KAMPALA CAPITAL CITY AUTHORITY (KCCA)
THE REPUBLIC OF UGANDA

PREPARATORY SURVEY FOR THE PROJECT FOR IMPROVEMENT OF TRAFFIC CONTROL IN KAMPALA CITY

FINAL REPORT

FEBRUARY 2019

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

ORIENTAL CONSULTANTS GLOBAL CO., LTD.
EIGHT-JAPAN ENGINEERING CONSULTANTS INC.

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PREFACE

The Japan International Cooperation Agency (JICA) made the decision to conduct a preparatory survey related The Project for Improvement of Traffic Control in Kampala City, the Republic of Uganda. This survey was entrusted to Oriental Consultants Global Co., Ltd and Eight-Japan Engineering Consultants Inc.

The study team held discussions with the government of Uganda and Kampala Capital City Authority officials from June 1 to July 7, 2017 and conducted field surveys in the planned area. This report was completed upon returning and finishing work domestically.

JICA hopes that this report will further this project and will be useful for further developing friendship and goodwill between the two countries.

Finally, JICA would like to express our sincere gratitude to everyone involved for their cooperation and support regarding the survey.

May 2018

Itsu Adachi
Director General of Infrastructure and Peacebuilding Department
Japan International Cooperation Agency (JICA)

SUMMARY

1. Overview