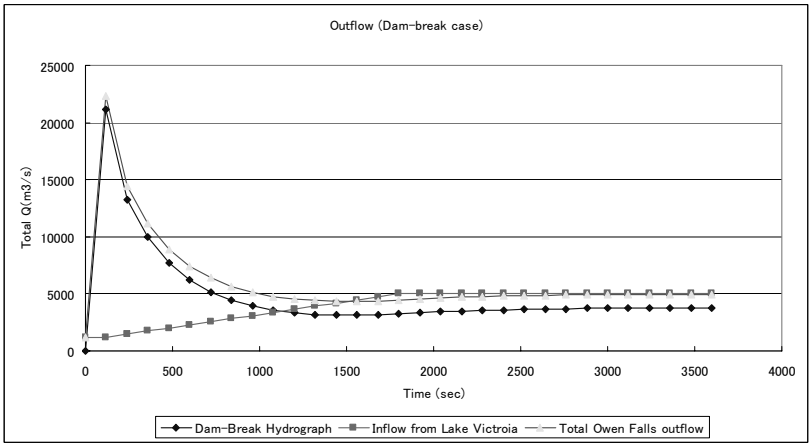
The lake basin is used as a source of food, energy, drinking and irrigation water, shelter, transport, and as a repository for household, agricultural and industrial waste. With the populations of the riparian communities growing at rates among the highest in the world, the multiple human activities in the lake basin have increasingly come into conflict. This has contributed to rendering the lake environmentally unstable.

4) Dam Breach Event of Owen Falls Dam Complex

The draft of the contingency program and warning system in case of the dam breach events of Owen Falls Dam Complex was summarized in the past [Ministry of Energy, 2003]. According to the hydrological study of this dam breach study, it is estimated that a tsunami with the height of approximately 4.5 m will occur in a dam-breach event of Owen Falls Dam Complex [Ministry of Housing, Communication and Works, 2003]. Figure 10.1.2 shows the simulated hydrograph under the Nalubaale Dam breach scenario. As shown in this figure, there is a rapid increase of entire river flow and its flow rate reaches to the peak value of approximately 22,000 m3/sec within the first 120 seconds. After this, the flow rate is gradually decreased and then, reached an asymptotical value of approximately 5,000 m^3/sec after the simulation time of 2,000 sec is elapsed.

The worst scenario would be the combined case in that the dam breach event would occur after the operation of Bujagali Dam will start and entire water level of River Nile will be raised to some extents due to the backwater effects of Bujagali Dam. Under this scenario, the

River Nile's water level rise around Route C would be more than 4.5 m due to the effect of the backwater from Bujagali Dam.



Source: Ministry of Housing, Communication and Works, Technical Report, Victoria Nile Owen Falls Dam Remedial Works, Control of Ripon Falls in Case of Emergency (Ripon Falls ECP) vol. #3, JACOBS, 2003

Figure 10.1.2 Dam-Break Hydrograph

5) Invasive Species (Water Hyacinth)

Water hyacinth [Eichhornia crassipes] has its origin from the Amazon Basin of South America, and has first appeared in 1989 in Lake Victoria. Without any natural enemies, it has become an ecological plague, suffocating the lake, diminishing the fish resources, and thus, hurting the local economies. By forming thick mats of vegetation, it has begun to choke important waterways, causes difficulties to maritime transportation, fishing, hydroelectric power generation and drinking water supply. By 1995, 90% of the Ugandan shoreline was covered by this plant. Figure 10.1.3 shows the water hyacinth, occurred at the west side of the River Nile.

Water Hyacinth growing at riverside

Water Hyacinth removed from water

Figure 10.1.3 Water Hyacinth occurred at the River Nile (Westside, near the water intake point of Nile Brewery, photo taken in March, 2009)

6) Invasive Species (Ecosystem of Lake Victoria)

Prior to the 1960s, Lake Victoria boasted of a rich fish biodiversity similar to that of Lakes Malawi and Tanganyika, with 400 – 500 species of fish, most of which were cichlids whereas non-cichlids only counted to about 50 species. The ecosystems of Lake Victoria and its surroundings have been badly affected by human influence. In 1954, Nile Perch [Lates niloticus], being native to the Congo, downstream River Nile, Senegal, Niger, and Lake Chad, Volta, Lake Turkanaa and other river basin, was first introduced into the lake's ecosystem in an attempt to improve lake-wide fishery yields. Introduction efforts were intensified during the very early 1960s. Also introduced was Nile Tilapia [Oreochromis niloticus], being native

from Sudan to East Africa through the Congo to Liberia, now an important food fish for local consumption.

Nile Perch [Lates niloticus] proved ecologically devastating. The introduction of this species to Lake Victoria is one of the most commonly cited examples of the negative effects invasive alien species can have on ecosystems. The IUCN's (World Conservation Union) Invasive Species Specialist Group considers Nile Perch as one of the world's 100 worst invasive species. Together with pollution induced by the deforestation and overpopulation of both people and domestic animals, Nile Perch has brought about a massive transformation in the lake's ecosystem and lead to the disappearance of hundreds of endemic haplochromine cichlid species. Many of these are now presumed to be entirely extinct. It is reported that some species which were extirpated from Lake Victoria itself, are known to survive in nearby satellite lakes such as Lakes Kyoga, Edward and Albert.

10.1.3 Initial Environmental Evaluation (IEE: Bio-Physical Environment).

(1) Introduction

Basically, there are three alternative plans for the bridge route options. The best crossing plan were selected from among the alternatives, reflecting several evaluation factors such as structural characteristics, social and environmental impact, land acquisition and compensations, conformity with existing facilities, and so on. Here, based on the information of the current bio-physical environment summarized previously, the features for each plan were evaluated. Note that the IEE regarding the social environment was carried out in a separate chapter. According to the JICA Guidelines, there are 18 environmental factors summarized therein. Note that one environmental factor, “Coastal Zone”, was removed from the IEE work since there is neither coastal beach nor coastal area around the study site. So, the set of 17 key environmental evaluation factors such as air quality and the water quality were used for clarification.

The IEE consists of two steps. First, a preliminary environmental evaluation between “Do Project” and “Do Nothing” scenarios was conducted. Secondly, based on the result, a more detailed IEE for all alternative options was conducted based on the construction sites (i.e., Jinja, River Nile and Njeru section). Note that the“River Nile” section, to be used for the second IEE, covers the river itself and a 100 m wide protection zones, located along both riversides.

(2) Engineering Options and IEE

The following three bridge route options were initially considered:

- Route A: About 0.5 km upstream of Nalubaale Dam
- Route B: About 1.2 km upstream of Nalubaale Dam
- Route C: About 1.8 km downstream of Nalubaale Dam

(3) Results and Discussions

1) Comparison of “Do Project” and “Do Nothing” Scenarios

The preliminary IEE result of “Do Project” and “Do Nothing” scenarios is summarized in Tables 10.1.8 - 10. As summarized in the tables, several negative environmental impacts such as roadside noise and air quality degradation during/after construction phase were inevitable to avoid by the implementation of the proposed new bridge construction project no matter which alternative will be selected.

Within the Route B Option, several bridge piers may be constructed inside River Nile, so that the impacts on water quality and the river bed are evaluated as "A" while "B" for Routes A and C with relatively less construction activities inside of River Nile. Route C has relatively longer distance approach road than the others, and the top soil (50 cm-depth from the ground surface) will be removed for the approach road construction. So, the impact on waste disposal was evaluated as "A" while "B" for Routes A and C.

Note that the life span of the existing dam-bridge is not very long, so that its service for the regional transport will not last without comprehensive rehabilitation works, and thus, the risk of collapse due to fatigue cannot be ignored. That is the main reason why the impact evaluation for "Accident" is provided with "A" for "Do Nothing" scenario. Current traffic capacity of the existing bridge could not accommodate the demand of future increased traffic volume. So, the future roadside air quality and noise environment under "Do Nothing" scenario maybe worsened.

All three route options run through both riverside conservation strip, and need a full-scale EIA study to obtain environmental approval from NEMA. So the impact evaluation of "Flora/Fauna" is given "A" for all "Do-Project" scenarios.

Regarding the impacts on visual resources, any potential to become a new regional landmark is unknown, yet. In the past large-scale bridge construction projects, conducted in other countries, there are many cases that new bridge sites became new scenic points that attracted many tourists. Aesthetics of the bridge structure would highly depend on the bridge type such as the cable-stay and/or suspension bridge. The visual impact of this proposed new bridge was analyzed by the engineering studies section of this study. So, this factor was deleted from the next route-specific IEE for three alternative options.

Under "Do-Nothing" scenario, the total amount of CO2 emission loading, originating from regional vehicular emissions will be increased, provided that no further fuel policy and/or vehicle Inspection/Maintenance program will be implemented in the future while regional traffic volume will increase naturally. Under "Do-Project" scenario, CO2 emission loading during the construction phase may be temporarily increased, but the total amount of CO2 emission loading for both construction and operation phases may be reduced (e.g., JICA, 2003), significantly depending on the improvement of the regional transport condition.

Within this preliminary IEE, the negative impact of the following three environmental factors such as "Ground Subsidence", "Foul Smell" and "Climate" are evaluated as "D". So, the three factors were also deleted from the next IEE for the three alternative options.

Table 10.1.8 Initial Environmental Evaluation (Comparison of Do –Project and Do-Nothing Scenarios)

Environmental Factor	Do Project			Do-Nothing
	Route A	Route B	Route C	
1. Air quality: Poorer roadside dust and air pollution during/after during construction of the project.	B			B
2. Water Quality: Risk of pollution to River Nile, temporary water quality degradation due to construction.	B	A	B	D
3. Soil and Sedimentation: Disturbance to contaminated site, sediment accumulation due to change in flood flow pattern course.	C			D
4. Waste Disposal: Generation of huge volume of construction wastes.	B	B	A	D
5. Noise/Vibration: Increased roadside noise and vibration during/after construction of the project.	B			B
6. Ground Subsidence	D			D
7. Foul smell emission	D			D
8. River Bed: Disturbance to river bed condition (e.g., benthos), enhanced scouring due to change in flow currents.	B	A	B	D
9. Accident: Potential increased in traffic accidents, potential vessel accidents (e.g., vessel collisions), and possible failure of the dam bridge due to fatigue.	B			A
10. Topography and Geology: Riverbank erosion/scouring will be enhanced, Shoreline of Lake Victoria will be partially damaged due to construction of the caisson.	B			D
11. Soil Erosion: Slope of approach road will be subject to potential erosion	B			D
12. Groundwater	D			D
13. Hydrology: Regional drainage pattern may change due to the approach road construction	B			D
14. Flora/fauna: Destruction of riverside vegetation, disturbance to bird habitats along riverbank and to aquatic eco-system.	A			D
15. Climate	D			D
16. Visual Resources: Disharmony with surrounding landscape	C			D
17. Global Warming: Increased CO_2 emission.	B			B

Note A: significant, B: minor, C: Unknown, D: less significant.

Table 10.1.9 Summary of Preliminary IEE (Comparison of Do-Project and Do-Nothing Scenarios)

	A	B	C
Do-Nothing	1	3	0
Route A	0	10	3
Route B	2	8	3
Route C	0	9	3

Table 10.1.10 Breakdown of Each Potential Impact (Do-Projects)

	Environmental Factors	Remarks of Possible Impacts
1	Air Quality	1. Increase in roadside air quality degradation during construction 2. Future roadside air quality degradation after construction.
2	Water Quality	1. Risk of pollution to River Nile by accidental spill of toxic waste. 2. Temporary water quality degradation during construction.
3	Soil and Sedimentation	Unknown. Several soil contaminated sites may exist such as factories or GS.
4	Waste Disposal	1. Preparation of disposal site for excavated soil. 2. Proper disposal of construction wastes to be generated during the construction period.
5	Noise/Vibration	1. Enhanced roadside noise and vibration during construction period. 2. Enhanced roadside noise and vibration after construction.
6	Subsidence	Less significant.
7	Bad Smell	Less significant.
8	River Bed	1. Disturbance to river bed condition during construction. 2. Enhanced scouring due to change in flow of currents.
9	Accidents	1. Potential increase in traffic accidents before and/or during the construction period. 2. Potential occurrence of Vessel accident during construction. 3. Dam Bridge Failure due to fatigue (Do Nothing)
10	Topography/ Geology	1. Enhanced riverbank erosion/or scouring due to change in flow of currents. 2. Partial potential damage to the shoreline of Lake Victoria due to construction of the caisson.
11	Soil Erosion	Potential occurrence of slope erosion of the approach road .
12	Groundwater	Less significant
13	Hydrology	Disruption to regional drainage discharge pattern due to approach road construction
14	Flora/Fauna	1. Disturbance to riverside conservation area. 2. Destruction to riverside vegetation. 3. Disturbance to bird habitats along river banks and to aquatic eco-system.
15	Climate	Less significant
16	Visual Resources	Unknown. Potential to become landmark would be significant.
17	Global Warming	Unknown, Total amount of CO_2 emission emissions may be reduced.

2) IEE of the Three Alternative Options

More detailed IEE results for each engineering option for the construction and operation of the facilities are summarized in Tables 10.1.11 – 10.1.16. Based on the knowledge of the current bio-physical environment of the study area, summarized in previous sections, it was found that several environmental factors would be important and critical for the implementation of each proposed bridge construction plan.

As mentioned earlier, adverse impacts on water quality during the construction period cannot be ignored. due to the occurrence of several important species along the River Nile. In particular, Route B would cause significant impact regarding "Water Quality" and "River Bed" since this option is provided with numerous bridge piers to be constructed inside the River Nile. The size of the construction camp to be set up for the entire construction work for all three options, would be huge (roughly estimated at about 1000 labourers in peak construction), and household effluents to be generated by the construction of the project should be properly treated before discharging into the River Nile. It is noted that the exact number of total labourers would be determined based the final construction schedule.

There are conservation areas along both riverbanks of the River Nile and the shoreline of Lake Victoria, and all three route options run through the protection areas. In addition, Route C runs through Kimaka Forest Reserve, located eastside of the River Nile.

In Route B Option, bridge piers are to be constructed, by numerous caissons. The caisson fabrication yard may be set up at the shoreline of Lake Victoria (i.e., the conservation area), to enable the caissons to be tugged to the site of installations by tow boats. Potential occurrence of vessel accidents and the physical disturbance to the Lake Victoria shoreline cannot be ignored.

Note that several rehabilitation works were conducted for the existing Owen Falls Dam Complex and the contingency plan in case of dam failure was established by the [Ministry of Housing, Communication and Works, 2003]. From the practical point of view, it would be advisable to avoid downstream route alignment, or appropriate counter measure should be established in the event of dam breach particularly for Route C alignment. Thus, the adverse impact on "Accident" is evaluated as "B" for Route C Option.

Some portions of the approach roads may intersect the natural regional drainage could cause l inundation unless appropriate mitigation measures are considered. Thus, the adverse impact on "Hydrology" is given a score of "B" for all the route options. Tables 10.1.17 and 18 summarized the IEE results of all three alternatives. The following is a summary of this IEE study.

IEE Summary

1. Conservation Area (100 meters away from the high water level of the River Nile) exist at both the riversides and all the Route Options, A, B and C will pass through the protected areas. In Route A and B Options, caisson fabrication yard for the construction of piers inside the river may be set up along the shoreline of Lake Victoria (i.e., another protected area). Route C will cut through Kimaka Forest Reserve, located on the eastside of the River Nile.

2. It is found that several IUCN-CR (critically Endangered), EN (Endangered), VL (Vulnerable), NT (Near Threatened) and LC (Least concern) species exists inside and around the River Nile for all Route Options.

3. Route C has the longest-distance approach roads on both sides of the River Nile, so that it is expected to have the largest volume of construction wastes, as compared with those of Routes A and B. By the same token, adverse impacts on the regional drainage by Route C would be significant, as compared with those of Routes A and B.

4. Route B will be provided with two bridge piers inside River Nile, so that the order of the magnitude of water quality degradation to be encountered during the construction of the facility would be significant, as compared with those of Routes A and C.

5. The bridge section for Route C is located downstream of Owen Falls Dam Complex, so that the potential risk of the dam breach can not be ignored.

Table 10.1.11 Initial Environmental Evaluation (Construction of New Nile Bridge, Alignment A)

Environmental Factor	Jinja		River Nile		Njeru	
	Co	Op	Co	Op	Co	Op
1. Air quality						
Increase in roadside dust and air pollution	B	B	D	D	B	B
2. Water Quality						
Risk of pollution to River Nile.	B	D	B	D	B	D
Temporary water quality degradation due to construction of bridge foundations	B	D	B	D	B	D
Household discharge from the construction camp	D	D	B	D	D	D
3. Soil and Sedimentation						
Contamination of the site	C	D	D	D	C	D
Sediment accumulation due to change in current flow pattern during the occurrence of flood.	D	D	C	C	D	D
4. Waste Disposal						
Generation of large volume of construction wastes.	B	D	B	D	B	D
5. Noise/Vibration						
Increase in roadside noise and vibration	B	B	D	D	B	B
6. River Bed						
Disturbance to river bed condition (e.g., benthos)	D	D	B	D	D	D
Enhanced scouring due to change in flow of currents	D	D	C	C	D	D
7. Accident						
Potential increase in occurrence of traffic accidents.	B	C	C	C	B	C
Potential increase in occurrence of vessel accidents(e.g., vessel collisions)	D	D	B	D	D	D
Potential occurrence of dam breach and resulting to flooding	D	D	D	D	D	D
8. Topography and Geology						
Enhancement of riverbank erosion/scouring	D	D	B	C	D	D
Partial damage to the shoreline of Lake Victoria due to the fabrication of caissons.	D	D	D	D	D	D
9. Soil Erosion						
Potential risk of soil erosion	B	D	B	D	B	D
10. Hydrology						
Regional drainage pattern would change due to the approach road construction	B	B	D	D	D	D
Creation of new inundated area.	B	B	D	D	D	D
11. Flora/fauna						
Disturbance to the riverside conservation area.	D	D	A	C	D	D
Destruction of riverside vegetation.	B	D	B	D	B	D
Destruction of roadside vegetation.	B	D	D	D	B	D
Disturbance to forest reserve	D	D	D	D	D	D
Disturbance to bird habitats along the riverbank.	B	D	B	D	B	D
Disturbance to the aquatic ecosystem/or habitats.	D	D	B	D	D	D
Reduced fish spawning and breeding area	D	D	C	D	D	D
Disturbance to fish migration along River Nile	D	D	C	D	D	D
Disturbance to lake shoreline ecosystem due to caisson fabrication	D	D	B	D	D	D
12. Global Warming						
Increase in CO_2 emission.	B	C	B	C	B	C

Note Co: Construction Phase, Op: Operation Phase, A: significant, B: minor, C: Unknown, D: less significant.

Table 10.1.12 Breakdown of Each Potential Impact (Alignment A)

	Environmental Factors	Remarks of Possible Impacts
1	Air Quality	1. Increase in roadside air quality degradation during construction 2. Future roadside air quality degradation after construction.
2	Water Quality	1. Risk of pollution to River Nile. 2. Temporary water quality degradation during construction. 3. Temporary increase in household effluents from the contractor's camp.
3	Soil and Sedimentation	Unknown. Several soil contaminated sites may exist due to others (factories, plants, etc.)
4	Waste Disposal	1. Preparation of soil disposal areas. 2. Proper treatment of industrial wastes to be generated by the construction activities.
5	Noise/Vibration	1. Increase in roadside noise and vibration during the construction period. 2. Increase in roadside noise and vibration after construction is completed.
6	River Bed	1. Disturbance to the river bed during construction. 2. Enhanced scouring due to change in flow of currents.
7	Accidents	Potential increase in traffic accidents during the construction period. 2. Potential occurrence of Vessel (Caisson towing by tugboats) accident during the installation period of caissons. .
8	Topography/ Geology	1. Enhanced riverbank erosion/or scouring due to change of local currents.
9	Soil Erosion	Potential occurrence of soil erosion due to earthwork of the approach road and riverbank.
10	Hydrology	1. Change in drainage pattern due to approach road construction 2. Creation of new inundated area.
11	Flora/Fauna	1. Disturbance to the riverside conservation area. 2. Destruction of riverside vegetation. 3. Destruction of roadside vegetation. 4. Disturbance to bird habitats along the riverbank and to aquatic eco-system. 5. Disturbance to the lake shoreline ecosystem due to caisson fabrication.
12	Global Warming	CO_2 emissions may be increased due to construction activities. Undetemined for the Operation of the facilities, CO_2 emissions may be reduced.

Table 10.1.13 Initial Environmental Evaluation (Construction of New Nile Bridge, Alignment B)

Environmental Factor	Jinja		River Nile		Njeru	
	Co	Op	Co	Op	Co	Op
1. Air quality						
Worsened roadside dust and air pollution	B	B	D	D	B	B
2. Water Quality						
Risk of pollution to River Nile.	B	D	A	D	B	D
Temporary water quality degradation due to construction	B	D	A	D	B	D
Household discharge from construction camp	D	D	B	D	D	D
3. Soil and Sedimentation						
Disturbance to contaminated site	C	D	D	D	C	D
Sedimentation change due to change of local flood flow pattern over floodplain.	D	D	C	C	D	D
4. Waste Disposal						
Generation of large amounts of construction wastes.	B	D	B	D	B	D
5. Noise/Vibration						
Increased roadside noise and vibration	B	B	D	D	B	B
6. River Bed						
Disturbance to river bed condition (e.g., benthos)	D	D	A	D	D	D
Enhanced scouring due to change of local currents	D	D	C	C	D	D
7. Accident						
Potential of increased traffic accidents.	B	C	C	C	B	C
Potential of increased vessel accidents(e.g., vessel collisions)	D	D	B	D	D	D
Potential of dam breach and resultant flood	D	D	D	D	D	D
8. Topography and Geology						
Enhanced riverbank erosion/scouring	D	D	B	C	D	D
Partial destruction of shoreline of Lake Victoria due to construction of caisson.	D	D	B	D	D	D
9. Soil Erosion						
Potential for soil erosion	B	D	B	D	B	D
10. Hydrology						
Regional drainage pattern change due to approach road construction	B	B	D	D	D	D
Creation of new inundated area.	B	B	D	D	D	D
11. Flora/fauna						
Disturbance to riverside conservation area	D	D	A	C	D	D
Destruction of riverside vegetation.	B	D	B	D	B	D
Destruction of roadside vegetation.	B	D	D	D	B	D
Disturbance to forest reserve	D	D	D	D	D	D
Disturbance to bird habitats along riverbank.	B	D	B	D	B	D
Disturbance to aquatic ecosystem/or habitats.	D	D	B	D	D	D
Reduced fish spawning and breeding area	D	D	C	D	D	D
Disturbance to fish migration along River Nile	D	D	C	D	D	D
Disturbance to lake shoreline ecosystem due to caisson construction	D	D	B	D	D	D
12. Global Warming						
Increased CO_2 emission.	B	C	B	C	B	C

Note Co: Construction Phase, Op: Operation Phase,
A: significant, B: minor, C: Unknown, D: less significant.

Table 10.1.14 Breakdown of Each Potential Impact (Alignment B)

	Environmental Factors	Remarks of Possible Impacts
1	Air Quality	1. Increased roadside air quality degradation during construction 2. Future roadside air quality degradation after construction.
2	Water Quality	1. Risk of pollution to River Nile. 2. Temporary water quality degradation during construction. 3. Temporary increase of household effluents from construction camp.
3	Soil and Sedimentation	Unknown. Several soil contaminated sites may exist.
4	Waste Disposal	1. Preparation of excavated soil dump site. 2. Proper treatment of industrial wastes to be generated during construction period.
5	Noise/Vibration	1. Worsened roadside noise and vibration during construction period. 2. Worsened roadside noise and vibration after construction.
6	River Bed	1. Disturbance to river bed condition during construction. 2. Enhanced scouring due to change of local currents.
7	Accidents	1. Potential of increased traffic accidents during construction period. 2. Potential of Vessel (Caisson delivery by ship) accident during construction phase.
8	Topography/ Geology	1. Enhanced riverbank erosion/or scouring due to change of local currents. 2. Partial destruction of shoreline of Lake Victoria due to construction of caisson.
9	Soil Erosion	Potential of soil erosion to be caused by earthwork of approach road and riverbank.
10	Hydrology	1. Regional drainage pattern change due to approach road construction 2. Creation of new inundated area.
11	Flora/Fauna	1. Disturbance to riverside conservation area. 2. Destruction of riverside vegetation. 3. Destruction of roadside vegetation. 4. Disturbance to bird habitats along riverbank and to aquatic eco-system. 5. Disturbance to lake shoreline ecosystem due to caisson construction
12	Global Warming	CO_2 emission loading may be increased due to construction activities. Unknown for operation phase, CO_2 emission loading may be reduced.

Table 10.1.15 Initial Environmental Evaluation (Construction of New Nile Bridge, Alignment C)

Environmental Factor	Jinja		River Nile		Njeru	
	Co	Op	Co	Op	Co	Op
1. Air quality						
Worsened roadside dust and air pollution	B	B	D	D	B	B
2. Water Quality						
Risk of pollution to River Nile.	B	D	B	D	B	D
Temporary water quality degradation due to construction	B	D	B	D	B	D
Household discharge from construction camp	D	D	B	D	D	D
3. Soil and Sedimentation						
Disturbance to contaminated site	C	D	D	D	C	D
Sedimentation change due to change of local flood flow pattern over floodplain.	D	D	C	C	D	D
4. Waste Disposal						
Generation of large amounts of construction wastes.	A	D	B	D	A	D
5. Noise/Vibration						
Increased roadside noise and vibration	B	B	D	D	B	B
6. River Bed						
Disturbance to river bed condition (e.g., benthos)	D	D	B	D	D	D
Enhanced scouring due to change of local currents	D	D	C	C	D	D
7. Accident						
Potential of increased traffic accidents.	B	C	C	C	B	C
Potential of increased vessel accidents(e.g., vessel collisions)	D	D	D	D	D	D
Potential of dam breach and resultant flood	D	D	B	B	D	D
8. Topography and Geology						
Enhanced riverbank erosion/scouring	D	D	B	C	D	D
Partial destruction of shoreline of Lake Victoria due to construction of caisson.	D	D	D	D	D	D
9. Soil Erosion						
Potential for soil erosion	B	D	B	D	B	D
10. Hydrology						
Regional drainage pattern change due to approach road construction	D	D	D	D	B	B
Creation of new inundated area.	D	D	D	D	B	B
11. Flora/fauna						
Disturbance to riverside conservation area	D	D	A	C	D	D
Destruction of riverside vegetation.	B	D	B	D	B	D
Destruction of roadside vegetation.	B	D	D	D	B	D
Disturbance to forest reserve	A	A	D	D	D	D
Disturbance to bird habitats along riverbank.	B	D	B	D	B	D
Disturbance to aquatic ecosystem/or habitats.	D	D	B	D	D	D
Reduced fish spawning and breeding area	D	D	C	D	D	D
Disturbance to fish migration along River Nile	D	D	C	D	D	D
Disturbance to shoreline ecosystem due to caisson construction	D	D	D	D	D	D
12. Global Warming						
Increased CO_2 emission.	B	C	B	C	B	C

Note Co: Construction Phase, Op: Operation Phase,
A: significant, B: minor, C: Unknown, D: less significant.

Table 10.1.16 Breakdown of Each Potential Impact (Alignment C)

	Environmental Factors	Remarks of Possible Impacts
1	Air Quality	1. Increased roadside air quality degradation during construction 2. Future roadside air quality degradation after construction.
2	Water Quality	1. Risk of pollution to River Nile. 2. Temporary water quality degradation during construction. 3. Temporary increase of household effluents from construction camp.
3	Soil and Sedimentation	Unknown. Several soil contaminated sites may exist.
4	Waste Disposal	1. Preparation of excavated soil dump site. 2. Proper treatment of industrial wastes to be generated during construction period.
5	Noise/Vibration	1. Worsened roadside noise and vibration during construction period. 2. Worsened roadside noise and vibration after construction.
6	River Bed	1. Disturbance to river bed condition during construction. 2. Enhanced scouring due to change of local currents.
7	Accidents	1. Potential of increased traffic accidents during construction period. 3. Risk of Dam Breach during/after construction phase.
8	Topography/ Geology	1. Enhanced riverbank erosion during construction.
9	Soil Erosion	Potential of soil erosion to be caused by earthwork of approach road and riverbank.
10	Hydrology	1. Regional drainage pattern change due to approach road construction 2. Creation of new inundated area.
11	Flora/Fauna	1. Disturbance to riverside conservation area. 2. Disturbance to Kimaka Forest Reserve. 3. Destruction of riverside vegetation. 4. Destruction of roadside vegetation. 5. Disturbance to bird habitats along riverbank and to aquatic eco-system.
12	Global Warming	CO_2 emission loading may be increased due to construction activities. Unknown for Operation phase, CO_2 emission loading may be reduced.

Table 10.1.17 Summary of IEE Results (All Route Alignments)

		A Scores		B Scores		C Scores	
		Construction	Operation	Construction	Operation	Construction	Operation
Route A	Njeru	0	0	11	2	1	2
	River Nile	1	0	13	0	5	6
	Jinja	0	0	13	4	1	2
Route B	Njeru	0	0	11	2	1	2
	River Nile	4	0	11	0	5	6
	Jinja	0	0	13	4	1	2
Route C	Njeru	1	0	13	4	1	2
	River Nile	1	0	12	1	5	6
	Jinja	2	1	11	2	1	2

Table 10.1.18 Summary of Potential Impact by Score

	Alignment A	Alignment B	Alignment C
Evaluation A	1. Disturbance to riverside conservation area (construction).	1. Disturbance to riverside conservation area (construction). 2. Risk of pollution to River Nile by accidental spill (construction). 3. Temporary water quality degradation (construction). 4. Disturbance to river bed condition (construction).	1. Disturbance to riverside conservation area (construction). 2. Preparation of excavated soil dump site and proper treatment of industrial wastes (construction). 3. Disturbance to Kimaka Forest Reserve.
Evaluation B	1. Increased roadside air quality degradation (construction/operation) 2. Risk of pollution to River Nile (construction). 3. Temporary water quality degradation (construction). 4. Preparation of excavated soil dump site and proper treatment of industrial wastes (construction). 5. Worsened roadside noise and vibration (construction/operation) 6. Potential of increased traffic accidents (construction). 7. Potential of Vessel (Caisson delivery by ship) accident during construction phase. 8. Enhanced riverbank erosion/or scouring due to change of local currents (construction). 9. Potential of soil erosion to be caused by earthwork of approach road and riverbank (construction). 10. Regional drainage pattern change due to approach road construction (construction/operation) 11. Creation of new inundated area (construction/operation). 12. Destruction of riverside vegetation (construction). 13. Destruction of roadside vegetation (construction). 14. Disturbance to bird habitats along riverbank and to aquatic eco-system (construction). 15. Disturbance to lake shoreline ecosystem due to caisson construction (construction). 16. Increased CO_2 emission loading (construction).	1. Increased roadside air quality degradation (construction/operation) 2. Preparation of excavated soil dump site and proper treatment of industrial wastes (construction). 3. Worsened roadside noise and vibration (construction/operation) 4. Potential of increased traffic accidents (construction). 5. Potential of Vessel (Caisson delivery by ship) accident during construction phase. 6. Enhanced riverbank erosion/or scouring due to change of local currents (construction). 7. Partial destruction of shoreline of Lake Victoria (construction). 8. Potential of soil erosion to be caused by earthwork of approach road and riverbank (construction). 9. Regional drainage pattern change due to approach road construction (construction/operation) 10. Creation of new inundated area (construction/operation). 11. Destruction of riverside vegetation (construction). 12. Destruction of roadside vegetation (construction). 13. Disturbance to bird habitats along riverbank and to aquatic eco-system (construction). 14. Disturbance to lake shoreline ecosystem due to caisson construction (construction). 15. Increased CO_2 emission loading (construction).	1. Increased roadside air quality degradation (construction/operation) 2. Risk of pollution to River Nile (construction). 3. Temporary water quality degradation (construction). 4. Worsened roadside noise and vibration (construction/operation) 5. Potential of increased traffic accidents (construction). 6. Potential of dam breach and resultant flood (construction/operation). 7. Enhanced riverbank erosion (construction). 8. Potential of soil erosion to be caused by earthwork of approach road and riverbank (construction). 9. Regional drainage pattern change due to approach road construction (construction/operation) 10. Creation of new inundated area (construction/operation). 11. Destruction of riverside vegetation (construction). 12. Destruction of roadside vegetation (construction). 13. Disturbance to bird habitats along riverbank and to aquatic eco-system (construction). 14. Increased CO_2 emission loading (construction).

10.1.4 Environmental Impact Assessment

(1) Scoping for ESIA Study

ESIA, conducted within this section, is concerned with potential natural environmental impacts to be caused by the selected engineering option. Potential negative impacts were identified throughout the environmental screening/scoping of this report, summarized in previous section. Based on those screening/scoping results, ESIA study is carried out in accordance with the Ugandan ESIA law, JICA Guideline and relevant international EIA standards/guidelines. Main purpose of this ESIA study is to evaluate the potential impacts of the proposed projects at three different phases (i.e., pre-construction, construction, and operation phases), establish appropriate environmental mitigation and management programs, and provide fundamental environmental study results that support a successful environmental license application processes that is carried out by Ugandan C/P.

(2) Impact Assessment

1) Introduction

Possible environmental impacts regarding environmental factors, listed in Tables 10.1.11 and 10.1.12, are summarized for selected engineering option (i.e., Alignment A). Basically, more detailed studies shall be carried out for some of identified "Category-A" and "Category-B" environmental factors whereas simple analysis is for "Category-C" and "Category-D" ones within this ESIA study. More specific descriptions for each impact, categorized as "Category-A" and "Category-B" are to be delineated separately in following section.

2) Descriptions of Impact Assessment

a) Air Quality

- Dust during the construction period

It is likely to have temporal dust problem during the construction period. In general, construction activities of the proposed project would comprise of large-scale earthworks but are scheduled to be done within relatively short period. So, the magnitude of the dust level will not be major during this period. It is recommended that stock piles of sand and soil are well screened from residential areas. Frequent usage of sprinklers would be appropriate in Jinja. Multi-directional fall-out buckets should be used to monitor dust levels during the construction period.

- Local Air quality degradation after the operation starts.

Some local feeder roads connecting to the project sites run through residential area on where current traffic volumes are not so large. The future roadside air quality of some local feeder roads may be deteriorated due to the increased traffic volume after the construction. It would be better to carry out air quality-related study in order to evaluate the future air quality impacts on some residential areas.

Roadside air quality measurement is carried out in order to analyze the current baseline air quality condition around the project site, as a part of the technical assistance to UNRA (see Section 10.1.10 for more detailed description).

b) Water Quality

- Risk of water pollution to the River Nile during the construction.

During the construction period, it is likely that the water quality (e.g., turbidity) of the River Nile may be degraded temporally due to the bridge pier construction activity to be held inside of the river. Also, the water pollution may be caused by the accidental spillage of oil or any chemical solvents. So it would be wise to prepare for the occurrence of accidental spillage of the oil/other chemical materials and/or construction wastes.

Periodical water quality monitoring work shall be carried out in order to monitor the potential water quality change quantitatively. It is essential that strict controls must be established on operations in the storage of all potentially hazardous liquids such as oils. Emergency procedures should be developed in the event of an accidental spillage.

- Potential of water quality degradation due to the erosion during/and after the construction

During the construction period, approach roads will be constructed on both hilly sides of the River Nile, and the water quality degradation of the river water (e.g., worsened turbidity) may occur due to the natural run-off of turbid water to be generated at construction site temporally. So, special attentions shall be paid to erosion-related water quality degradation during/and after the construction period shall be prepared. It is recommended to carry out periodical water quality monitoring of the river water around the project site during/and after construction phases.

- Household effluent discharged from construction camp/or yard during the construction period

Construction yard and camp are to be established around the River Nile and many construction workers and their families will stay therein temporally. It is quite essential to prepare for the well-organized sewage and household waste treatment systems that will not deteriorate the current local environmental condition as well as other relevant infrastructure facilities.

c) Soils and sedimentation

Basically, existence of contaminated soil around the project site is not reported. However, there is a gas station around the east end of the approach road while the west side approach road will run through the industrial area, on where factory complex of Nitel Textile, Nile Brewery and others exist. It is essential to carry out the soil test to check the if there are any soil contaminated sites around the project site prior to the construction phase.

d) Waste Disposal

- Preparation of excavated soil dump and industrial waste treatment sites.

All excavated soils and other construction wastes will not be re-used and have to be dumped at proper waste disposal sites. Appropriate industrial waste treatment sites should be prepared and be large enough for the treatment of this excavated soil and construction wastes. More specific information such as total amounts and/or types of construction wastes will be available after the construction plan of the proposed project is delineated.

e) Noise/vibration

- Noise and vibration during the construction period

Since construction activities will result in almost continuous noise from a mobile mechanical plant and others, the order of the magnitude of the noise and the vibration level will be significant during this period temporally. Entire construction activities maybe planned to be conducted during the night time, and applications of special mitigation measures such as noise barriers or use of silent construction machinery may be considered to alleviate the noise and the vibration impacts on the resort or residential areas around the project site.

- Noise and vibration after construction.

Due to the increased regional traffic volume that is expected to occur after the operation of the proposed project starts, those roadside noise environments of several major routes would become worse. As mentioned earlier, the estimated local bridge-crossing traffic volume under both “Do” and “Do-nothing” scenarios in Year 2025 is of 27,943 Vehicles/day (note that the traffic volume counted in Year 2008 is of approximately 11,108

Vehicles/day). So, it is likely that the future roadside noise environment may be slightly worsened after the operation will start.

So far, no roadside noise data exist around the study area, so it is essential to carry out the roadside noise survey in order to obtain the baseline data although IEE evaluation regarding the impact on the roadside noise environment seems to be minor. Roadside noise measurement is carried out in order to analyze the current baseline noise condition around the project site, as a part of the technical assistance to UNRA (see Section 10.1.10 for more detailed description).

f) River Bed

- Disturbance to the river bed condition (e.g., benthos)

Construction of several bridge piers are to be carried out at inside of the River Nile, and, consequently, the local river bed condition of surrounding areas will be disturbed temporally. It is known that inland water area around the project route is very close to local fishery zone and several water intake points. It is essential to carry out relevant biological environmental study as well as water quality study in order to summarize the current baseline condition and to assess potential significance of those impacts to be caused by the construction activity.

- Enhanced scouring due to the change of local currents

Some shallow portions of the River Nile between the east river front and the a small island on where a bridge pier is to be constructed will be filled partially during the construction phase. Total distance of this filling is of approximately 50 m while entire river width along the project alignment is of approximately 400 m. The order of the magnitude of the local scouring may be increased although the main flow of the River Nile runs through a deeper section, adjacent to this island.

g) Accidents

- Increased traffic levels during the construction for the road material transport.

Due to the delivery of a large amount of construction materials and/or wastes, temporal traffic increase and/or resultant traffic jams are expected to occur at several sites around the project site. Several material sources such as asphalt, concrete, and aggregate plants and quarries are available around Jinja. If those deliveries are spread throughout the entire project period, this may not result in significant increases in the road traffic.

- Potential of Vessel (Caisson delivery by ship) accident during the construction phase.

Caisson, to be used for the bridge pier construction, is to be created at the waterfront of Lake Victoria, and then, be towed to the construction site via the River Nile. Basically, the local current of Victoria Nile is rapid while the local fishery comprising of many small-scale fishermen is active around the project site. So, it is essential to establish a safe caisson delivery plan that would not hamper local fishery industry.

h) Topography and Geology

- Enhanced riverbank erosion/or scouring due to change of local currents.

As mentioned earlier, the local flow pattern around a small island on where a bridge pier is to be constructed may be changed, and, consequently, the order of the magnitude of the river bank erosion may be intensified during the construction phase since the total area of passable flow section will be decreased. It is essential to carry out a detailed hydrological study and prepare appropriate mitigation measure (e.g., riverbank protection) if necessary.

i) Soil Erosion

- Potential of soil erosion to be caused by earthwork of approach road construction

Currently, no significant soil erosion event is observed around the project site. However, a large-scale earthwork is to be carried out for the construction of approach roads on both

sides of the River Nile. So it is essential to implement appropriate anti-erosion mitigation measures not to cause severe soil erosion from the project site.

j) Hydrology

- Regional drainage pattern change due to approach road construction and creation of newly inundated areas

Some of the eastside approach road would cur through the natural run-off (sometime, the direction of the road alignment is perpendicular to the regional drainage flow direction on the east side of the river), and thus, may cause disruption on the regional drainage system and cause newly inundated area during the rain season. It is essential to carry out a detailed hydrological study and prepare appropriate drainage measures that would be compatible with regional drainage system.

- Risk of Malaria, Dengue and waterborne disease outbreak from newly created long-term inundated area.

Due to the change of the regional drainage system, there are some possibilities to have newly inundated sites, that would cause new outbreaks of malaria and dengue during the rainy season. A structural integrity between current local drainage and newly created roadside drainage systems of the proposed project must be established in order to achieve a smooth regional drainage network system and lessen the chance of the creation of permanently/or long-term inundated area after the operation starts. Daily precaution such as use of mosquito spray must be taken in order to lessen the risk of those diseases infection on construction workers. If new inundated areas are happened to be created around the study area, it might be helpful to spray pesticide periodically.

k) Flora/Fauna

- Destruction of natural riverine vegetation.

Entire project route will result in some loss of the natural riverine vegetation, located inside of the protected zone (see Section 10.1.2 for more detailed description). Special attentions must be paid for the handling of this natural riverine vegetation. Remnant areas of shrub shall be left undamaged by bridge development activities. The biological environment study shall be carried out in order to grasp the importance of the current riverine vegetation as well as local fauna at both sides of the river.

- Disturbance to birds and wildlife during the construction period.

During the construction period, the noise and the dust will be resulted from the mechanical plant movement, and/or any earthwork activities. It is likely that any wildlife or birds roosting or feeding around riverine vegetations at both sides will move away to surrounding quieter areas such as Mabira Forest Reserve, located 7 km away from the project site temporally. The return of these animals or birds will depend on the scale of the construction and the increased noise to be resulted from greater number of trucks as well as the tolerance of those creatures to the repeated disturbance.

- Illegal fishing/or hunting activities by bridge construction workers.

During the construction period, many construction workers and their families will stay at Jinja City and Njeru Town. If in-migration is expected during construction phase, it will be important to ensure that any fishing activities/or hunting by construction workers is minimized, while inspecting effectively if there is no increase in current fishing levels in collaboration with both NaFIRRI and LVFO. Also, it is essential to have special seminars for them to enhance their understanding about the importance of local fauna/flora including the local fishery resources along the upper Victoria Nile.

- Habitat change due to the physical change/or damage on the River Nile.

Alternation in local hydrology and river morphology (e.g., dredging and destruction of subsurface habitat), alternations to sediment and nutrient loads, changes to river flow

patterns, and resultant spatial modification of water temperature, may negatively impact on various fish species. Minimizing discharge of construction materials into the main river and pollution, avoiding blockage of the river or modification of the main river channel, and maintaining the river's natural flow should all be prioritized during the bridge construction phase. It is essential to ensure that the construction of the bridge will have no significant long-term, direct impacts on the water quality or local flow condition, that would have significant impacts on the vast majority of fish species.

As described on the IEE Results of this proposed project, several important species including IUCN-EN fishes occur around the project site. Currently, some of them are on the verge of the extinction due to the rapid growing of Nile Perch, major invasive species and predator for those endemic fishes around the Upper Victoria Nile whereas no significant negative impacts on those species, except the accidental spillage of toxic chemical, will be caused by the proposed project.

However, it would be worth creating several conservation ponds around the waterfront near the project site and make this bridge construction project environmentally-friendly one.

- Risk of pollution to aquatic species during the construction period.

In case of the spillage accident, described earlier, there also will be the risk of the pollution-related damage to aquatic species of the River Nile during the construction period. This could have a long-term, more severe impacts on aquatic species populations. Based on IEE results of this study, it is found that current water quality condition of the River Nile around the project site is generally in good condition, and therefore any large-scale pollution incidents could have significant negative impacts on the aquatic fauna. In particular, risks of the temporal water quality degradation such as worsened turbidity caused by the sediment discharge or re-suspension of the bottom sediment; or increases in pH caused by the untreated water discharge from the concrete-batching plant could adversely affect local flora and fauna would not be negligible during the construction phase.

- Disturbance to animal path after the construction.

Some portions of the project route will pass through several natural riverine areas, and may cause the habitat separation or the loss of the access to the feeding place. Mitigation measures such as the animal path or the conservation pond shall be taken in order to lessen both impacts of the fauna community separation and the animal path cutting if any species with important conservation status would occur around the project site. Also, the roadside fence or cage that would protect animal from traffic accidents shall be prepared.

To summarize flora/fauna-related discussions, described above, it is essential to carry out an appropriate biological environment study around the study area in order to determine the presence/or possible absence of any species with conservation status and assess the potential significance of any impacts to be caused by the construction activity.

l) Global Warming

- Possible CO2 emission reduction after bridge operation starts.

As mentioned earlier, the future traffic volume of the proposed project will be increased for both “Do” and “Do-Nothing” scenarios, provided that no significant change in a region-wide traffic condition will occur. Total amount of the regional vehicular emission (e.g., CO2) under “Do-Scenario” may be reduced due to the implementation of more organized regional transport system, compared with that of “Do-Nothing Scenario”. It is quite essential to carry out quantitative evaluation of a cumulated amount of entire vehicular emission loading to be generated under each option. More detailed discussions of CO2 emission will be presented in the vehicular emission study section of this technical report, as a part of the technical assistance to UNRA (see Section 10.1.10 for more detailed description).

10.1.5 Impacts Mitigation

The comprehensive, effective measures of the mitigation (i.e., avoidance, reduction, and elimination) of negative impacts for the pre-construction, construction and operation phases of the project are described in this section. The objectives of the mitigation plan are to review impacts identified through the environmental and social impact assessment (ESIA), described in previous section, and incorporate probable working practices into the mitigation plan at the pre-construction and construction phases of the project in order to anticipate those issues which are likely to require a close environmental management.

The mitigation plan addresses to the negative impacts caused by the construction works and its operation. The impacts to be caused during the construction period are mostly of a temporary nature lasting only for the construction period, about several years. Detailed descriptions of each mitigation measure are attached in Appendix 5.1. Mitigation measures must be incorporated into tender documents prepared under the engineering component of this project in order to ensure that the contractor is obliged to comply with measures in the environmental management plan (EMP).

10.1.6 Environmental Management

(1) Introduction

Effective environmental management during pre-construction and construction requires the establishment of effective institutional arrangements for the implementation of the Environmental Management Plan (EMP). In general, any environmental management programme should be carried out as an integrated part of project planning and its execution, making a significant and continuous contribution to the overall development of the scheme. It must not be regarded merely as an activity limited to monitoring and regulating activities using a pre-determined checklist of required actions. Rather, it must interact dynamically as the project implementation proceeds, dealing flexibly with environmental impacts – both expected and unexpected as they arise. For this reason, the plan provides for periodic audits, which will evaluate compliance of on-site environmental management practices with the EMP requirements and also to refocus the plan itself in the light of experience and issues arising.

(2) Scopes and Objectives

The EMP is concerned with the environmental impacts due to the construction of both new bridge and approach roads and these controlling procedures. The main purpose of the EMP is to ensure that the various environmental protection measures selected through the project-planning phase are implemented during the construction phase, so that the environmental degradation and pollution resulting from construction activities will be minimized. Specific objectives of the plan are to:

- Define organizational and administrative arrangements for the environmental monitoring, including the definition of responsibilities of staff, coordination, liaison and reporting procedures.
- Discuss procedures for pro-active environmental management, so that potential problems can be identified and mitigation measures to be adopted prior to the construction commencement.

(3) Methodology

The basic approach to prepare the management plan comprises of following parts:

- Reviews of the mitigation plan.

- Discussions with engineering staff engaged on the design phase of the project.
- Experience gained through past relevant environmental monitoring activity.

(4) 6.4 Environmental Management Plan (EMP)

Within the EMP, the Engineer's role is to monitor the activities of the contractors and to take action under the terms of the contract to prevent and minimize the environmental damage. Basically, there are three factors to be considered in order to have an organized and efficient EMP; i.e., (1) the contractors' organization, (2) the resident engineer's organization, and (3) the liaison, coordination and reporting among each sections of the project.

1) Contractors' Organization

The tender documents should require the contractor to state his/or her environmental policy clearly. The clear specification of the responsibility for the environmental protection within the contractor's organization is a critical factor for the achievement of a good environmental control. So, it is necessary to ask contractors of submission of their proposals for the environmental management. More detailed descriptions of proposal contents are attached in Appendix 5.1.

2) Resident Engineer's Organization (REO)

Following arrangement might be necessary when the staffing structure for the project is finalized. Ultimate responsibility for environmental matters within the REO will rest with the Project Manager (PM), and with the Chief Resident Engineer (CRE) being responsible for daily direction and management. It will be necessary to have an Environmental Monitor (EM) who will be able to make occasional visits to sites, and a full-time local Assistant Environmental Monitor (Assistant EM) who will be responsible for daily monitoring of projects. The Environmental Monitor (EM) should have suitable experience in the environmental management. More detailed descriptions of the responsibilities of each team members are attached in Appendix 5.1.

3) Liaison, Co-ordination and Reporting

a) Liaison with the Contractors

The Assistant EM will attend a weekly site meeting of the relevant contractors' staff and address environmental shortcomings arisen there. From the contractor's side, the attendance of the senior manager and the engineer responsible for the environmental protection would be preferable for this meeting. From the consultant's side, the EM or Assistant EM and the RE/or CRE will attend. These meetings should be minuted.

b) Liaison with Central and Local Governments

As mentioned above, the Assistant EM will prepare a short monthly report for the submission to the relevant agencies such as the MOWT, NEMA, MWT, Jinja Municipality, Njeru Town Council and/or NaFIRRI/LVFO, and will be available to attend progress meetings when required.

c) Liaison with the Local Community

Liaison with the local community will be important during the construction period in order to ensure that their views are being taken into account and those problems and nuisances such as noise and dust are reduced to the minimum. All complaints must be recorded, and also, these records should show what action was taken, and when, and what monitoring is necessary.

d) Consultant's Internal Co-ordination and Reporting

The Environmental Monitoring Team will prepare a monthly report, which should not be lengthy, but will summarize issues carried over from the previous report, stating whether

they have been resolved or are on-going, and new issues arising. This should be included in a general monthly progress report to be submitted to the MOWT. It is not envisaged that formal meetings will be required for the internal management of the environmental programme, and that ad-hoc meeting would be adequate.

4) Environmental Management and Audit Programme

The first several months of the construction phase will be important for the EMP establishment. It is anticipated that the Programme should be audited annually, but that the first audit should be carried out after six months in order to review the establishment of the management systems and procedures. The processes of environmental management should be continuously evolving and improving as the project proceeds.

10.1.7 Environmental Monitoring

(1) Objectives

The objective of the monitoring system is to assist the project management through: Descriptions of scope and the basic approach for the environmental monitoring are attached in Appendix 5.1.

- Defining requirements and procedures for the environmental monitoring (type of equipment to be used, monitoring schedule, parameters to be monitored and so on).
- Identifying targets and objectives for the project implementation.
- Keeping environmental records for the project evaluation.
- Identifying problems arising from the project, and figuring out procedures for the environmental remediation in the event of the pollution or similar incidents.
- Providing readily available results of related environmental analysis for the decision making.

(2) Environmental Monitoring

The aim of the monitoring plan is to develop a cost-effective approach to monitor the contractors' environmental performance. Certain parameters (e.g., roadside air quality, noise and vibration, surface water quality around the project area and so on) can be monitored through measurements, and others can only be monitored through the observation (e.g., vegetation clearance, roadkill, unusual death of species). Careful observations made through this monitoring work, established by a forward planning, is a key part for a successful environmental management to prevent problems (or at least to limit their effects).

Baseline data to be summarized in this project will help to define the requirements for the site restoration and provide a basis for the comparison of effects during the construction. Post project audit should be carried out to examine the success of the site restoration and evaluate the effectiveness of the mitigation measures adopted.

(3) Monitoring Requirements

The monitoring requirements of the Monitoring Programme were identified in the Mitigation Plan. The Engineer should be responsible for the monitoring the activities of the contractor, and the EM and the Assistant EM should assist the Engineer in the monitoring which requires measurements, based on responsibilities listed in previous chapter.

The monitoring activities can be divided into following two groups; (i) one which can be carried out through the measurement, and (ii) one which will be carried out through observation. Detailed descriptions of the activities to be undertaken for each of the monitoring requirements are attached in Appendix 5.1. It is strongly recommended that corresponding clauses should be developed for the inclusion in the bid documents. The monitoring requirements for the air quality, noise and vibration, groundwater level, and surface and subsurface water quality to be followed will be the responsibility of the EM.

Detailed descriptions of both implementation and operation, manpower and budget allocation for the monitoring program are attached in Appendix 5.1.

(4) Environmental Management Costs

Environmental protection costs are of two types: (i) sub-components of bridge/approach road structures (e.g., drains, vegetation, fence and other relevant facilities), and (ii) technical support and management. Generally, the cost of direct environmental protection measure such as drains and fence construction works is included within the estimation of the direct construction cost. So, here, the cost for the later item is summarized as environmental management costs, and is usually included within the administration cost.

The environmental technical support for the project consists of following five components: (1) hiring environmental personnel, (2) local consultation, (3) training and co-ordination meeting, (4) facilitation, and (5) periodical environmental survey.

From the economical points of view, it is strongly recommended to carry out periodical on-site monitoring such as roadside air quality, noise and water quality survey not by another contracted survey company but by EMs themselves. Besides, those survey instruments manufactured recently are very portable and accurate, so that the feedback of those survey results to environmental monitoring program will be quick.

Mainly, the environmental management cost to be associated with this bridge construction project consists of following two components: i.e., (1) periodical environmental monitoring activities around the study area, and (2) the conservation activities of several endemic fishes (IUCN Endangered). Periodical environmental monitoring activities cover from water quality survey of the River Nile to the roadside noise survey. The annual cost of the proposed environmental monitoring program excluding the cost of the conservation pond, described later, would be of US$ 116,200.00/year (see Appendix 5.1 for more detailed breakdown). Entire bridge construction work would take roughly 3.5 years, so it can be assumed that relevant environmental monitoring activities summarized within its environmental program will be and/or must be carried out continuously/or periodically during this period. Thus, the total cost of this environmental monitoring work would be of US$ 406,700.00.

Working process of the creation of the conservation pond consists of simple dredging and the coordination of surrounding vegetation (i.e., the conversion of the riverine shallow area into the conservation pond for several endemic fish species). Here, it is assumed that the conservation pond can be constructed within five months, provided that the detailed design of the conservation pond is finalized. In addition, relevant monitoring activities such as periodical site inspections will be required for at least five years after the conservation pond construction is completed. The construction and relevant monitoring and follow-up work would cost US$ 95,850.00 (see Appendix 5.1 for more detailed breakdown). As a total, whole environmental cost to be associated with this bridge construction project would be of US$ 502,550.00.

10.1.8 Conclusions and Recommendations

Throughout this ESIA study on the natural environment, it was found that potential impacts regarding the water quality, regional drainage, and waste treatment would be critical for the implementation of the construction of the proposed bridge. In particular, there are several water intake points (detailed descriptions about this water intake are summarized in the social environmental study section) around the project site and the biodiversity around the current riverine condition is good. So, special care shall be taken for the prevention of the water quality degradation.

Also, it was found that several important fish species with IUCN "Endangered" status occur around the project site of the River Nile, so the conservation of those species is one of important and challenging points, though the proposed project will not cause direct,

significant negative impacts on those species. Note that key components of the local fauna/flora conservation of the protection zone of the River Nile are to establish a well-coordinated link with a basin-wide Lake Victoria management program, supervised by LVFO and/or Nile Basin Initiative and to undertake education concerning biodiversity conservation for the general community.

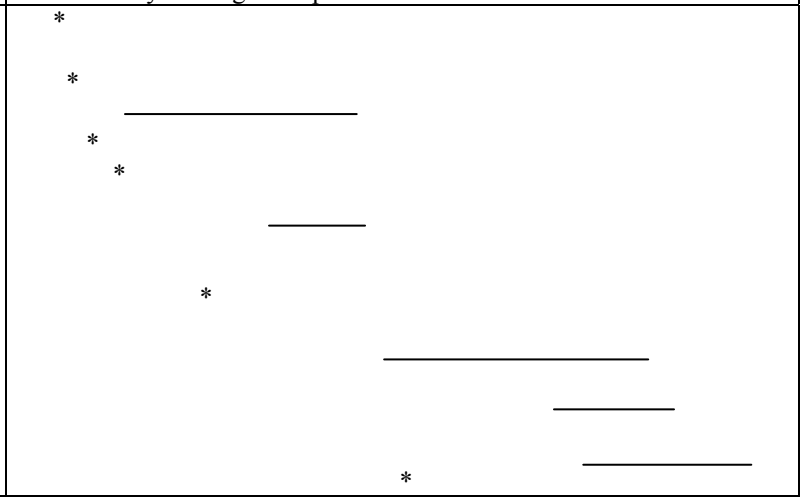
Key directions and/or principles for the development of a comprehensive EMP, which are discussed within this study, and engineering results of D/D to be held after this feasibility study should help to prepare an action plan for the implementation of EMP before the construction starts. NaFIRRI, one of key inland freshwater fishery resources institutes, has a great knowledge about the aquatic eco-system of the upper Victoria Nile. Therefore, the participation of this institute in executing the EMP can be useful for the successful implementation of EMP for the natural environment.

10.1.9 Technical Assistance to UNRA for Environmental Studies

Due to several internal contract - related matters, the transaction process of the contract between UNRA and the selected consultant (i.e., COWI) was delayed, and thus, the implementation of ESIA/RAP studies of the proposed project was also delayed (originally, it was supposed to be initiated around January 2009).

Table 10.1.19 summarizes the final timeframe of the environmental approval process. As indicated in the table, a kick-off meeting for the ESIA/RAP studies was held in Kampala on June 17, 2009, and mobilization of personnel was conducted on June 21, 2009. Site inspection, with the participation of both Jinja City and Njeru Town, was one of the key steps of the ESIA/RAP studies, held on June 26, 2009. Note that all ESIA/Rap studies were completed around the middle of August while ESIA/RAP reports (D/F) were submitted to NEMA for the license evaluations around the same time within the timeframe of ESIA/RAP studies.

Table 10.1.19 Time Frame of Environmental Approval Process for the Project (Modified, as of June 2009)

	2009 June July Aug Sep Oct Nov Dec
1. COWI's Kick-off Meeting (EIA/SEIA/RAP Study Team) 2. Mobilization 3. EIA/SEAI/RAP Study 4. Site Inspection 5. Public Consultation 6. Preparation of EIA/SEIA/RAP Report(D/F) 7. Submission of D/F Reports to NEMA 8. Evaluation of D/F Reports 9. Revision/or supplemental EIA/SEIA works, if necessary 10. Final Evaluation 11. Approval	

Note: Step 1, "Kick-off Meeting", was held on June 17, 2009, and Step 2, "Mobilization" was on June 21, 2009. Step 5, "Public Consultation", listed in the table, is one of the public involvement processes specified within Uganda's EIA Regulation e held during the EIA/SEIA/RAP studies. During the process, most PAPs (i.e., project-affected-persons) were invited.

10.1.10 Technical Assistance from JICA Study Team

(1) Introduction

As described in the Interim Report of this proposed project (JICA, 2009), several technical assistances from JICA Study Team were provided to UNRA (see Table 10.1.20). As described in the table, relevant information to be required for the EIA/SEIA/RAP studies were turned over to UNRA-selected consultant (i.e., COWI) from April to June 2009 (Items 1 – 4, mentioned in this table). Also, the technical transfer seminar on two environmental field surveys for roadside air quality, noise and CO2 emission studies were provided to UNRA to enhance their capacity for environmental monitoring, associated with the transport planning activities. Field survey outlines and results of the studies are described separately hereafter.

Table 10.1.20 List of Technical Assistances

	Items	Descriptions
1	Submission of Progress Report 1	A set of soft copies of Progress Report for the proposed study was submitted by the JICA Study Team to COWI, UNRA-selected EIA/SEIA/RAP consultants, in late April, 2009.
2	Submission of Interim Report	A set of soft copies of Interim Report of the proposed study was submitted by the JICA Study Team to COWI, UNRA-selected EIA/SEIA/RAP consultants, in early June, 2009.
3	Provision of Coordinate	Coordinate for the three alternative routes (Routes A, B and C) were provided by the JICA Study Team to UNRA and COWI on April 20, 2009.
4	Outline of implementation schedule	Briefing on construction schedule outline was provided by the JICA Study Team to COWI on 26 June, 2009.
5	Roadside Air Quality Survey	Field survey was conducted in early July 2009, and relevant equipments and directions were provided byJICA Study Team to COWI. Technical transfer for roadside noise study was completed in July of 2009.
6	Roadside Noise Survey	Field survey was conducted in early July 2009, and relevant equipments and directions were provided by JICA Study Team to COWI. Relevant technical transfer program regarding was completed in July 2009 by the JICA Study Team.
7	CO2 Emission Study	Preliminary vehicular CO2 emission study was conducted by the JICA Study Team. Relevant technical transfer program was conducted in August of 2009 by the JICA Study Team.
8	On-site instructions/coordination	Members of the JICA Study Team conducted an on-site assessment of ESIA/RAP studies periodically during the entire field work.

(2) Roadside Noise Survey

1) Outline of Field Survey

In order to assess the current roadside noise condition in selected pre-feasibility sites, 24 hour - continuous roadside noise survey was conducted by UNRA-selected Consultant with assistance from the JICA Study Team. The measurement, for noise parameter, Leq, was the primary concern of the study (see Table 10.1.19). Based on the project features, land use characteristics, regional traffic distribution pattern and others, three (locations) points were selected for the noise survey (see Table 10.1.21). Points 1 and 2 were for roadside noise survey while Point 3 was for the baseline noise condition without the effects of traffic (see Figure 10.1.4). Traffic volume count was conducted at 30 minutes and 60 minutes interval for the two roadside points (i.e., Points 1 and 2). Tables 10.1.21 and 22 summarize the outline of the noise measurement.

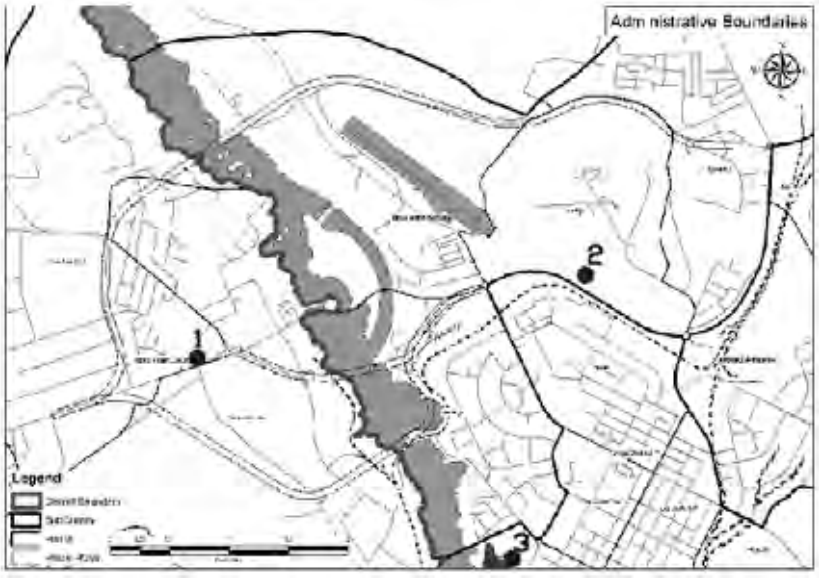
Table 10.1.21 Noise Measurement

Total number of survey points = 3. Measuring period: 1st measurement July 01 -03, 2009 2nd measurement July 09 – 10, 2009	
Parameter	Instrument
Leq	RION NL-21, Japan

Table 10.1.22 Measurement Point Location (Noise)

Point #	Location (approx)
1	Njeru, close to the beer brewery
2	Jinja, Rubaga Village
3	Jinja Town, close to the Hindi Temple, in Jinja Golf Club compound

Note: Roadside air quality measurement was carried out, in the same 3 survey points, as shown in the figure hereunder.



Note: Roadside air quality measurement was carried out, in the same 3 survey points, shown in the above figure.

Figure 10.1.4 Location of Noise and air quality Survey Points

2) Discussions

Figure 10.1.5 and 10.1.6 show the time variation for hourly-averaged Leq measurements and hourly traffic volumes at the west side of the River Nile (i.e., Point 1), respectively. From the figures, it can be seen that hourly-averaged measured Leq varies from 60 to 80 dBA. Several peaks seem to arise in the morning (6:00 a.m. - 8:00 a.m.) and in the evening (4:00 p.m. - 6:00 p.m.). During night time period, the orders in magnitude of t roadside noise level were reduced to around 60 dBA. Hourly - averaged traffic volume shows similar time pattern. Thus, it can be said that close correlation between the roadside noise and nearby traffic flow exist at Point 1. Similar tendency for the roadside noise and traffic volume were observed in Point 2, the east side of the River Nile (see Figure 10.1.7 and 10.1.8).

In Uganda, the daytime noise standard from 6:00 – 18:00 for the mixed zones and industrial zones are 55 and 70 dBA, respectively (see Table 10.1.23), and most of the Leq measured at both sides exceeded the standards frequently. Hence, it can be said that the current daytime roadside environment is not in good condition. In the same token, nocturnal noise standard from 22:00 to 6:00 for the mixed zones and industrial zones are 45 and 60 dBA, respectively. Most of the nocturnal Leq measured at both sides exceeded the standard of both zones. Therefore, it can be said that the current nocturnal roadside noise environment is any better.

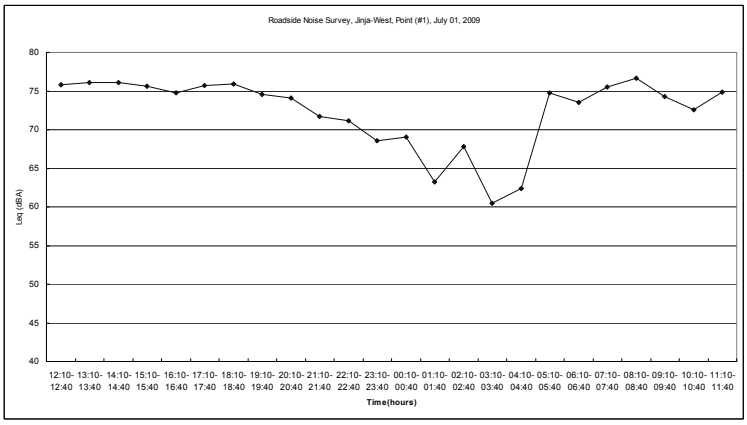
Figure 10.1.9 shows the time variation of the hourly-averaged Leq measurement for residential areas in Point 3for comparison with the two roadside measurements, mentioned earlier. As shown in the figure, most of the Leq measurements varied from 35 to 45 dBA. In Uganda, the noise standards for daytime and night time in residential areas range from 45 to 35 dBA, respectively (see Table 10.1.23). Thus, it can be said that the noise environment for Point 3 have passed the standard requirement.

Table 10.1.23 summarizes the daytime and night time - average sound levels (i.e., Ld and Ln, respectively) measured in all points. From the table, it can be seen that Ld measurements, for the two roadside points, are higher than 70 dBA. Thus, it can be said that the current roadside environment in Jinja and Njeru (i.e., Points 1 and 2) is below the standard requirement except for the residential areas in Point 3.

Table 10.1.23 Roadside Noise Survey Results

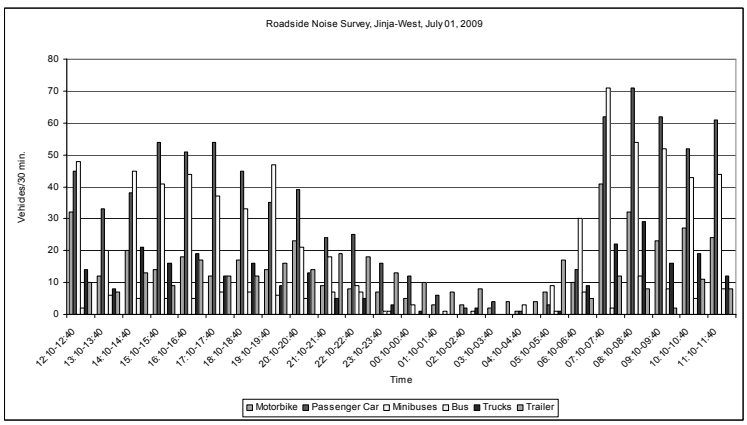
	Location	Date	Daytime Ld (dBA)	Nighttime Ln (dBA)
1	West	July/01/09	75.1	69.4
2	East	July/02/09	71.1	65.3
3	East	July/09/09	43.5	39.6
Noise Standard (Residential)			45	35
Noise Standard (Mixed)			55	45
Noise Standard (Industrial)			70	60

Note: Ld is the daytime measurement (6:00 – 22:00) – averaged Leq measurement while Ln is the night time (22:00 – 6:00 am)-averaged measurement. Noise standard measurement, listed above, based on the Law of National Environment (Noise Standard and Control) Regulations of 2003.



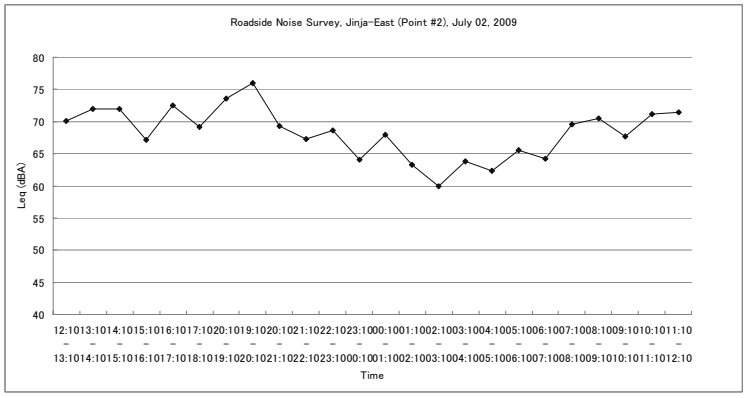
Note: Survey was conducted at Jinja-West (Point 1) on July 01, 2009.

Figure 10.1.5 Roadside Noise Survey (Leq – Time)



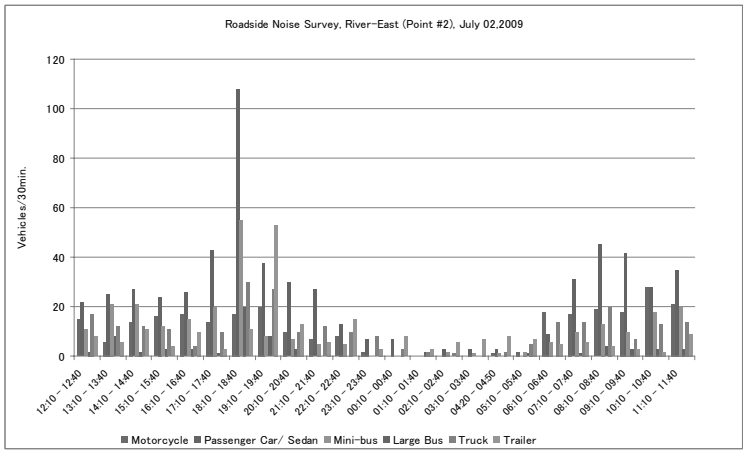
Note: Survey was conducted at Jinja-West (Point 1) on July 01, 2009.

Figure 10.1.6 Traffic Counting Results



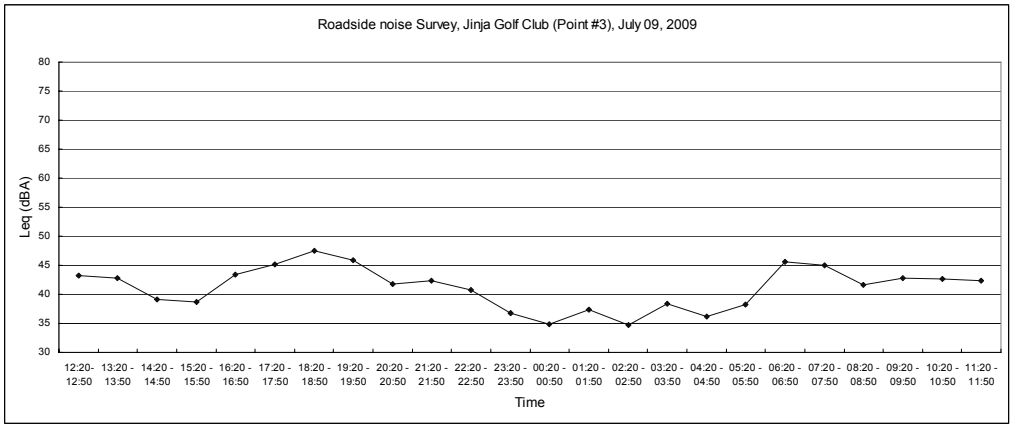
Note: Survey conducted at Jinja-East (Point 2) on July 02, 2009

Figure 10.1.7 Roadside Noise Survey (Leq – Time)



Note: 30 minutes-traffic counting for one direction (from Jinja to Tororo) was conducted at Jinja-East (Point 2) on July 02, 2009.

Figure 10.1.8 Traffic Counting Survey Results



Note: Survey conducted at Jinja Golf Club (Point 3) on July 09, 2009

Figure 10.1.9 Roadside Noise Survey (Leq – Time)

(3) Roadside Air Quality Survey

1) Outline of the Field Survey

In order to analyze the current roadside air quality conditions for the project routes, roadside air quality field measurements were carried out by UNRA-selected Consultant with supports from the JICA Study Team. The study, involved the following three pollutants, to wit: CO, NO_x and SO_2.

Based on the project features, land use characteristics, regional traffic pattern and others, two points were chosen for the roadside air quality measurements. Of the two, one point is located at the East side of River Nile while the other is at the opposite side. One additional survey point was considered for the baseline survey of air quality condition without any adverse impacts from vehicular emissions.

Basically, three-time roadside air quality surveys, based on regional traffic peaks (i.e., morning, noon and evening) were conducted. Tables 10.1.24 and 10.1.25 summarize the outline of the air quality measurements.

Table 10.1.24 Instruments Used for Air Quality Measurements

Pollutant	Instrument Used for Measurement
CO	GASTEC-100S, CO Detector Tube (1M001LCJ3), Japan
NO_x	GASTEC-100S, NOX Detector Tube (1M0011LJ1), Japan
SO_2	GASTEC-100S, SO2 Detector Tube (1M005LbJ2), Japan

Notes: Total number of sampling points = 3, Measuring period: July 2009

Table 10.1.25 Measurement Point Locations (Air Quality)

Site #	Location (approx)
1	Njeru, close to the brewery plant
2	Jinja, Rubaga Village
3	Jinja City, close to the Hindi Temple, of Jinja Golf Club Compound

Note: Roadside noise survey was carried out, using the same three as those for the survey points, of the noise survey measurements.

2) Results and Discussions

Table 10.1.26 summarizes the survey results of the field air quality study. Based on the table, it can be seen that all of survey results on CO, NO_x and SO_2 are below the minimum detection limits of each of the survey equipment. This simply means that roadside air qualities for the project route, for the three parameters, mentioned earlier, satisfied the standard requirements. This may be due to fact that the current traffic volumes in Jinja City and Njeru Town are quite few and vehicular emissions rather tend to disperse rapidly (i.e., regional air circulation is in good condition). Similar survey results were reported by current air quality study, conducted in Jinja City by the World Bank, in 2006.

Table 10.1.26 Survey Results

Sampling Session	**Morning**		**Noon**		**Evening**	
Sampling Date	July 10, 2009		July 09, 2009		July 09, 2009	
Site 1	CO	ND (<1.0 ppm)	CO	ND (<1.0 ppm)	CO	ND (<1.0 ppm)
	NO_x	ND (<0.2 ppm)	NO_x	ND (<0.2 ppm)	NO_x	ND (<0.2 ppm)
	SO_2	ND (<0.2 ppm)	SO_2	ND (<0.2 ppm)	SO_2	ND (<0.2 ppm)
Site 2	CO	ND (<1.0 ppm)	CO	ND (<1.0 ppm)	CO	ND (<1.0 ppm)
	NO_x	ND (<0.2 ppm)	NO_x	ND (<0.2 ppm)	NO_x	ND (<0.2 ppm)
	SO_2	ND (<0.2 ppm)	SO_2	ND (<0.2 ppm)	SO_2	ND (<0.2 ppm)
Site 3	CO	ND (<1.0 ppm)	CO	ND (<1.0 ppm)	CO	ND (<1.0 ppm)
	NO_x	ND (<0.2 ppm)	NO_x	ND (<0.2 ppm)	NO_x	ND (<0.2 ppm)
	SO_2	ND (<0.2 ppm)	SO_2	ND (<0.2 ppm)	SO_2	ND (<0.2 ppm)

Note: "ND" means "Not Detected".

(4) Vehicular Emission Study

1) Introduction

The purpose of this study is to evaluate the quantity of vehicular emissions to be generated by future traffic and transport facilities in the study area, based on a comparative study for two scenarios; i.e., with- and without the project for Years 2015 and 2025. Here, emission of the carbon dioxide (CO_2) is the primary concern.

2) Computation of Vehicular Emissions

The daily volume for total emission loading of pollutants, Ws, is computed by the following equation:

$$Ws = \Sigma Es \cdot CK \qquad (1)$$

Where, Es is the vehicle-type generating air pollution emission factor of targeted pollutants, and CK is the computational results (i.e., vehicle times kilometers) of e future traffic and transport demand forecast (see the future traffic and transport demand forecast study section of the main report for more detailed information). In the"Do-Nothing scenario", it was assumed that the existing bridge will be used, provided that proper maintenance work will be provided for future regional transport.

Based on differences in vehicles times kilometers values between Do-Project (i.e., Route A Option) and Do-Nothing scenarios, the order of the magnitude of the reduction in the quantity of regional CO_2 emission loading was computed.

Here, four different vehicle types such as passenger car, mini-bus, bus and truck (or trailer) were considered. No information and/or parameter of CO_2 emission factor are prepared in Uganda, yet. Thus, the vehicular emission factors developed in conjunction with the current study reports1) were used in the study. In general, the order of magnitude of CO_2 emission factor for old vehicles tends to be larger than those of the new ones. However, due to lack of appropriate vehicle registration records that would provide precise information of the vehicle age by vehicle type, only one type of emission factor was used for all the types of vehicle for purposes of the estimation. There is still no long-term vehicle maintenance/inspection programs regulating the future vehicle type and future vehicular emission targets in Uganda, thus, it was assumed that no significant change in vehicular condition will occur till 2025.

The estimation of the environmental benefit to be caused by the operation of the proposed bridge construction project was carried out based on the reduction in quantity of emitted CO_2 loading, to be caused by the change in vehicle-kilometer for regional transport facilities.

3) Results and Discussions

Based on the evaluation procedures mentioned above, the calculation of regional quantity of CO_2 vehicular emission loading to be generated by the implementation of the proposed project for Years 2015 and 2025 was carried out. Table 10.1.27 summarizes the estimated result of total reduction in CO_2 vehicular emission loading. Based on the table, it can be said that certain volume of CO_2 emission loading can be reduced by the construction of the new Nile Bridge for 2015 and 2025 by 30,115 units. It is noted that CO_2 emission loading during the construction period was not included in the preliminary estimate.

Table 10.1.27 Reduction in CO_2 Emission Loading

	Emission Loading (t/yr)	
	2015	2025
Do Nothing Scenario A Do Project Scenario B Difference: A – B	5,261 3,498 1,763 (34 % Reduction)	9,878 5,618 4,260 (43 % Reduction)
Accumulated Reduction during between 2015 - 2025	30,115 t	

1) Environmental Bureau, Tokyo Metropolitan, Study on Vehicular Emission for Future Traffic Demands for the Metropolitan Area, 2000

10.1.11 Supervising the ESIA Study

Most of the ESIA/RAP-related field studies were completed in early August 2009, and thereafter, the preparation of ESIA/RAP was initiated by COWI (UNRA-selected consultant). Firstly, the data and information (i.e., preliminary version of the D/F report to be submitted to UNRA) were summarized by COWI, and were provided to the JICA Study Team on August 7, 2009 for comprehensive review. Based on the result of the review, JICA Study Team prepared 134 comments. A first meeting between COWI and the JICA Study Team, regarding the revision of the "Working Documents" was held on August 10, 2009. All comments were explained by the JICA Study Team, and COWI agreed to proceed with the relevant revision of the works for the preparation of a complete set of D/F Reports, that was submitted to both UNRA and NEMA for the securing of license approval.

10.2 Social Environmental Study

10.2.1 General

In this chapter, a social environmental study of the project area, consisting of the Jinja City and Njeru Town Council that may be affected directly by the Project, was carried out to select the optimum alignment for crossing the River Nile. First, the socio-economic profiles of the two locations were broadly assessed using data gathered from various sources and supplemented with field survey conducted by the Study Team. Second, the features of the social aspects for the alternative alignments were outlined in terms of anticipated negative impacts such as involuntary resettlement.

For the initial environmental examination (IEE) of the three alignment alternatives, firstly the social environmental parameters were selected using scoping matrix pertinent to JICA

Guidelines. Based on the results of the scoping, the assessment revealed the project's negative impacts for each environmental parameter by the grade system: "grade A" to "D" for each alternative alignment. Then, a comparative analysis of the negative impacts provided the basis for the comprehensive evaluation of alternative alignments.

The comparative analysis results eventually contributed to the selection of the optimum alignment and bridge type as discussed in the Chapter 3 "Selection of Optimum Solution to Cross the River Nile at Jinja".

10.2.2 Socio-economic Profile of the Project Area

(1) Administrative Boundaries and Local Governance

In the project area, the River Nile forms the boundary between Jinja District on the east bank and Mukono District on the west bank. Within Jinja District, the area directly affected by the project lies in Jinja Municipality, or more precisely in the villages of Kimaka, Rubaga, Mpumude West, Kamuli and Nalufenya B. In Mukono District, the area directly affected lies in Njeru Town council, or in the villages of Lower Naava, Triangle zone, Naminya south and Bukaya west.

There are three divisions in Jinja Municipality: namely Central, Walukuba / Masese and Mpumudde / Kimaka. Each of these Divisions is headed by an LC III chairperson. At the Municipal level, the division chairperson heads a team of elected Councillors. On the technical side, the division is headed by a Senior Assistant Town Clerk with the replica of a technical team like that at the Municipal level. The divisions are expected to coordinate with the Municipality in matters of policy and programme implementation.

Overall, there are 11parishes and 53 villages distributed in the three divisions of Jinja Municipality as shown in Table 10.2.1.

Table 10.2.1 Administrative Structure of Jinja Municipality

Division (3)	Parish / Ward (11)	Villages (53)
Jinja Central	Old boma	5 = Loco, Rinya Poson, Ripon falls, Grant,Ryagwe
	Magwa	4 = Mvule, Madhvan, Gokhale, Nizam
	Jinja Central West	3 = Ripon Gardens, Gabula Road, Main St.West
	Jinja Central East	7 = Main St. East, Iganga Rd., Lubas Rd., Allidina, Oboja Rd., Spire, Kinnya Rd.
Walukuba-Masese	Walukuba East	6 = Police Wing, School, Ntege, Central, Church, Steel/UFRO
	Walukuba Wast	8 = Babu-Patel, Railway, KLMN, JROP, ZABEF, Matemity, WTCO/IDA, Works
	Masese	6 = Masese I, Masese II, MaseseIII, Kisma I, Kisma II, Rwabitooke
Mpumudde-Kimaka	Kimaka	4 = Kimaka A, Kimaka B, Muleo Quarters, Amber Court
	Mpumude	5 = Mpumude West, Market, National Housing, Commercial, Kamuli
	Rubaga	3 = Army-Police, Rubaga A, Rubaga B
	Nalufenya	2 = Nalufenya A, Nalufenya B

Source: Population Census 2002

Njeru Town Council was a unit of Jinja Municipal Council until 1969. However, it is now under the administration of Buikwe County of Mukono District. Njeru Town Council consists of four parishes which are further divided into 35 villages.

(2) Demographic Conditions

1) National Trends

The 2002 census indicated that Uganda had a total population of 24.4 million with an estimated annual growth of 3.3% per annum between 1991 and 2002. The Statistics Department projected in 2002 that the population would reach 26.7 million in 2005 (Government of Uganda, Statistical Abstract, 2002).

In 2002, approximately 49% of the population was under the age of 15. Approximately 88% of the population was living in the rural areas with 12% in towns and cities. Average population density was 124 persons per sq.km, or slightly more than one person per ha.

2) Local Trends

Demographic data at the district level was obtained from the 2002 census (GoU, 2002). The total populations of Jinja and Mukono Districts in 2002 were 387,573 and 785,393, respectively, with population in Mukono District presumably having dropped from 824,606 in the 1991 census as a result of the creation of Wakiso District. The growth rates of the population in the two districts were 2.5% and 2.6% per annum respectively between 1991 and 2002, which was below the national average of 3.3% per annum.

The population was 49% male and 51% female for Jinja District; 50% male and 50% female for Mukono District. In Mukono District 49% of the population was under the age of 15 while in Jinja District the proportion was 46%. In Mukono District 82.8% of the population lived in rural areas while in Jinja District the proportion is only 77.9% due to the presence of the Jinja urban area, Uganda's second largest urban centre.

3) Economically Active Population

According to the 2002 population census, the proportion of economically active population (defined as between 10 and 64 years old) is higher in Jinja District (53%) than in Mukono (29%), and both are lower than the national average (60.5%).

The proportion of economically active population engaged in agriculture is 43% in Jinja District compared to 53% in Mukono and 71% nationally.

(3) Education

1) Literacy

The 2002 census indicates that 73.4% of the population over 10 years of age is literate in Jinja District, while in Mukono it is 79%. In both districts, it is higher than the national average of 68%. All of these%ages are 10% to 15% higher than in the 1991 census. The proportion of the population over the age of six who have never attended school is 13.2% in Jinja District and 13% in Mukono compared to a national average of 32%. The proportion of the population between the ages of six and twelve who have attended primary school is 90.6% in Jinja District and 89% in Mukono compared to a national average of 83%. In conclusion, standards of education in the Project area are generally higher than at the national level, particularly in Jinja District.

2) Education Facilities

In Jinja Municipality, there are 24 nursery schools, 30 primary schools, 11 secondary schools, and 6 tertiary institutions managed by both government and private sector (refer to Table 10.2.2).

Table 10.2.2 Type and Number of Education Institution in Jinja Municipality

Level of Institutions/Schools	Management		Total
	Government	Private	
Nursery School	0	24	24
Primary School	25	5	30
Secondary School	3	8	11
Tertiary Institution	6	0	6
Total	34	37	71

Source: Jinja Municipality Structure Plan 2008-2018(Nov.2008)

In Njeru Town, there are 30 nursery schools, 37 primary schools and 14 post primary schools managed by both government and private sector (refer to Table 10.2.3).

Table 10.2.3 Type and Number of Education Institutions in the Njeru Town Council

Level of Institutions/Schools	Management		Total
	Government	Private	
Nursery School	5	25	30
Primary School	14	23	37
Post Primary School	1	13	14
Total	20	61	81

Source: Njeru Structure Plan 2008-2018(Nov.2008)

(4) Public Health

1) National and Local Health Indicator Statistics

Table 10.2.4 gives the basic health statistics for Jinja and Mukono Districts in comparison to Uganda national figures. Jinja District ranks better than Mukono District in all categories of health except for the number of hospitals/capita. Both districts rank higher than the national averagein all categories of health except for Mukono District's percentage of the population situated within a 5 km radius of a health facility (44.3% in Mukono District versus 49.0% nationally and 94.1% in Jinja District).

Table 10.2.4 Health Profile for Jinja District, Mukono District and Uganda, (2002)

Health Category	Jinja District	Mukono District	Uganda
Fertility and mortality rates			
Total Fertility rate	6.2	7	6.9
Infant Mortality Rate/1000	77	80	83
Child Mortality Rate /1000	115	152	n/a
Health facilities and inpatients Beds			
Hospitals	3	4	104
Health Units	65	47	2971
Total Beds	859	950	25,628
Population within 5 km radius of health facility (%)	94.1	44.3	49.0
Deployment of Trained Health personnel	712	681	16,866

Source: Statistics Abstract, 2002, Republic of Uganda & District Planning Offices (Jinja and Mukono)

2) National Morbidity Patterns

Table 10.2.5 shows the proportion of deaths for the top ten outpatient diagnoses for 1997-2001 for all ages from 22 reporting districts in Uganda.

Table 10.2.5 Proportional Morbidity for the Ten Major Causes of Illness (%)

Diagnosis	1997	1998	1999	2000	2001
Malaria	28.5	32.2	31.6	33.9	39.1
ARI-Not Pneumonia	14.1	13.8	13.4	13	16.3
Intestinal Worms	9	8.4	8.5	8	8.1
Diarrhoea	7.1	6.3	6.4	6.5	4.9
Trauma (Injuries and Wounds)	6.6	6.5	5.8	5.6	4.8
ARI- Pneumonia	8.1	6.4	6.1	5.6	3
Skin Diseases	4.7	4	3.9	3.5	3
Eye Diseases	3.8	2.7	2.7	2.5	1.9
Anaemia	2.1	2.3	2.4	2.2	2
Ear Diseases	1.5	1.5	1.6	1.5	1
Other	14.5	15.9	17.6	17.8	15.9
Total	100	100	100	100	100

Source: Resource Centre Ministry of Health Kampala

3) Morbidity Pattern in the Project Area

Morbidity data for 2005-2006 were obtained from recorded outpatient diagnoses in the health institutions located in the two districts. Disease incidence patterns were similar at all health facilities. The Out-Patient Department (OPD) statistics for most frequent diagnoses in Jinja and Mukono Districts are presented in Table 10.2.6 and Table 10.2.7respectively. Malaria is the most common diagnosed disease in all categories of outpatients, followed by acute respiratory infections (excluding pneumonia), intestinal worms, and diarrhea.

Table 10.2.6 Outpatients Diagnoses for Jinja District 2005-2006

Diagnoses	Under five years old		Five years and above		Total
	Number	% of all	Number	% of all	Number
Malaria	120,960	44.1	153,390	55.9	274,350
ARI-Not Pneumonia	44,106	42.5	59,758	57.5	103,864
Diarrhoea	22,172	59.5	15,106	40.5	37,278
Intestinal Worms	19,138	13.0	128,218	87.0	147,356
ARI- Pneumonia	17,436	65.4	9,226	34.6	26,662
Skin Diseases	11,719	41.1	16,814	58.9	28,533
Anaemia	11,142	47.8	12,185	52.2	23,327
Eye Diseases	5,606	24.3	17,466	75.7	23,072
Trauma (Injuries and Wounds)	4,899	44.5	6,102	55.5	11,001
Ear Diseases	4,787	34.9	8,925	65.1	13,712

Source: Directorate of Health Jinja District

Table 10.2.7 Outpatients Diagnoses for Mukono District July 2005 – June 2006

Diagnoses	Under five years old		Five years and above		All ages
	Number	% of all	Number	% of all	Number
Malaria	90,831	38.7	143,957	61.3	234,788
ARI-Not Pneumonia	29,376	39.2	45,575	60.8	74,951
Diarrhoea	1,685	50.6	1,645	49.4	3,330
Intestinal Worms	13,510	33.6	13,172	66.4	40,245
ARI- Pneumonia	14,860	40.4	21,973	59.6	36,819
Skin Diseases	7,083	35.0	13,172	65.0	20,255
Anaemia	2,808	34.4	4,357	65.6	8,165
Eye Diseases	2,970	25.6	8,647	74.4	11,617
Trauma (Injuries and Wounds)	2,842	25.2	8,449	74.8	11,291
Schistosomiasis	6	2.1	284	97.9	290

Source: Directorate of Health Mukono District

(5) Land Use in the Study Area

1) Land Use in Jinja Municipality

a) Commercial Area

Central business district is located at the centre of the city and is serving the neighbouring region as a growth centre. Another business district is the area around Nalufenya Roundabout comprising fuel stations and small retail shops including restaurants.

b) Industrial Area

Reflecting on the development process of the city, the industrial area is divided into four main places: former copper smelter area, steel corporation area, conventional factory area in the centre of the city, near Lake Victoria area along the railway and steel rolling mill area along the primary road connecting to Tororo.

c) Residential Areas

The residential areas is arranged in several places also reflecting the past development process of the city. Nalufenya is known as a high class residence, where European and Indian people have been residing from the beginning of the city development. High density residential area neighbouring to the CBD is serving labourers, who have been working in factories, due to convenience for commuting. Other residential areas are located near the manufacturing industries and along the primary and secondary roads in the city.

d) Resort and Recreation Area

One is located along the River Nile including the golf course near the estuary and another in the north west of the city along the River Nile as well. Many hotels and guest houses are located in the resort and recreation area to serve tourists. Rafting and canoeing are types of unique tourism characteristics that take advantage of the many waterfalls. Nile Resort Hotel located near the airfield is one of the bases for these activities.

The area along Lake Victoria near the estuary of the River Nile is also serving water-related resort and recreation activities.

2) Land Use in Njeru Town Council

a) Overview

The land use pattern of Njeru Town is something different from that of Jinja. Spontaneous development such as commercial and residential area along the primary roads characterizes the land use in Njeru Town while artificial area-development is realized in Jinja Municipality. Two main land use developments are observed along Mbikko – Jinja Road connecting to Kampala and Bukaya – Nyenza Road. Other areas, both large scale and small scale ones, are mainly serving agricultural activities.

b) Commercial Area

There are three commercial areas. One is located in Namyawa and its neighbouring area, which forms the central commercial area along the Mbikko – Jinja Road in Njeru Town. The other two are located in the south-west in the town along Bukaya – Nyenga Road.

c) Industrial Area

Only one industrial area is observed and located at Bukaya Ward along the River Nile comprising textile, brewery, carton box factories and others. Some are making use of the water from the River Nile.

d) Residential Area

Most residential areas are located along primary and secondary roads. High density residential area is developed adjacent to the primary roads, and middle and low density residential areas lie behind the high density ones.

e) Resort and Recreation Area

Two resort and recreation areas are observed: one is near the estuary of the River Nile and another is located on the opposite side of Nile Resort Hotel in Jinja.

(6) Economic Activities

1) Agriculture

Agriculture is practiced as a labour intensive, intercropping system with both cash crops and subsistence crops in the project area. The main cash crops are coffee and some sugar cane and there has recently been extensive planting of vanilla. The main subsistence food crops grown are bananas, cassava, sweet potatoes, maize, beans, groundnuts, cocoyam, millet, sorghum, peas, simsim, and yams. A range of vegetable crops is grown throughout the year including tomatoes, onions, cabbages, pepper, eggplants and carrots.

2) Fisheries

Fisheries are very important in Uganda's national economy and are based on the extensive and varied aquatic system that covers about 20% of the country's surface area. This system comprises five major lakes (Victoria, Albert, Kyoga, Edward and George) and 160 small lakes in addition to rivers and swamps. Fish is still the cheapest source of high quality animal protein in Uganda and provides over 50% of animal protein consumption. Fish is a major source of income especially for the rural poor, and this industry contributes greatly to poverty eradication. Fish is an important export commodity; it is estimated that in 1996 USD 45 million were earned from fish exports, putting it next to coffee in export earnings (GoU statistics, 1998).

(7) Tourism

There is a starting point for white water rafting(WWR) at around Bujagali Falls located at approximately 8.5 km downstream of the “source of the Nile” (i.e. where Lake Victoria empties into the Victoria Nile). Due to the history and scenic topography of the area, it is attractive to tourists, especially to white water rafters who come to take advantage of the sequence of rapids on the upper reaches of the Victoria Nile.

Note that the Project will not affect the white water rafting activities since it is located at about 5 km upstream from the starting point.

Table 10.2.8 below provides the summary data on the four WWR companies that currently have operations on the Upper Victoria Nile.

Table 10.2.8 Summary Operational Characteristics of the Rafting Companies

Company	Company Started	Most Popular Rating Trip	Rafting Trip Fee(USD)	Number of Staff	Rafter Nos. in 2005(estimate)
Adrift	Mid 1996	1 day trip	95	40F/T	4,000
NRE	Early 1997	1 day trip	95	50F/T	5,000
Equator	Early 2001	1 day trip	95	35F/T	600-700
Nalubaare	Mid 2005	1 day trip	95	8F/T	200-300(6months)

Source: Interviews with Rafting Companies and Mrs Sarah Muwanguzi (Itanda LC1 Representative)

10.2.3 Characteristics of the Social Aspects for the Alternative Alignments

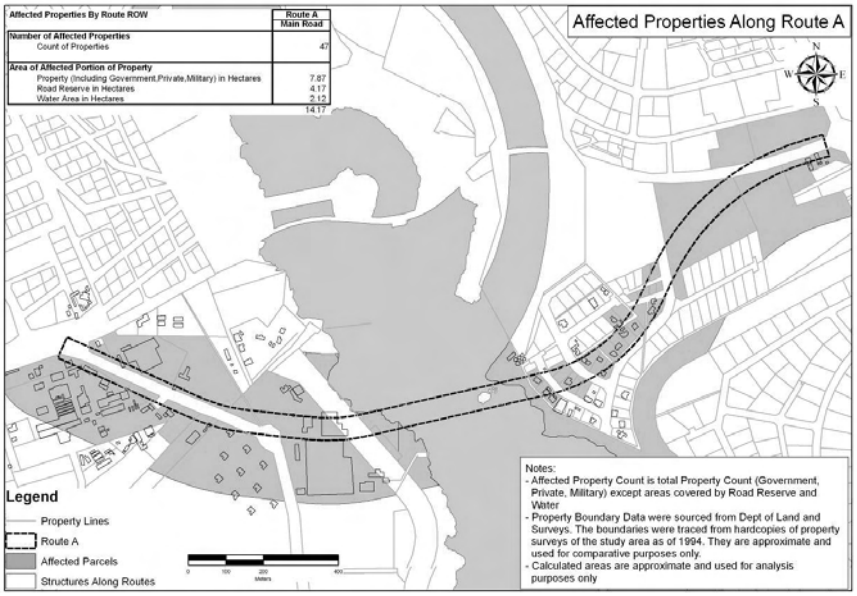
(1) Characteristics of Social Aspects for Alignment A

Bridge alignment A is located at approximately 500 m upstream of Nalubaale Dam. At the western terminal the alignment bears to the right and passes the north of the areas of Nile brewery parallel to the Kampala-Jinja road. Then it passes through the area of Nytil Textile Factory complex before crossing over the river. The part of the canteen for the Nile brewery and a warehouse and administration building of the Nytil Textile Factory will be affected by the alignment. After passing the river, the alignment bears to the north-east avoiding Nile recreational centre and then connects to the Nalufenya roundabout.

There are no substantially sensitive or large scale private or public facilities along the route except for some minor facilities, such that the alignments were designed to make shorter stretch and smooth approach from the terminal point to the bridge.

A field survey on the affected buildings was conducted in March 23, 2009. The characteristics such as building category, size, and number of story, existing/under construction, wall materials and conditions of the affected properties were investigated. The survey revealed that the required numbers of resettlement by the route are 26 units consisting of 16 residential, 2 commercial and 8 industrial (for details refer to Appendix 6).

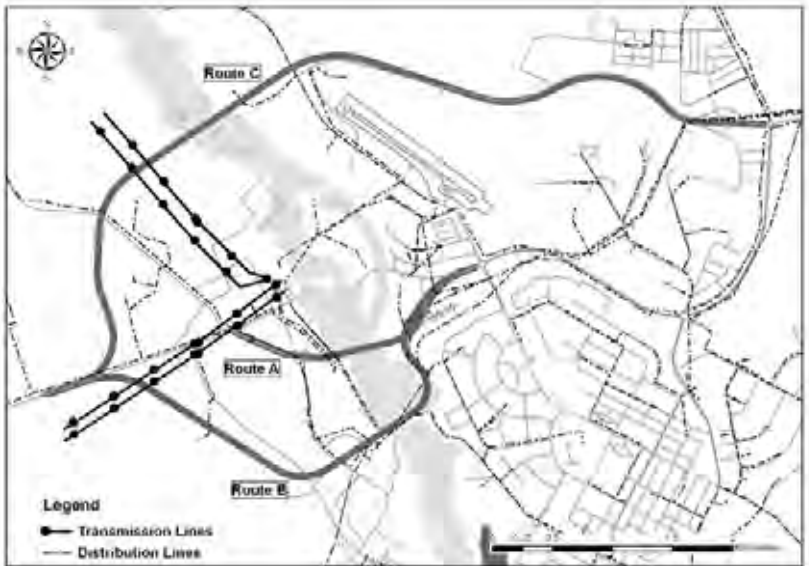
The number of affected parcels is 47 as shown in Figure 10.2.1.



Source: JICA Study Team

Figure 10.2.1 Affected Parcel for Alignment A

Transmission line (1) at Njeru, distribution lines (10: Jinja<3>and Njeru<7>) will be crossed by the ROW. (refer to Figure 10.2.2) Water intakes for the textile factory at the upstream and the Brewery plant at the downstream respectively will have to be relocated. (refer to Figure 10.2.3)



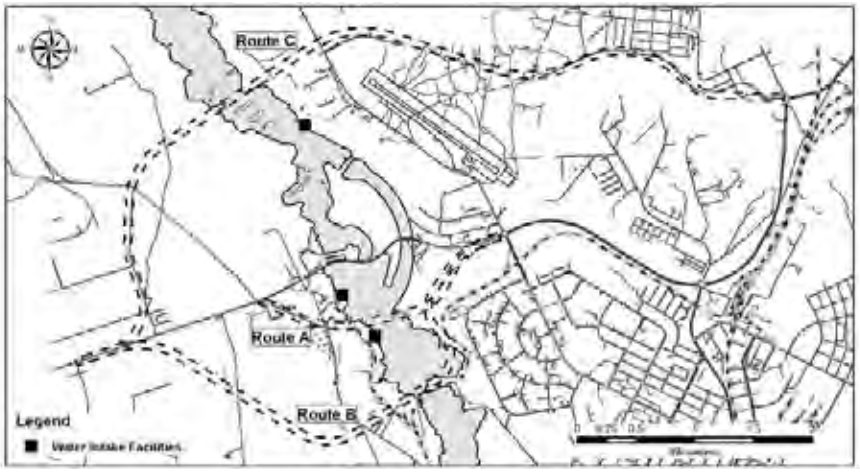
Source: JICA Study Team

Figure 10.2.2 Location Map of the Transmission lines in the Project Area

Table 10.2.9 Affected Transmission/Distribution lines

Alignment / Voltage	Alignment A		Alignment B		Alignment C	
	Jinja	Njeru	Jinja	Njeru	Jinja	Njeru
Transmission Line (by UETCL)						
132kv	-	1	-	1	-	2
66kv	-	1	-	1	-	-
Distribution Line (by UEDCL)						
33kv	1	4	2	4	1	1
11kv	2	2	3	4	3	1
Total	3	8	5	10	4	4
	11		**15**		**8**	

Source: JICA Study Team



Source: JICA Study Team

Figure 10.2.3 Location Map of Water Intakes in the Project Area

Table 10.2.10 Water Intake Facilities Existed Along River Nile

Owned by	Daily Consumption	Pump equipment size	Pump equipment unit	Transmission Pipe size	Transmission Pipe length	Remarks
(1) Nile Breweries	3,900m3/d	300mm x 2 units 150mm x 1 unit		150mm x 1 x 1,200 m (PVC)		-Njeru side -to be Affected b Route-A
(2) Nytil Picfare	800m3/d	250mm x 3 units 150mm x 1 unit		250mm x 3 x 300 m 150mm x 1 x 300 m (Steel)		-Njeru side
(3) Paper & Pulp (Papco)	(unidentified)	100mm x 2 units		150mm x 1 x 400 m (PVC)		-Jinja side

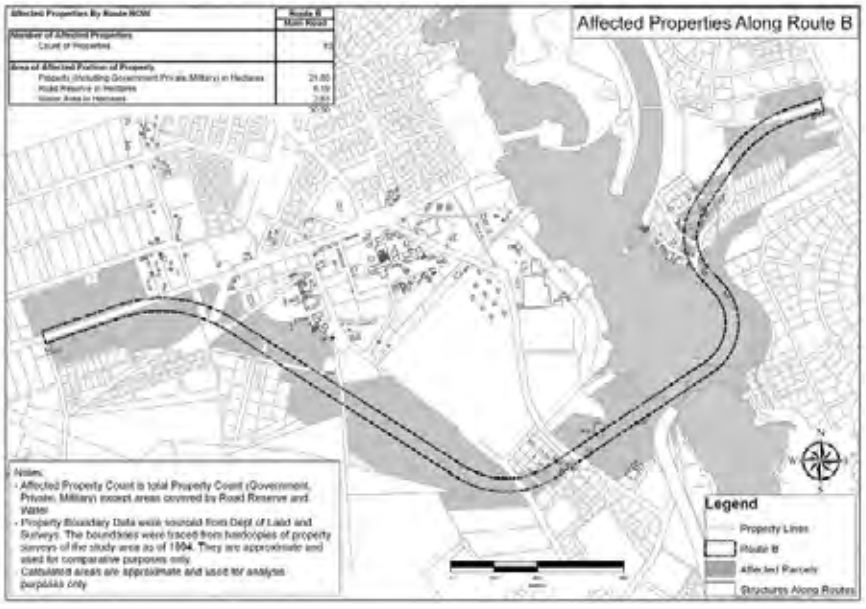
Source: JICA Study Team

(2) Characteristics of Social Aspects for Alignment B

Bridge alignment B is located at approximately 1,200 m upstream of Nalubaale Dam, very close to the Nile Bridge. The alignment runs through a swamp area where few facilities including a sub-station exist at the left river bank. After passing the river, the alignment bears to the north-east avoiding Nile recreational centre and then connects to the Nalufenya roundabout.

The required numbers of resettlement are surveyed as 30 houses consisting of 22 residential, 2 commercial, 4industrial and 2 others. (for details refer to Appendix 6).

The number of the affected parcels is 83 as shown in the Figure 10.2.4.



Source: JICA Study Team

Figure 10.2.4 Affected Parcel for Alignment B

Transmission line (1) in Njeru, with distribution lines (11:Jinja<6>and Njeru<5>) will be crossed by the ROW. (Refer to Figure 10.2.2.) Although there is a water intake for the Brewery factory, it is located far from the crossing point (about 1km downstream). (Refer to Figure 10.2.3)

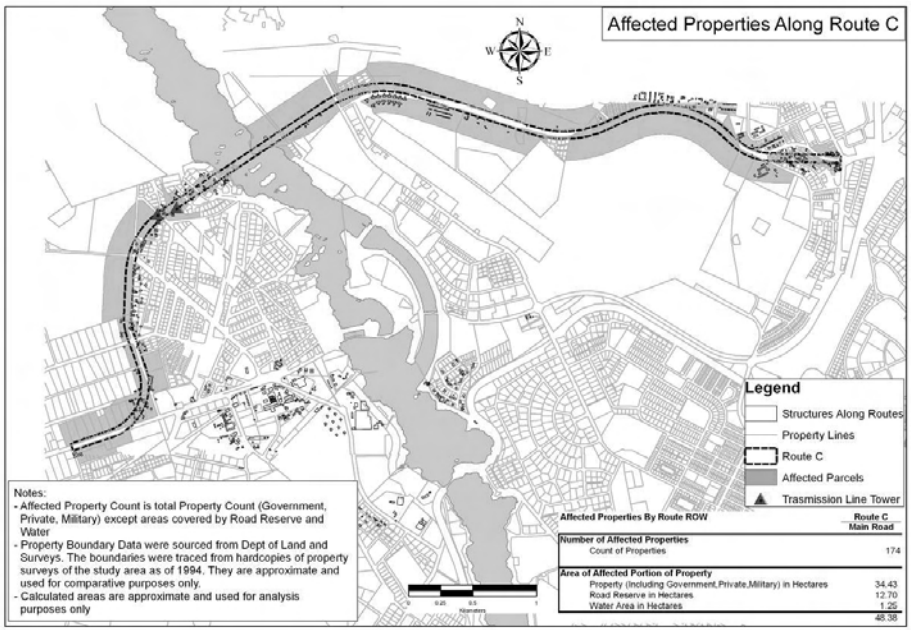
(3) Characteristics of the Social Aspects of the Alignment C

Bridge Alignment C is located at approximately 1800 m downstream of Nalubaale Dam with river width of 450 m. The alignment alternatives are set at the northern part of the study area which forms like the bypass of the existing national road. The route contains several control points from the western to the eastern terminal such as the developing residential area in Njeru, Retreat Centre (Muto Muyoni), Nile Resort Hotel, Jinja Airfield, Military Academy, Developing residential area in Jinja.

The alignment requires the removal of a part of Nile Resort Hotel in the right bank as well as the complete violation of the resort facilities in the left bank

The required numbers of resettlement by the alternative is 81 units consisting of 79 residential houses and 2 utilities (tower sites) (for details refer to Appendix 6).

The number of affected parcels is 174 as shown in Figure 10.2.5.



Source: JICA Study Team

Figure 10.2.5 Affected Parcel for Alignment C

Transmission line (3) at Njeru, with distribution lines (4: Jinja<2>and Njeru<2>) will be crossed by the ROW. (Refer to Figure 10.2.2) Although there is a water intake facility for the PAPCO (pulp factory) of the Jinja side, it is located upstream of the crossing point. (Refer to Figure 10.2.3)

10.2.4 Initial Environmental Examination (IEE)

(1) Scoping of Social Environmental Parameters

After taking into account the scoping checklist contained in the JICA Environmental and Social Considerations, as well as other potential factors that could have impacts on a bridge/road sector project, a list of social environmental parameters that could impact on the Project was prepared:

i. Involuntary Resettlement
ii. Local economy such as employment and livelihood, etc

iii. Land use and Utilization of local Resources
iv. Social institutions such as social infrastructure and local decision-making institutions
v. Existing social infrastructures and services
vi. The poor, indigenous and ethnic people
vii. Misdistribution of benefit and damage
viii. Cultural Heritage
ix. Local Conflict of interests
x. Water Usage or Water Rights and Rights of Common
xi. Sanitation
xii. Hazards (Risk), Infectious diseases such as HIV/AIDS

Considering the current status of the environment of the Project area and the Project's activities, an examination of whether or not the factors likely to cause negative impacts in the pre-construction, construction and post- construction periods exist was carried out in the matrices shown below for alignments A, B and C (see Table 10.2.11 -13), which is further broken down into the Njeru side and Jinja side of the routes.

Table 10.2.11 Scoping Matrix for "Alignment A"

Project Phase / Environmental Parameters	Pre-Construction Period		Construction Period		Post Construction Period	
	Njeru Side	Jinja Side	Njeru Side	Jinja Side	Njeru Side	Jinja Side
Involuntary Resettlement	○	○	-	-	-	-
Local economy such as employment and livelihood, etc.	-	-	○	○	○	○
Land use and Utilization of local Resources	-	-	○	○	○	○
Social institutions such as social infrastructure and local decision-making institutions	-	-	-	-	-	-
Existing social infrastructures and services	-	-	○	○	-	-
The poor, indigenous and ethnic people	-	-	-	-	-	-
Misdistribution of benefit and damage	-	-	-	-	-	-
Cultural Heritage	-	-	-	-	-	-
Local Conflict of interests	-	-	-	-	-	-
Water Usage or Water Rights and Rights of Common	-	-	○	○	-	-
Sanitation	-	-	-	-	-	-
Hazards (Risk), Infectious diseases such as HIV/AIDS	-	-	○	○	-	-

Note ○ : Impact exists
- : No or negligible impact

Table 10.2.12 Scoping Matrix for "Alignment B"

Project Phase / Environmental Parameters	Pre-Construction Period		Construction Period		Post Construction Period	
	Njeru Side	Jinja Side	Njeru Side	Jinja Side	Njeru Side	Jinja Side
Involuntary Resettlement	○	○	-	-	-	-
Local economy such as employment and livelihood, etc.	-	-	○	○	○	○
Land use and Utilization of local Resources	-	-	○	○	○	○
Social institutions such as social infrastructure and local decision-making institutions	-	-	-	-	-	-
Existing social infrastructures and services	-	-	○	○	-	-
The poor, indigenous and ethnic people	-	-	-	-	-	-
Misdistribution of benefit and damage	-	-	-	-	-	-
Cultural Heritage	-	-	-	-	-	-
Local Conflict of interests	-	-	-	-	-	-
Water Usage or Water Rights and Rights of Common	-	-	○	○	-	-
Sanitation	-	-	-	-	-	-
Hazards (Risk), Infectious diseases such as HIV/AIDS	-	-	○	○	-	-

Note ○ : Impact exists
- : No or negligible impact

Table 10.2.13 Scoping Matrix for "Alignment C"

Project Phase / Environmental Parameters	Pre-Construction Period		Construction Period		Post Construction Period	
	Njeru Side	Jinja Side	Njeru Side	Jinja Side	Njeru Side	Jinja Side
Involuntary Resettlement	○	○	-	-	-	-
Local economy such as employment and livelihood, etc.	-	-	○	○	○	○
Land use and Utilization of local Resources	-	-	○	○	○	○
Social institutions such as social infrastructure and local decision-making institutions	-	-	-	-	-	-
Existing social infrastructures and services	-	-	○	○	-	-
The poor, indigenous and ethnic people	-	-	-	-	-	-
Misdistribution of benefit and damage	-	-	-	-	-	-
Cultural Heritage	-	-	-	-	-	-
Local Conflict of interests	-	-	-	-	-	-
Water Usage or Water Rights and Rights of Common	-	-	○	○	-	-
Sanitation	-	-	-	-	-	-
Hazards (Risk), Infectious diseases such as HIV/AIDS	-	-	○	○	-	-

Note ○ : Impact exists
- : No or negligible impact

Based on the results of the above scoping, the following six social environmental parameters were considered likely to cause negative impacts on the Project.

- Involuntary Resettlement
- Local economy such as employment and livelihood, etc
- Land use and Utilization of local Resources
- Existing social infrastructures and services
- Water Usage or Water Rights and Rights of Common
- Hazards (Risk), Infectious diseases such as HIV/AIDS

(2) Assessment of Project's Negative Impacts for Alignments A, B & C

1) Assessment of Negative Impacts

In order to assess the negative impacts by selected factors based on the scoping, the magnitudes of the respective impact that will occur as a result of the Project implementation were evaluated. The magnitudes for each negative impact are classified below.

A: Serious impact is expected

B: Some impact is expected

C: Expected impact is unknown

D: Negligible impact is expected

The results of the evaluation for alignments A, B and C for each environmental parameter are shown in Tables 10.2.14 to 10.2.16. The summary of the evaluation is shown in Table 10.2.17.

Table 10.2.14 Evaluation Matrix for "Alignment A"

Environmental Parameters	Evaluation	Description
Involuntary Resettlement	B	Number of affected buildings are 26 including those under construction
Local economy such as employment and livelihood, etc.	B	Some buildings of the textile factory are affected
Land use and Utilization of local Resources	D	Length of the approach road is short.
Existing social infrastructures and services	D	Only distribution lines (9: Jinja<3>and Njeru<6>) will be crossed by the ROW.
Water Usage or Water Rights and Rights of Common	B	Although the water intakes for the textile factory at the upstream and Brewery plant at the downstream respectively exist, the impact on water quality could be mitigated.
Hazards (Risk), Infectious diseases such as HIV/AIDS	B	Labour migration to the Project area might cause hazards and infectious diseases during the construction period

Table 10.2.15 Evaluation Matrix for "Alignment B

Environmental Parameters	Evaluation	Description
Involuntary Resettlement	B	Number of affected buildings are 30 including those under construction
Local economy such as employment and livelihood, etc.	D	Impacts on industrial/commercial facility are relatively low.
Land use and Utilization of local Resources	D	Length of the approach road is relatively short.
Existing social infrastructures and services	B	Transmission line (2)at Njeru ,distribution lines(13:Jinja<5>and Njeru<8>) will be crossed by the ROW.
Water Usage or Water Rights and Rights of Common	D	Although there is water intake for the Brewery factory, it is located far from the crossing point (about 1km downstream).
Hazards (Risk), Infectious diseases such as HIV/AIDS	B	Labour migration to the Project area might cause hazards and infectious diseases during construction period

Table 10.2.16 Evaluation Matrix for "Alignment C"

Environmental Parameters	Evaluation	Description
Involuntary Resettlement	B	Number of affected buildings are 81 including those under construction
Local economy such as employment and livelihood, etc.	B	Private resort facilities in the Njeru side will be completely affected.
Land use and Utilization of local Resources	B	Length of the approach road is longest among the alternatives
Existing social infrastructures and services	B	Transmission lines (2)at Njeru ,distribution lines(6:Jinja<4>and Njeru<2>) will be crossed by the ROW.
Water Usage or Water Rights and Rights of Common	D	Although there is water intake for the PAPCO (pulp factory) at the Jinja side, it is located at upstream of the crossing point.
Hazards (Risk), Infectious diseases such as HIV/AIDS	B	Labour migration to the Project area might cause hazards and infectious diseases during construction period

Table 10.2.17 Summary of the Evaluation

Evaluation \ Alignment	Alignment A	Alignment B	Alignment C
A	0	0	0
B	4	3	5
D	2	3	1

Remarks: Evaluation "C" was not identified.

2) Comparative Analysis of the Negative Impacts for each Environmental Parameter

a) Involuntary Resettlement

Alignment C has the highest number of affected buildings while Alignment A has the lowest number. However, the affected numbers in those Alignments are not significant. Therefore, the negative impact of involuntary resettlement of the two Alignments are similarly evaluated as "B"

b) Impact on the Local Economy

Alignment C will affect a part of the "Jinja Nile Resort" and most of the land and two buildings of "MTO MOYONI" which is a huge retreat centre managed by a local NGO registered with the Ugandan NGO Board.

A part of the store of the refuelling institution of the service station will have to be relocated at the starting point of the Jinja side for both Alignments A and B. This is considered to cause an adverse impact to the local economy to a certain extent.

Alignment A will require the relocation of the administrative building and warehouse belonging to NYTIL (textile factory) and a part of the canteen of the Nile Breweries (beer factory) at the Njeru side. Although Alignment B will affect a part of the facility of Umeme Co. Ltd. (power company) and Vita Foam Ltd (mattress factory) , the negative impact will be lower than the one for Alignment A. Therefore the negative impact on the local economy of Alignment A and C were given a score of "B" followed by Alignment B.

c) Impact on Land Use

The longer distance of the approach road has a direct relation with the area of land acquisition. In this respect, Alignments A and B with relatively shorter approach road will have smaller impact. On the other hand, Alignment C with the longest approach road will have greater impact. Therefore the magnitude of negative impact on land use is Alignment C and as such was given a score of "B" followed by Alignments B and Alignment A.

d) Impact on Existing Social Infrastructures and Services

Alignment B, C will cross over the power transmission lines and distribution lines with Alignment A crossing only some distribution lines. Therefore, based on the impact for existing social infrastructures, Alignment B and C were evaluated with a score of "B" followed by Alignment A.

e) Impact on Water Usage

Although the water intake of the beer plant and the textile factory located approximately 240m downstream and approximately 100m upstream at the Njeru side from Alignment A, the negative impact on water quality could be mitigated by appropriate countermeasures.
Although the water intake for the textile factory is located at approximately 600m from

Alignment B, the negative impact will be negligible because it is located far downstream of the Route.

The water intake of the pulp factory is located at approximately 500m from Alignment C at the Jinja side. No impact is anticipated since it is located at the far upstream from the Alignment. As for the impact on water usage, Alignment A is considered to have certain impact followed by Alignment B and Alignment C.

f) Impact on Hazards (Risk), for Infectious Diseases

Labour migration to the Project area during the construction period might cause hazards brought about by the spread of infectious diseases. The migration of laborers for the construction activities generally would cause negative impact, but mitigation measures could be applied. Consequently, Alignment A, B and C were similarly evaluated as "B" in terms of impacts.

3) Overall Evaluation

Involuntary resettlement is usually considered as one of the major negative impact among the social environmental considerations for the development of a project. Alignment A is considered to have some advantage in involuntary resettlement.

However, the above comparative analysis on several issues related to social environmental aspects revealed that Alignment B seems to be the most preferable followed by Alignment A and Alignment C even if the difference in evaluation among the alternatives is not large.

10.2.5 Draft ESIA Results on Social Environment by UNRA's Consultant

(1) General

The Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) for the Project were undertaken by UNRA based on the contract with COWI Uganda Ltd. The ESIA assessed the environmental impacts due to the construction of the Bridge and approach road in accordance with existing environmental and social requirements of Uganda such as the EIA guidelines of 1997 as well as the EIA regulations of 1998 among other requirements. Attention was equally paid to the development partners' including social safeguard policies on Involuntary Resettlement among others. Specific attention was also paid to the Guideline s for Environmental and Social Considerations of JICA.

The ESIA/RAP Study Team was mobilised on June 21, 2009 and the draft ESIA report was provided to the JICA Study Team on 7 August. (The RAP is currently being prepared simultaneously for submission.)

The report will be submitted to NEMA soon for obtaining the environmental approval. The draft ESIA report was reviewed from the viewpoint of social environmental consideration for the project.

(2) Identified Negative Impacts and Proposed Mitigation Measures

In the study process several negative impacts were anticipated for the project implementation. The negative impacts identified and proposed mitigation measures are summarised in Table10.2.18.

Table 10.2.18 Summary of the Negative Impacts and Mitigation Measures

Negative Impact	Description	Mitigation Measure
Land acquisition	Total of 72,000m^2 of land acquisition for the ROW of the approach road will be needed.	• Conducting adequate RAP study for fair and appropriate compensation • Design considering the need to reduce the ROW
Involuntary Resettlement	The actual number of buildings that require resettlement is 26 consisting of 16 houses (either partially or completely built), 2 commercial and 8 industrial buildings.	• Adequate, fair and prompt compensation under the RAP • Consideration on issues of restoring peoples' livelihoods following from the completion of project activities • Establishment of mechanism for resettlement of some of the PAPs based on their demand
HIV/AIDS Concern	Influx of labours from the outside might cause the spread of Sexually Transmitted Diseases (STDs) and HIV/AIDS.	• Preparation of comprehensive HIV/AIDS mitigation programme for the workers
Social conflict and Crime Issues	The increased influx of workers is likely to lead to conflict over housing, water resources and related social services.	• Encouraging the recruiting of local labour force from within the immediate communities
Occupational Safety and Health(OSH) for the Workers	There will be a number of health and safety concerns relating to site preparation and construction.	• Preparation by the contractor of OSH plan based on OSH Statute of 2006
Public Health and Human Safety	The project could easily introduce certain hazardous materials not envisaged in the SEIA study during the implementation.	• Preparation of comprehensive plan for the management of potential hazardous materials based on the endorsement of the Ministry of Health and the Uganda National Bureau of Standards(UNBS)
Risk due to Project related Traffic	There will be some disruption to local traffic movement during construction of the planned approach roads	• Preparation of traffic management plan in close liaison with traffic police
Loss of access route to properties	The construction of approach road will cut off some of the roads in the eastern section of the Jinja side .	• Provision of alternative road for the residents

Source: JICA Study Team compiled from the Draft ESIA report

(3) Public Consultation and Information Disclosure

The Uganda National EIA Guidelines of 1997 stress the need for the ESIA process to provide full opportunity for public involvement and participation in the planning development. The ESIA process should provide an opportunity for the stakeholders to express their concerns on to the planned development. The process is to further provide the public an opportunity provide their in-put to the design and the implementation of the project. In this ESIA, inhabitants including individuals, or groups of local communities who may be affected by the project should be a focus for public involvement.

The summary of the public consultation conducted is shown in Table 10.2.19.

Table 10.2.19 The summary of the Meetings

No.	Date	Venue	Invitees
1	June 26	Crested Crane Hotel	Local Govt. officers(Jinja, Ngeru)
2	July 8	Njeru Town Council	Councillors of related villages
3	July 9	Mpumdde Div. Council	Councillors of related villages
4	July 14	Crested Crane Hotel in Jinja	Chiefs of the related villages
5	July 17	Baraza Resort in Jinja	Members of fisherman association
6	July 21	Jinja Town Hall	Councillors of JMC
7	July 22	Cool Breese Hotel in Jinja	Identified PAPs in the ROW

Source: JICA Study Team

10.3 Resettlement Action Plan

10.3.1 General

Under the road construction project, it is likely that communities will be affected. This is particularly true to areas where the project roads will pass through people's properties and dwellings. This may lead to involuntary displacement and the need for land acquisition, resettlement, and compensation. Because involuntary displacement disrupts and impoverishes communities, it should be avoided or at least minimised if displacement is inevitable then displaced persons should not only be adequately compensated for their losses, but they should be given opportunities to share in the road project benefits, and assisted in improving their livelihood.

The main objective of land acquisition and resettlement is to ensure that displaced people receive benefits from the displacing project. When communities or individuals are displaced, it is likely that production systems are dismantled, kinship groups may be scattered, jobs may be lost, and social networks may collapse leading to a number of other socio-economic problems. The Resettlement Action Plan (RAP) should consider all these socio-economic aspects of the affected inhabitants.

10.3.2 Legal Framework, Laws and Regulations for Resettlement /Land Acquisition

The position of the Government of Uganda in relation to compensation to be paid, if damages extend to land, is clearly defined in the 1995 Constitution and other Ugandan Laws as listed and briefly described below:

(1) The Constitution of Uganda (1995)

Article 237(1) of the Constitution vests all land in the citizens of Uganda. However, under Article 237(1)(a), the Government and Local Government may acquire land in the interest of the public. Such acquisition however, is subject to the provisions of Article 26 of the Constitution, which gives every person in Uganda the right to own property and prohibits forceful seizure of the individual property including land by any authority including the Government without adequate compensation.

The Constitution also prescribes the tenure regimes in accordance with rights and interest in which land may be held (Customary, Leasehold, Mailo, and Freehold). It provides procedures to the "prompt payment of fair and adequate compensation" prior to taking possession of the land. The Constitution does not make resettlement a right.

(2) The Land Act (1998)

The 1998 Land Act addresses land holding, management control and dispute processing. The developer should seek to enter into mutual agreement with the occupier or owner of the land upon payment of compensation. The act creates a series of land administration institutions consisting of Uganda Land Commission (ULC), District Land Boards (DLB), Parish Land Committees (PLC) and land tribunals. Section 78 of the Act gives valuation principles for compensation, i.e compensation rates to be yearly approved by DLBs.

Section 77 of the Act provides the value of the buildings on the land to be taken at open market value for urban areas and depreciated replacement cost for the rural areas in the computation of compensation. In addition to compensation assessed under this section, there shall be paid as a disturbance allowance of 15 percent or if less than six months' notice to give up the vacant possession at 30 percent of any sum.

(3) Roads Act (1964)

The Roads Act of 1964 provides for the establishment of road reserves and for the maintenance of roads. Section 3 of the Act declares a Road Reserve Area

"... an area bound by imaginary lines parallel to and not more than 50 feet from the centre line of any road" and "... no person shall, save with written permission of the road authority, erect any building or plant any tree or permanent crops within a road reserve".

In this respect all the property that follows within the right of way and the road reserve will be valuated and compensated for by the project. However, this has to be customized since there is no clear demarcation of the road reserve. Crops and trees will be evaluated and compensated and a period of six months will be given to the affected inhabitants to harvest all their crops in the road reserve.

(4) Land Acquisition Act (1965)

This Act makes provisions of the procedures and method of compulsory acquisition of land for public purposes whether for temporary or permanent use. The Minister responsible for land may authorise any person to enter upon the land and survey the land, dig or bore the subsoil or any other thing necessary for ascertaining whether the land is suitable for a public purpose.

The Land Acquisition Act stops at payment of compensation. It is not a legal requirement to purchase alternative land for the affected people by the Project. Once they are promptly and adequately compensated, then the obligations stop there. The Government through the Ministry of Lands, Housing and Urban Development will pay the compensation to the affected persons.

There is no requirement or provision in the Law that people need to be moved or that alternative land be made available or bought. Each affected person is entitled to be compensated on receipt of his/her compensation is expected to move and has no further claim.

10.3.3 Compensation System of Uganda

(1) Inventory and Registration of Affected Properties and Persons

This entails a complete count and description of all property that will be acquired or lost as a result of relocation. The land inventory specifies the type of land (dry-land, irrigated, perhaps soil type), its use (agricultural, types of crops, business), size and location, so that each can be correctly valued. The physical inventory lists each asset, including structures (homes, animal pens, store houses) and infrastructures (e.g. wells) and other assets, e.g. trees by type (fruit or timber), age and size, for valuation purposes.

(2) Criteria and Eligibility for Compensation

Affected persons irrespective of their status (whether they have formal title, legalizable rights, non-legalizable) are eligible for some kind of assistance if they occupied the land before the entitlement cut-off. The entitlement cut-off refers to the time when the assessment of land acquisition and compensation for crops and buildings affected was carried out. Thereafter, no new cases are entertained.

The following categories will be eligible for compensation:

a) People who are indirectly affected by the project by loss of income and livelihood

b) People whose houses/structures will be affected by land acquisition

c) People who borrow land for cultivation and their crops or trees will be removed or damaged due to land acquisition activities.

d) Persons who encroach the area after the Resettlement survey are not eligible to compensation or any form of resettlement assistance.

(3) Land

Land management and control of its transaction are decentralized at District and Parish level through District Land Boards and Parish Land Committees respectively. Fixing the value of land in Uganda depends on whether it is public (Government owned) or privately owned according to land tenure types (Customary, Mailo, Freehold and Leasehold). If it is public land, the Chief Government Valuer's Office will fix the rate of compensation. If owned privately, the developer (UNRA) will negotiate with the owner and agree on the amount to pay for the land to be acquired.

(4) Structures and Assets

In Uganda, it is the responsibility of the developer to engage a professional valuer to carry out an assessment of all structures and assets in the affected area. However, rates of structures/buildings in urban area are fixed by the Chief Government Valuer's Office.

Rates of structures which are located on land which has a Title Deed are normally negotiated with the owner of the structure. Rate for structures on land that lacks a Title Deed are fixed by the District Land Board just like crops and trees.

Affected people should be provided with full replacement cost for the lost structures so that they are able to build their own houses without difficulties. The construction of a replacement house will be offered whenever a building has be removed. This may either be on remaining land of the plot if it is deemed viable and the affected household agrees to such solution, or on another resettlement plot.

In the process of valuation of affected structures, the methods of replacement cost, comparable market price and combination of these two are usually used by professional valuers to get compensation rates. When valuation of individual structures is completed, detailed compensation rates for different structures will be included in the resettlement action plan (RAP).

(5) Crops and Trees

A number of trees and crops will be left by the affected communities when they move to other areas due to displacement. These will have to be compensated.

10.3.4 Safeguards Policies on Resettlement of JICA

According to the JICA Guidelines for Environmental and Social Considerations, the overall objectives of the JICA policy on Involuntary Resettlement are;

- Involuntary resettlement and loss of means of livelihood are to be avoided where feasible, exploring all viable alternatives. When, after such examination, it is proved unfeasible, effective measures to minimize impact and to compensate for losses must be agreed upon with the people who will be affected;
- People to be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported by the project proponents, etc. in timely manner. The project proponents, etc. must make efforts to enable the people affected by the project, to improve their standard of living, income

opportunities and production levels, or at least to restore them to pre-project levels. Measures to achieve this may include: providing land and monetary compensation for losses (to cover land and property losses), supporting the means for an alternative sustainable livelihood, and providing the expenses necessary for relocation and the re-establishment of a community at relocation sites; and

- Appropriate participation by the people affected and their communities must be promoted in planning, implementation and monitoring of involuntary resettlement plans and measures against the loss of their means of livelihood.

10.3.5 Resettlement Action Plan (RAP)

The preparation of resettlement action plan (RAP) shall be conducted in accordance with the requirements of the Resettlement/Land Acquisition Policy Framework (Nov. 2001) available at UNRA supervised by Chief Government Valuer.

(1) Objectives of the RAP

The overall objectives of the RAP is to provide all the findings and outputs from the land acquisition preparatory exercises and propose how the land acquisition process is to be implemented. The RAP will address the resettlement and compensation related issues on the proposed project.

(2) Tasks under the RAP

a) Raise and spread awareness of the project among the communities affected by the Project in liaison with Jinja and Mukono Districts

b) Obtain all cadastral and other relevant information necessary to identify property owners and other persons that are likely to be affected by the project, using maps and drawings that show the land tenure system and affected land along the alignment. Each type of tenure is to be uniquely identified.

c) Secure and verify copies of registered land titles, digital maps of the site and immediate neighbourhood (for purposes of injurious effects), including full cadastral surveys of the site

d) Prepare strip maps, drawings and data compiling with requirements of the valuation Division and the Department of Survey and Mapping, Ministry of Lands, Housing and Urban Development (MLHUD) for purposes of acquiring properties and relocation of utilities falling within the project site

e) Map sub-divisions of plots traversed by the road to the stage of certified road planning

f) Prepare a cadastral survey of the project site

g) Using procedure approved by and working in close liaison with the Valuation Division, Ministry of Water, Land and Urban Development carry out detailed valuation of all land properties and livelihoods affected by the project in order to provide the basis for compensation/resettlement

h) Compile land acquisition and resettlement costs

i) Deposit at local authorities in accordance with the Town and Country Planning Act, the resultant strip maps and drawings showing the alignment, property boundaries, including plot numbers, ownership and land tenure system

j) Display the resultant strip maps (at a planning scale of 1:2,500) at the Ministry of Works and Transport (MoWT) headquarters and relevant local Council offices along the route

k) Follow-up by the consultant to ensure the transfer of the title deeds to GOU/UNRA and change of deeds for the remaining portion of land to the owners

10.3.6 Experiences of Land Acquisition/Compensation for Road Development Project

Uganda government has been conducting land acquisition and compensation for several road development projects. Table 10.3.1 shows the summary of those experiences for road development projects by UNRA. The list contains projects which are undergoing land acquisition/compensation procedures. According to UNRA, serious conflicts with PAPs have not been identified so far.

Table 10.3.1 The summary of the experiences on land acquisition/compensation

Project Name	RAP Preparation Year	No. of Affected PAPs	Acquired Land(ha/ acres)	Compensation Cost (Ush.)	Budget
Kyotera – Mutukula Road Upgrading Project	July 2002	2,529	-	546,809,557	AfDB
Gayaza-Kalagi Road Upgrading Project	March 2003	1,033	88.732 ha	719,764,605	AfDB
Soroti-Dokolo-Lira Road Upgrading Project	March 2005	1,099	-	3,056,989,127	WB
Kabale – Kisoro – Bunagana – Kyanika Road Development Project(101 km)	December 2007	5,491	198 ha	7,013,000,000	AfDB
Matugga- Semuto Kapeeka Road Development Project (41.1km)	June 2008	711	124.13ha	578,095,837	AfDB
Gayaza-Zirobwe Road Development Project(42 km)	December 2008	1,399	64.443 acres	4,600,000,000	WB
Fort Portal – Bundibugyo – Lamia Road Development Project(103km)	February 2009	3,000	-	4,000,000,000	AfDB

Source: UNRA (August 2009)

10.3.7 RAP Preparation for the Project

(1) General

The Environmental and Social Impact Assessment (ESIA) Study team organised by the local consultancy firm (COWI Uganda Limited.) based on the contract with UNRA has mobilised the activities on 4th June 2009. The RAP preparation has been conducted as part of the ESIA study. The RAP preparation work has been carried out in close collaboration with and in accordance with the requirements of the Valuation Division and the Department of Survey and Mapping, Ministry of Lands, Housing and Urban Development (MLHUD) in cooperation with the Uganda National Roads Authority (UNRA).

(2) Current Status of the Preparation Work

All of the field works on the preparation of the RAP including measurement survey has been completed on the 7th of August 2009(refer to Figure 10.3.1). The local consultancy firm has been conducting report preparation including data processing and compilation for the RAP report. The RAP report shall be submitted to the Ministry of Land in the middle of September after the review of the Chief Government Valuer.

Figure 10.3.1 Measurement Survey

(3) Preliminary Results of the RAP

1) Consultations with the Stakeholders

In order to provide project information and encourage potentially affected persons/communities to participate in the consultation process, consultation meetings were organized and invitations to the local authorities and the affected communities were made in a timely manner to allow all the project area stakeholders to effectively participate (refer to Figure 10.3.2). The summary of the meetings is shown in Table10.3.2

Table 10.3.2 The summary of the Meetings

No.	Date	Venue	Invitees
1	June 26	Crested Crane Hotel	Local Govt. officers(Jinja, Ngeru)
2	July 8	Njeru Town Council	Councillors of related villages
3	July 9	Mpumdde Div. Council	Councillors of related villages
4	July 14	Crested Crane Hotel in Jinja	Chiefs of the related villages
5	July 17	Baraza Resort in Jinja	Members of fisherman association
6	July 21	Jinja Town Hall	Councillors of JMC
7	July 22	Cool Breese Hotel in Jinja	Identified PAPs in the ROW

Figure 10.3.2 Stakeholder Meeting with PAPs (July 22, 2009)

2) Consultation with Crucial Stakeholders

The selected alignment runs through an industrial area at the Njeru side. Nytil (Textile factory) and Nile Breweries requested realignment to avoid adverse negative impacts on their properties. Representatives from related parties consisting of UNRA, JICA Study Team and COWI had meeting with the affected people in finding optimum solutions.

a) Consultation with Nytil

The representative of Nytil (Mr. Sanjay) requested that if the main access road of the factory, located inside the Project ROW could be retained. He pointed out that the road was the heart

of the factory as the major point of entry to the factory. To accommodate his request, it was agreed that the width of the ROW along the affected main access road will be reduced by 6 meters (from 30 to24meters) based on discussion and field inspection (refer to Figure 10.3.3). The Minutes of Meeting is attached in Appendix 7.

Figure 10.3.3 Meeting with Nytil (July 13, 2009)

b) Consultation with Nile Breweries Ltd. (refer to Figure 10.3.4)

Nile Breweries Ltd. sent a letter to the JICA Study Team requesting the realignment of the project approach road due to several reasons on indirect negative impacts caused by the construction activities (refer to Appendix 7).

In terms of realistic solutions, those issues mentioned in the letter were clarified into three categories during the meeting as follows:

- Reducing the ROW to avoid physical impact on concerned properties
- Confirmation of the subject land acquisitions for compensations
- Provision of mitigation measures for the concerns

To avoid adverse impact to the water treatment plant and reservoir, UNRA decided that the ROW width of the affected section will be decreased by 7m. Therefore the ROW width of the south side will be 23m. The minutes of meeting is attached in Appendix 7.

Figure 10.3.4 Meeting with Nile Breweries (July 22, 2009)

3) Participatory Socio-Economic Survey (refer to Figure 10.3.5)

Detailed participatory Socio-Economic Survey of all affected persons (on a household basis) was conducted. This survey drew accurate information and careful consideration of the likely impacts due to displacement in order to inform the process needed in developing acceptable costs for relocation and rehabilitation.

Figure 10.3.5 Participatory Socio-Economic Survey

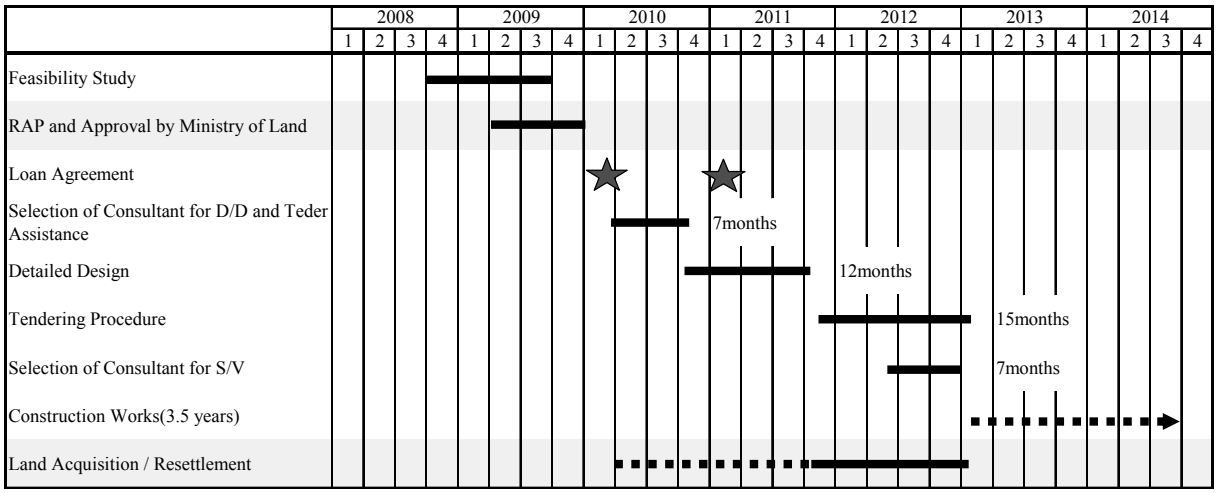
4) Preliminary Results of the Field Works

The measurement survey revealed that approximately 72,000 m^2 of land need to be acquired as the ROW of the approach road and the actual number of buildings that require resettlement is 26 consisting of 16 houses (either partially or completely built), 2 commercial and 8 industrial buildings.

5) Preliminary Implementation Schedule for Land Acquisition /Compensation

The preliminary implementation schedule based on discussion with the Land acquisition specialist of UNRA is shown in Table 10.3.3.

Table 10.3.3 Preliminary Implementation Schedule for Land Acquisition/Compensation



10.4 Technical Assistance to UNRA for Environmental Studies

10.4.1 Introduction

UNRA has already started the tender process for the ESIA/RAP studies required for the Project for implementation sometime in June 2008, and six consulting firms had submitted technical proposals to UNRA in November 19, 2008. Meantime, a comprehensive review of the ToR for this ESIA/RAP studies, which was attached with the tender documents, was conducted by the JICA Study Team. Based on the review result, appropriate technical assistance program from the JICA Study Team as well as coordination strategies between JICA's study and UNRA's ESIA/RAP studies were discussed in Section 7.3. It is noted that

COWI UGANDA was selected by UNRA as ESIA/RAP Consultant in the early part of March 2009.

10.4.2 Environmental Approval Process

(1) Outline

The entire process for acquiring the Environmental License and its relevant EIA examination in Uganda consists of the following four (4) steps: (i) e submission of project brief (i.e., almost equivalent to the concept of IEE in conventional EIA process) and screening, (ii) ToR development and its approval (iii) relevant environmental studies and preparation of Environmental Impact Statement (EIS), and (iv) EIS evaluation and licensing approval. The Environmental Approval Procedures are described as follows:.

(2) Environmental Approval Procedures

1) Project Brief

1. Submit an official application form for an environmental approval to the Executive Director of NEMA with 10 copies of the project brief that summarizes the project outline and its surrounding bio-physical and socio-cultural environment. If contents of the submitted project brief documents are satisfactory to the Executive Director, he may pass forward a copy of the submitted project brief to the lead agency for comments within seven (7) working days of the date on which the project brief was received.
2. The lead agency will summarize their comments on the project brief and send them back to the Executive Director within fourteen (14) working days of the date on which the project brief was received.
3. The Executive Director starts the evaluation of the project brief, based on comments summarized by the lead agency. If the Executive Director concludes that the proposed project will not cause severe negative environmental impacts, or the environmental mitigation program described therein is comprehensive and sufficient, he may approve the project.
4. If the Executive Director concludes that the proposed project will cause significant negative environmental impacts, and/or environmental mitigation program, described in the submitted project brief, is not sufficient, then he will ask the project owner to conduct the Environmental Impact Study. He will do this EIA notification to the project owner within twenty-one (21) working days of the date on which the project brief is received.

2) Environmental Impact Study

1. The ToR for environmental studies required for this Environmental Impact Study needs an approval from NEMA and the lead agency prior to its implementation. After the components of the ToR has been approved, the project owner shall prepare the relevant documents by summarizing the EIA experts/or consultants who undertook the Environmental Impact Study and submit them to the Executive Director. After the approval of the Report, then the project owner can officially initiate the Environmental Impact Study.
2. During the Environmental Impact Study period, the project owner shall take relevant measures to enhance Public Participation from the surrounding communities that may be affected by the implementation of the proposed project and incorporate those opinion into the Environmental Impact Study. One of the main objectives of the public participation is the inclusion of the opinions of the surrounding communities

about the project site into the ToR development process for the Environmental Impact Study to the extent possible (UNRA, personal communication, 2008).

3) Environmental Impact Statement (EIS)

1. Based on the study results of the Environmental Impact Study, the project owner shall prepare the D/F for the Environmental Impact Statement (EIS). This EIS (D/F) shall be signed by each of the individuals involved with the assessment works. The project owner shall submit twenty (20) copies of the EIS (D/F) to the Executive Director. Then, the Executive Director passes forward a copy of the (D/F) to the lead agency for comments.
2. The lead agency shall summarize the comments on the EIS (D/F) and send them back to the Executive Director within thirty (30) working days of the date on which the EIS (D/F) is received.
3. If the Executive Director concludes that the components of the EIS (D/F) are satisfactory, then he will invite Written Comments from the general public within ten (10) days from receiving the lead agency's comments. This invitation is usually published in the newspapers. The written comments will be sent to the Executive Director within twenty eight (28) days of the date on which the invitation was issued.
4. Also, the Executive Director shall request comments from persons who are most likely to be affected by the proposed development of the project (PAP). The invitation will be made through publications in the newspaper. The written comments will be sent to the Executive Director within twenty-one (21) days of the date on which the invitationwas issued.
5. Based on gathered comments and components of the EIS (D/F), if the Executive Director concludes that the proposed project would cause controversy or would cause trans-boundary impacts, he will call for a Public Hearing. On the written request of the Executive Director, the lead agency will hold a Public Hearing. The duration of the Public Hearing should not be less than thirty (30) days and should not exceed more than forty-five (45) days of the date on which the written comments, mentioned above, are received. The date and place of the Public Hearing will be issued through mass media such as theTV and newspaper.
6. After the Public Hearing is concluded, relevant reports summarizing the advices/opinions and/or suggestions will be prepared and sent to both the lead agency and the Executive Director, within thirty (30) days of the date on which the Public Hearing was concluded. Also, the lead agency will prepare the report summarizing the findings and recommendation obtained from the Public Hearing, and submits it to the Executive Director within twenty-one (21) days of the date on which the Public Hearing was conducted.

4) Decision on EIS (D/F)

1. Based on the information including the EIS (D/F), written comments, public hearing reports and others, the Executive Director will decide the approval or disapproval of the proposed project. The decision will be made within one hundred eighty (180) days of the date on which the EIS (D/F) was submitted. The decision will be conveyed to the project owner within fourteen (14) days from the final ruling.

Figures 10.4.1 and 10.4.2 show the flowchart of the environmental approval process for all development projects in Uganda.

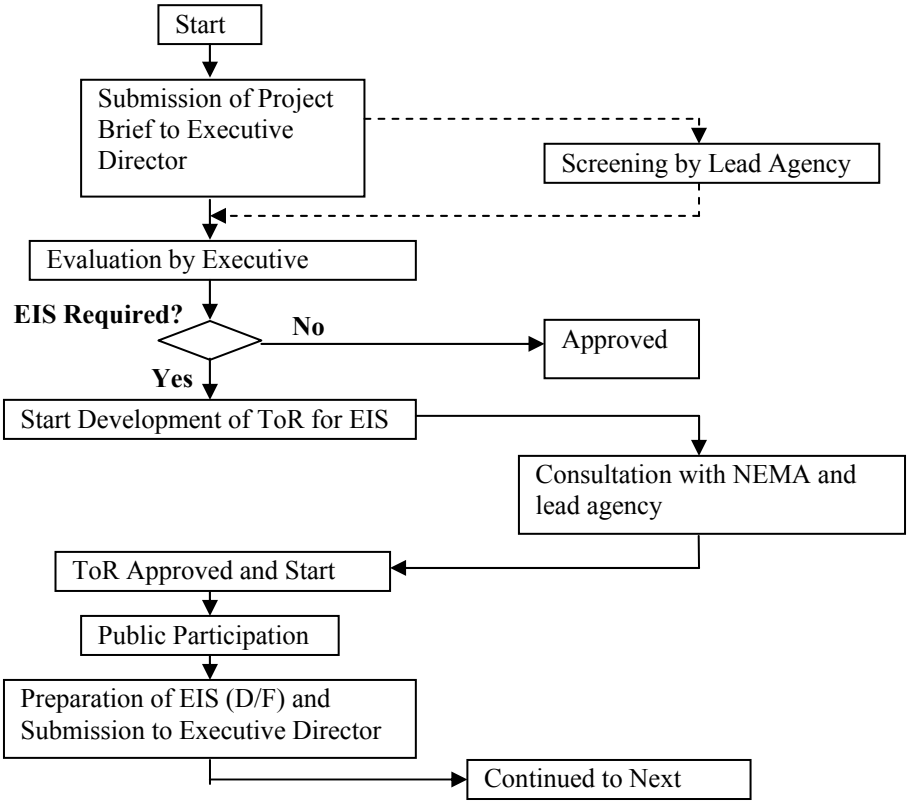


Figure 10.4.1 Flowchart for Environmental Approval Process in Uganda

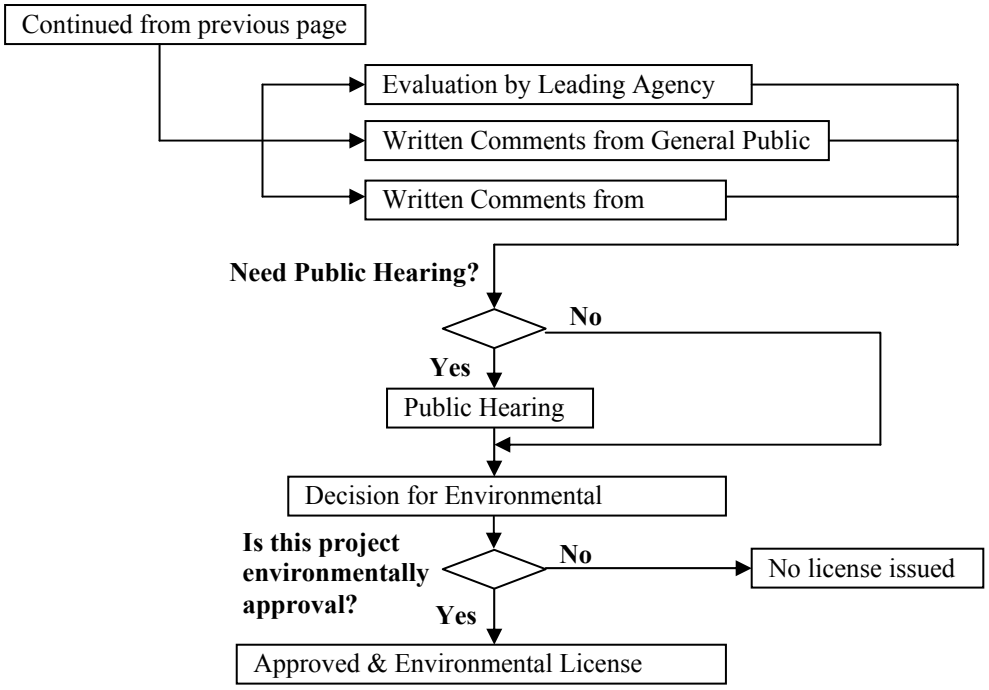


Figure 10.4.2 Flowchart forEnvironmental Approval Process in Uganda (continued)

10.4.3 Interaction with UNRA-Environmental and Social Studies

(1) Outline

During the first two months of the study period (i.e., November and December 2008), specific study directions and tentative schedule were prepared by the JICA Study Team. Based on the directions, interaction schemes between the engineering study portion (JICA Study) and the environmental/social study (UNRA) were formulated. This was expected to reflect the study directions for the ESIA/RAP studies while incorporating new findings, obtained from the engineering study, into the ToR for ESIA/RAP studies prior to starting the actual ESIA/RAP studies (UNRA, personal communication, 2008).

In order to enhance UNRA's ESIA/RAP studies more comprehensive and specific (i.e., carry out ESIA/RAP studies based on the latest engineering results of the selected alignment, design, construction schedule and others) and compatible with JICA Guidelines for Environmental and Social Considerations (hereinafter referred to as the JICA Guidelines), comprehensive review of theToR attached to UNRA's tender document was conducted by the JICA Study Team. Based on the review result, the outline of relevant technical support program by the JICA Study Team was formulated. Also, appropriate interaction schemes between the JICA Study Team and UNRA-selected Consultant were developed.

The 1st meeting between the JICA Study Team and COWI UGANDA was held on March 05, 2009, at the meeting room of UNRA. During the 1st meeting, the JICA Study Team explained the current project status and the outline of the technical support programs for the ESIA/RAP studies. Both sides agreed to prepare the ESIA/RAP studies for the proposed bridge construction project more comprehensive and adaptable to the JICA Guideline. Thereafter, a more specific ToR for the entire ESIA/RAP studies was prepared by the JICA Study Team. The actual EIA/SIA-related studies (registered officially by NEMA) started sometime in the later part of June 2009.

(2) Review of ToR of UNRA-ESIA/RAP Studies

JICA Study Team carried out several technical site inspections in November and December 2008. Based on JICA's preparatory study report, drafted in October, 2008 and major findings obtained during the Team's technical site inspections, , a preliminary environmental examination of the selected three routes for alternatives alignment A,B and C was carried out, and the potential environmental issues associated with the three routes were identified.

Based on the above study results and the 25 environmental factors listed in the JICA Guidelines, the review of the ToR for the tender of the ESIA/RAP studies, drafted by UNRA, was conducted.

Based on the review result, the outlines of the technical supports that the JICA Study Team will provide were delineated.

Table 10.4.1 summarizes the outline of the technical support programs from the JICA Study Team. Also, a more detailed technical suggestions for the TOR of several environmental tasks were discussed between the JICA Study Team and UNRA.

Table 10.4.1 Summary of EIA-related Technical Supports

Environmental Factor	Outline of Technical Supports
1. Air Quality	**Need full support.** The JICA Study Team assisted UNRA in carrying out the relevant roadside air quality survey in obtaining the baseline for air quality condition that was pursued by selected local consultant's team. Equipments and skill e required for the survey were provided by the JICA Study Team. Simple pilot survey was conducted at both Kampala and Jinja/Mukono.
2. Noise/Vibration	**Need full support.** The JICA Study Team assisted UNRA in carrying out relevant roadside noise survey in obtaining the baseline for roadside noise condition pursued by a selected local consulting team. Equipments and skill required for the survey was provided by the JICA Study Team. Simple pilot survey was conducted at both Kampala and Jinja/Mukono.
3 Water Quality	Not necessary.
4. Waste Disposal	The JICA Study Team assisted UNRA in carrying out relevant environmental studies by selected local consulting team for appropriate treatment of construction waste to be generated by the construction activity, using engineering study results provided by the JICA Study Team.
5. Global Warming	**Need full support.** The JICA Study Team assisted UNRA in carrying out a relevant CO_2 emission loading study by selected local consulting team using the results of future transport demand forecast study under several development scenarios and current traffic survey. A preliminary regional CO2 vehicular emission loading study was conducted by the JICA Study Team.
6. Involuntary Resettlement	The selected local consulting team conducted relevant RAP study for the selected optimum alignment option provided by the JICA Study Team.
7. Existing social infrastructures and services	Appropriate mitigation program that would not cause temporal traffic jam and/or business disturbances such as stoppage of factory operations during the construction of the was prepared, based on the construction schedule of the Project. Increase of temporal traffic mainly due to the operations of construction-related vehicles was considered based on the result of the engineering study provided by the JICA Study Team.

Source: JICA Study Team

10.5 Assistance to Public Consultation

10.5.1 General

The information disclosure by public consultations is one of the integral parts of the basic principle of the JICA Guidelines for Environmental and Social Considerations. The Guidelines state that, while the recipient governments disclose information about environmental and social considerations of the projects, JICA requests the assistance of the recipient governments through the implementation of cooperative efforts.

The bridge construction project was planned and designed so as not to disturb the convenience of inhabitants based on public opinion considerations. Therefore, the active commitment of UNRA as the project proponent for the public consultations of the Project was indispensable. The JICA Study Team assisted UNRA in exercising its ownership of the project by conducting public consultations and giving them the proper advices in advance.

10.5.2 Public Consultations for the FS Study

(1) Schedule of Public Consultations

The TOR of the Feasibility Study requested the holding of at least three (3) public consultations during the study period. The first and second public consultations were already completed. Note that additional public consultation was called on "Focus Group Discussion" that was held to inform the local stakeholders about the progress of the preliminary study and

sharing of information with them prior to the 2nd public consultation, for the formulation of the basic agreement for the establishment of the optimum route for the bridge to be adopted. The results of the public consultations are described hereafter in detail.

The overall schedule for the public consultations is shown in Table10.5.1.

Table 10.5.1 Schedule for Public Consultations for the FS

YEAR	2008		2009								
MONTH	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
◆Project Activities											
Mapping & Survey											
Determination of the Alignments of Alternative											
Selection of optimal location and Structure of Bridge											
Preliminary Design for Optimal Plan											
◆Public Consultation(3times)											
◆Focus Group Discusiion											

Source: JICA Study Team

(2) First Public Consultation

1) Objectives

The major objectives of the first public consultation were:

- To introduce the outline of the Project and the Study
- To explain the schedule of the JICA Study to the public
- To share all the related information among stakeholders.

2) Date and Venue

December 12, 2008 at Serena Hotel in Kampala

3) Notification of the Meeting

Notification of the meeting was conducted through public notice in two national newspapers as listed below (refer to Appendix 8)

- *"The New Vision,"* December 9, 2008 issue
- *"Daily Monitor,"* December 11, 2008 issue

The detailed invitee lists is given in Appendix 8.

77 participants who attended the meeting and the detailed participant lists are shown in Appendix 8.

4) Main Topics of the Discussion

In the question and answer session, a totalof 20 participants raised questions and/or comments, for UNRA responded accordingly. The main topics of the discussions are described below, and the minutes of meeting are attached in Appendix 8.

- Some participant stressed the importance of the safety of pedestrians and cyclists as the first priority. UNRA answered that guard rails will be considered during the design for the safety of pedestrians and cyclists.

- A representative of UIPE stated that what is mostly required in Uganda is for the bridge to carry traffic and loads safely, and that aesthetic appearance is secondary. Also, a participant from NGO expressed similar opinion that they should consider not only beauty of the bridge but should also focus more on benefits, reliability and strategic location of the bridge.
- A physical planner of the Ministry of Land proposed that the Study Team coordinate with the land use planners of the Uganda government and also with the Jinja Municipal Council particularly with their physical plans. He informed that the Jinja Physical Plan will be presented to Jinja Municipal Planners on 16 December 2008.
- Eng. Ssebbugga mentioned that the 2nd public consultation should be held before the selection of the optimum location of the new bridge.

Figure 10.5.1 First Public Consultation

(3) Focus Group Discussion

1) Objectives of the FGD

The major objectives of the first public consultation were:

- To explain to the Focus Group about who might be affected by the Project about the three alternative alignments for the new bridge across River Nile at Jinja
- To conduct opinion exchanges

2) Date and Venue

March 6, 2009 at Crested Crane Hotel in Jinja

3) Notification of the Meeting

Notification of the meeting was conducted through public notice in a national newspaper, "The New Vision," March 3, 2009 issue (refer to Appendix 8)

69 participants attended the meeting and the detailed participant lists is shown in Appendix 8.

4) Main Topics of the Discussion

In the question and answer session, a total 15 participants raised questions and/or comments. The main topics of the discussions are described below, and the minutes of meeting are attached in Appendix 8.

- A representative of Nytil, the textile factory which will be directly affected by Alignment A, asked about the cost of compensation. UNRA answered that Alignment A is one of the proposed routes and if it is chosen, the process for compensation as discussed during the presentation of the land specialist will be followed.

- As for water use, the Nile Breweries stated that their water intake will be affected if Alignment A is chosen. UNRA answered that there will be no piers in the water (minimum construction in water)and if Alignment A is chosen; mitigation measures will be taken. The Team together with Nile Breweries Staff will visit the water source for further assessment.
- A representative of the Uganda Electricity Transmission Company pointed that Route C crosses the major local and export electricity transmission lines and just a day before, there was a ground-breaking ceremony for a new line. UNRA answered that if Alignment C is chosen, there may be a need to relocate the lines and the cost that hereof will be included in the construction costs.

In the closing remarks, Eng. Bwanga encouraged participants to attend the Second Public Consultations to be held on April 3, 2009 in which the basic agreement on the optimum route for the bridge would be established.


Figure 10.5.2 Focus Group Discussion

(4) Second Public Consultation

1) Objectives

The major objectives of the second public consultation were:

- To explain the results of the selection of the optimum solution for crossing River Nile
- To establish the basic agreement for the optimum route to be adopted for the bridge

2) Date and Venue

April 3, 2009 at Sheraton Hotel in Kampala

3) Notification of the Meeting

Notification of the meeting was conducted through public notice in a national newspaper as shown below (refer to Appendix 8)

- *"The New Vision"* March 31, 2009 issue

145 participants attended the meeting and the detailed participant lists is shown in Appendix 8.

Figure 10.5.3 Second Public Consultation

4) Main Topics of the Discussion

In the question and answer session, a total of 20 participants raised questions and/or comments. UNRA answered according with the support of the JICA Study Team for the response to the questions. In conclusion, the optimum solution to cross River Nile at Jinja was recommended by the JICA Study Team, for which "Alignment A with Bridge Type AA4" was approved by all of the attendees.

The main topics of the discussion are described as follows, and the minutes of meeting are attached in Appendix 8).

- A representative of Nile breweries, to be likely be affected by r alignment A2, appreciated the Study team's concern for the revision of the approach road alignment for route A by expanding the existing programme.
- A representative of the Ministry of Lands, housing and Urban Development expressed thanks for the JICA Study Team in their elaborate work, and stated their agreement for Alignment A with Bridge Type AA4 and gave the remark whether this alternative would provide a positive effect on the land use plans particularly for the Njeru area.
- A senior citizen mentioned that a good works has been done so far and the inputs of the various Stakeholders, provided the motion that Alignment A2 and Bridge type AA4 be approved.
- Assistant Town Clerk Njeru seconded the motion and all of the participants said AYE, indicating the selection of Alignment A2, Bridge type AA4.

(5) Third Public Consultation

1) Objectives

The major objectives of the third public consultation were:

- To explain the results of the Feasibility study
- To explain the results of the ESIA/RAP study
- To exchange opinions and reply any questions to be raised

2) Date and Venue

September 8, 2009 at Ridar Hotel in Seeta

3) Number of the Attendants

103 participants attended the meeting and the detailed participant lists is shown in Appendix 8.

4) Main Topics of the Discussion

In the question and answer session, a total of 14 participants raised questions and/or comments. UNRA answered according with the support of the JICA Study Team and COWI, consulting firm hired by UNRA for ESIA/RAP for the response to the questions.

The main topics of the discussion are described as follows, and the minutes of meeting are attached in Appendix 8).

- A representative of IGAR, petrol station located at Jinja, expressed his concern that when the compensation of the loss their sales would be considered. The land valuer of the COWI team answered that if a person is injuriously affected then the psycho-social support would be considered. This would also be the same with IGAR when the access to the petrol station is closed.
- A representative of the Uganda Media Centre concerned about the effect of the bridge construction on the climate. The team leader of JICA Study Team answered that the traffic congestion will be greatly reduced with the dual carriage way at the new bridge which results in decreased carbon dioxide emission at the bridge.
- The Chief Administrative Officer of Jinja and other some participants worried about the delay on payment for the compensation. The land acquisition specialist of UNRA assured that RAP preparation work for compensation had been started with valuation of the affected properties. The RAP report would be submitted to the Chief Government Valuer for approval and consideration in the national budget for next financial year.

Figure 10.5.4 Third Public Consultation

CHAPTER 11

TECHNICAL TRANSFER

11. TECHNICAL TRANSFER

11.1 Technical Transfer for Bridge Planning

The technical transfer program schedule for bridge planning is shown in Table 7.1.1 including the sessions of all subjects of the technical transfer program that have been implemented for UNRA personnel. The implementation date and number of attendees are also shown in the Table.

In the first session on 13th March, 2009 at UNRA Board Room, initial surveys such as topographic survey, geological investigation and hydrological/meteorological surveys were presented. On 2nd April, 2009, the second session presentation on design standards was made at the Ministry of Works and Transport Training Centre, Kyambogo. In the third session on 6th May, 2009 at UNRA Board Room, bridge planning was presented. In the fourth session on 29th May, 2009, bridge maintenance was presented at UNRA Board Room. In the last session on 17th June at UNRA Board Room, various Japanese long bridges and technical evolution were presented and introduced by Dr. Tatsumi.

Table 11.1.1 Technical Transfer Program Schedule for Bridge Planning

No.	Subject	Contents	Date	Presenter	No. of Attendees
1	Natural condition survey	Topographic Survey Geological Investigation Hydrologic & Meteorological Survey	13th March	Mr. Ohshita Mr. Kawamura Mr. Okabe	18
2	Design Standard	Geometric Standard Navigation Clearance Aviation Limitation Wind/Seismic Design Design Load & Combinations	2nd April	Mr. Urano	10
3	Bridge Planning	Bridge Types & Application Outline of Selection of Optimum Bridge Type	6th May	Mr. Konishi	17
4	Bridge Maintenance	Maintenance Procedure for Selected Bridge Type	29th May	Mr. Konishi	16
5	Bridges in Japan	Introduction of Bridges in Japan	17th June	Dr. Tatsumi	10

Photo-1 1st Technical Transfer

Photo-2 2nd Technical Transfer

Photo-3 3rd Technical Transfer

Photo-4 4th Technical Transfer

Photo-5 5th Technical Transfer

11.2 Technical Transfer for Environmental Study

11.2.1 Roadside Noise Study

(1) Objective

Within this proposed new bridge construction study, several environmental field studies are to be conducted for ESIA study. Among of them, a roadside noise survey is to be conducted, using survey equipments brought by JICA Study Team.

As mentioned in Section 10.3 of the progress report of this study, the roadside noise study in Uganda is somewhat rudimentary and needs a series of intensive technical transfer sessions to improve the relevant skills and knowledge, (i.e., capacity development) to raise their own expertise in this area. In order to strengthen the fundamental knowledge for roadside noise study while mastering the proper use of the equipment by Ugandan Counterparts, a series of technical transfer session for this study was conducted in April 2009. It is noted that the noise survey equipment set, brought by the JICA Study Team, was turned over to the Ugandan Counterparts at the end of this study.

(2) Background

Currently, NEMA owns one noise meter [UNRA, personal communication, 2009]. Aside from the equipment, there are no accessories such as tripod or wind shield as protection for long–term survey activities under all-weather conditions. In Uganda, several preliminary roadside noise surveys were conducted in the past. Upon reviewing the study results, it was found that the hourly variation pattern of the roadside noise (i.e., the correlation between the traffic volume and the roadside noise) were not properly taken into account within the noise studies. In other words, no long-term (e.g., one-day or half–day) continuous survey was not carried out, yet noise standards specified within Ugandan regulation are based on at least one–day continuous study.

(3) Qualification of Expected Participants

Basically, the seminar program was developed for environmental and/or planning personnel working for UNRA/MOWT/NEMA and/or other relevant organizations, who can use EXCEL (or similar spreadsheet computation software) and have fundamental knowledge of basic physics. Throughout the coordination with UNRA, 10 people were selected among relevant governmental environmental organizations such as NEMA, Kampala City Council, Uganda Police and others.

(4) Seminar Outline

As shown in Table 11.2.1, the technical transfer seminar was a 3-day continuous program. Actual technical transfer seminars were held on April/08 (Day 1), April/09 (Day 2) and April/16 (Day 3)). During the field training session (Day 1 – Day 3, see contents in Table 11.2.1), all participants were divided into two groups. Those two groups were engaged in a half-day continuous roadside noise survey (see Photo-6), post-data processing, and the presentation was conducted at the final session of the technical seminar (Day 3, see Table 11.2.1).

The following were the (tentative) major roles for each person during the field survey,

Example:

- Participant A: Record all noise survey results on survey sheet (morning).
- Participant B: Traffic counting (morning)
- Participant C: Record all noise survey results on survey sheet (afternoon)
- Participant D: Traffic counting (afternoon)

Note that several exercise sessions were held in order to grasp the extent to which each participant understands about this seminar.

Photo-6 On-site Roadside Noise Survey Training

Table 11.2.1 Technical Transfer Program Contents (Noise Study)

	Class Title (activities)	Contents	Day 1	Day 2	Day 3
1	Introduction	What is noise? Objective of Noise Study	X		
2	Noise Analysis	Concept of Noise Parameter (PWL, SIL, SPL, LpA, LeqA and the its data processing	X		
	Exercise 1	Familiarization with roadside noise study			
3	Noise Survey	Introduction	X		
	Exercise 2	Noise Parameters Data Processing (LeqA)	X		
4	Survey 1	Understanding of survey equipments	X		
5	Survey 2	How to set up noise survey program (e.g., selection of survey points & duration)?	X		
6	Survey 3	On-site survey training along Jinja Street in Kambogo, Kampala. Measure half-day continuous survey (10:00 am – 4:00 pm of April 09, 2009). a. LpA b. Traffic volume Post Data Processing for the presentation, to be conducted in next step.		X	
7	**Exercise 3**	Data Processing Computation of hourly Leq A Graph (LpA – time) Graph (Leq A – time) Graph (Traffic Counting)			X
8	**Presentation**	Make a presentation of the pilot roadside noise study, mentioned above.			X
9	**Wrap up**	Application Future tasks			X

(5) Noise Survey Equipments

Table 11.2.2 summarizes the list of noise survey equipment that JICA Study Team turned over to UNRA. Photo Record of the preliminary equipment testing conducted at the project office for the new bridge construction study is shown in Photo-7.

Table 11.2.2 Summary of Noise Survey Equipment

	Equipment	Make/Model	Set
1	Noise Meter:	RION NL-21	1
2	Tripod	RION ST-81	1
3	Windscreen (all weather type)	RION WS-03E	1
4	Connection Cable	RION EC-04B	1

Overview of Noise Equipment (all weather type). At least 2 persons are necessary for this survey

Surveyor 1 writes measured noise level on the survey sheet

Microphone (all weather type)

Noise Level Meter

Overview of Noise Survey (clear sunny day type)

Noise Meter Set-up (clear sunny day type)

Photo-7 Setting of Noise Survey Equipment

(6) Overall Achievements and Future Task

Throughout this technical transfer seminar, key environmental personnel from UNRA as well as other competent agencies such as MOWT, NEMA, Kampala Police and Kampala Municipality have participated. As an actual application of this technical transfer seminar, a roadside noise study (1-day continuous survey at 3 points) was conduced at Jinja in July 2009. This survey was mainly conducted by UNRA personnel, with assistances from the JICA Study Team. During this field survey, several environmental personnel from Jinja Municipality and Njeru Town also participated as OJT trainees for roadside noise study, and positive intra-technical transfer process among various Ugandan organizations was recognized.

The presentation of that survey result was made by UNRA, with participants from NEMA and Kampala Municipality while hard copies of the roadside noise study were conveyed to relevant organizations such as Jinja Municipality and Njeru Town. Currently, UNRA is

preparing their own training texts for roadside noise study, using seminar materials from the technical transfer seminar.

To summarize, the technical transfer program regarding roadside noise study was very successful. To support the future development of this area in Uganda, it would be essential to continue in carrying out several field studies and accumulate their own experiences while pursuing further capacity development with relevant supports from JICA (e.g., the technical assistance program of the environmental control program including roadside noise).

11.2.2 Roadside Air Quality Study

(1) Objective

As mentioned in the previous section, several environmental field studies were conducted for both ESIA studies. Among them, a roadside air quality survey was conducted, using survey equipments brought by the JICA Study Team.

The roadside air quality study in Uganda is rather rudimentary and would need a series of intensive technical transfer (i.e., capacity development) to improve their relevant skills and knowledge, and raise their own expertise in this area. In order to strengthen the fundamental knowledge for roadside air quality study while mastering the complete use of the equipments among Ugandan Counterpart, a series of technical transfer session regarding this study is conducted. It is noted that the air quality survey equipment set, brought by the JICA Study Team, was handed over to the Ugandan Counterpart after the completion of the proposed study.

(2) Qualification of Expected Participants

Basically, the seminar program was developed for environmental and/or planning employees of UNRA/MOWT/NEMA and/or other relevant organization, who are able to use EXCEL (or spreadsheet computation software) and have fundamental knowledge of basic physics. Based on thorough coordination with UNRA, 9 personnel were selected among relevant governmental environmental organizations including NEMA and Kampala City Council.

(3) Technical Transfer Program

The following is the draft program of the roadside air quality study-related technical transfer seminar program. This was a half-day program held on July 27, 2009. Photo 8 shows the register of the technical transfer seminar. There was a small exercise session after all the sessions (see column 7 of Table 11.2.3) in order to strengthen the understanding of the participants about the seminar while grasping the extent of the ability of each of the participant on how much they understood the seminar. It is noted that the review session of the roadside noise study, conducted in Jinja and an actual application of the previous technical transfer program regarding roadside noise study, held in April 2009, was implemented before all roadside air quality-related topics were presented to share the practical knowledge Ugandan Counterparts obtained through actual field application of the roadside noise study among other participants.

Table 11.2.3 Technical Transfer Program (Air Quality Study)

	Class Title (activities)	Contents
0	Roadside Noise Study	After the technical transfer seminar of the noise study, conducted in April 2009, roadside noise study was conducted in Jinja in July 2009 to put into actual application the transfer of theoretical knowledge that was disseminated in seminar lectures. In this session, major study results were presented by the survey team leader, Mr. Anthony Mwase.
1	Introduction	Objective of Air Quality Study
2	General Features of major Pollutants	Review 5 Major Pollutants including Particulate Matter (PM), NOx, CO, HC and SO2.
3	Air Quality Survey Demonstration.	Explanation of the Survey Equipments Survey equipment in other EAC countries. Demonstration
4	Field Air Quality Study	How to prepare successful A/Q study?
5	Air Quality Survey Equipments in Japan	Air Quality Monitoring System (Japan) Monitoring Station Air Quality Survey Vehicle (Japan).
6	Prediction	Outline - Prediction Approach - Parameters Exercise (construct analytical model, using EXCEL), using analytical model - 1D Dispersion Advection Equation - Plume Model. - Puff Model
7	Exercise	Construction of analytical model, using EXCEL.
8	Wrap-up	Achievement Future Task

Lecture by JICA Study Team

Group Discussion (1)

Group Discussion (2)

Air Quality Survey Demonstration

Photo-8 Technical Transfer Seminar of Roadside Air Quality Survey

(4) Air Quality Survey Equipments

Table 11.2.4 summarizes the list of air quality survey equipments the JICA Study Team has turned over to UNRA for custody. Photo-8 shows the key parts of the equipment. Photo-9 summarizes the photo register for field air quality survey activity, using the equipments, conducted in Jinja.

Table 11.2.4 Instruments Used for Air Quality Measurements

Equipment	Instrument Used for Measurement	Photo
Gas Sampling Pump	GASTEC, GV – 100S, Japan	#1 of Photo 1
CO Detector Tube	GASTEC-100S, CO Detector Tube (1M001LCJ3), Japan	#2 of Photo 1
NOx Detector Tube	GASTEC-100S, NOX Detector Tube (1M0011LJ1), Japan	Same as above
SO_2 Detector Tube	GASTEC-100S, SO2 Detector Tube (1M005LbJ2), Japan	Same as above

Gas Sampling Pump & its containers (#1)


Gas Detector Tube (#2)
From left to right columns on the table: NOx, SO2 and CO detector tubes, respectively.

Photo-9 Inventory Record of Air Quality Survey Equipment

(5) Overall Achievements and Future Task

Throughout the technical transfer seminar, key environmental personnel from UNRA as well as other competent agencies such as NEMA and Kampala Municipality have participated. As an actual application of the technical transfer seminar, a roadside air quality study (three peak time surveys in 3 locations) was conducted in Jinja in July 2009. The survey was primarily conducted by UNRA personnel, with assistances from the JICA Study Team. During the field survey, several environmental personnel from Jinja City and Njeru Town also participated as OJT trainees for the roadside air quality study, and active intra-technical transfer process among various Ugandan organizations was recognized although we were not able to gather specific survey results due to l limited survey equipments. Currently, UNRA is preparing their own training texts for e roadside air quality study, based on the seminar materials of the technical transfer seminar.

In summary, the technical transfer program for roadside air quality study was successful. To support the future growth of this field of expertise in Uganda, it would be essential continuing carrying out several field studies for them to accumulate their own experiences using more sophisticated survey equipments that can detect current roadside air quality conditions in Kampala, Jinja and other large cities in Uganda while pursuing further capacity development associated with supports from JICA for environmental control program technical assistance program including roadside air quality studies.

CHAPTER 12

CONCLUSION AND RECOMMENDATIONS

12. CONCLUSION AND RECOMMENDATIONS

12.1 Conclusion

As the consequence of the study, it concludes that:

- The project is technically and economically feasible and environmentally sound.
- Hence, it is justified to implement the project for national and people's benefits.
- An optimum location of the project should lie on the Alignment A which begins at Nile Brewery junction and passes by Nytil Textile Factory before crossing the River Nile and which further extends to Nalufenya roundabout after the River.
- A bridge type should be a PC Cable-stayed bridge with inverted Y-shape Pylon and Single Plane Stayed-Cable.
- Introduction of Toll System to the Project should be carefully examined again during the Detailed Design stage involving stakeholders not only the service providers but also users.

12.2 Recommendations

12.2.1 Natural Environmental Considerations

Throughout this ESIA study on the natural environment, it was found that potential impacts regarding the water quality, regional drainage, and waste treatment would be critical for the implementation of the proposed bridge construction project. In particular, there are several water intake points (detailed descriptions about this water intake are summarized in the social environment study section) around the project site while the biodiversity around the current riverine condition is in good condition. So, special care shall be taken for the prevention of the water quality degradation.

Also, it was found that several important fish species with IUCN "Endangered" status occur around the project site of the River Nile, so the conservation of those species is one of important and challenging points although the proposed project will not cause direct, significant negative impacts on those species. Note that key components of the local fauna/flora conservation of the protection zone of the River Nile is to establish well-coordinated link with a basin-wide Lake Victoria management program, supervised by LVFO and/or Nile Basin Initiative while undertaking education concerning biodiversity conservation for the general community.

It is quite essential to establish comprehensive and effective environmental mitigation/management programs during the project-planning phase of this project. Within this study, key directions and/or principles for the development of a comprehensive EMP are summarized. Based on that information and engineering results of D/D to be held after this feasibility study, the action plan for the implementation of EMP shall be developed before

D/D will start. NaFIRRI, one of key inland freshwater fishery resources institute, has vast knowledge about the aquatic eco-system of the upper Victoria Nile. So, the participation of this institute within the successful implementation of this EMP regarding the natural environment would be vital.

12.2.2 Social Environmental Considerations

Land acquisition and involuntary resettlement are considered as major negative impacts on social environment caused by the Project. The ESIA study conducted by UNRA's consultant reveals that approximately 72,000m^2 of land is to be taken as the ROW for the approach road and the actual number of built-up properties that require resettlement action along the adopted road alignment are 26 units consisting of 16 dwelling houses (comprising of either partially or completely built units), 2 commercial and 8 industrial buildings. These negative impacts could be minimized with adequate, fair, and prompt compensation and resettlement of communities based on the on-going RAP process.

It is therefore recommended to consider in the next project phase (detailed design) that:

- Monitoring of the compensation procedures

All compensation procedures including payment and relocation of affected properties should be completed before commencement of the construction activities. In order to conduct appropriate compensation, monitoring of the compensation procedures based on the RAP is indispensable.

- Loss of access route to properties

The construction of approach roads to the bridge will cut off some of the roads in the eastern (Jinja side) and this will imply loss of access to some properties. This has multiple effects with respect to increased travel time and distance for the people travelling to/from their homes. In order to solve this issue, more detailed plan on substitutive access roads for the residents should be prepared in the detailed design.

- Potential business loss

The approach road alignment passing through the sections in the industrial area will affect, in terms of disturbing access, such factories as Nile Breweries, East African Packaging Solutions, Nytil/Picfare in Njeru side. Also, two fuel stations (IGAR and TOTAL) in the Jinja side will be affected due to loss of business after completion of the approach road. In the detailed design, those potential business losses will have to be considered.

- Establishment of grievance procedure and redress system

It is envisaged that a number of issues (grievances) will come up as a result of land acquisition by the Project. A system must be put in place to settle these issues amicably through recognized institutions such as local councils, land boards and land tribunals to the satisfaction of involved parties. In order to address the concern, it should be encouraged that UNRA communicate closely with the relevant parties through the branch office in Jinja.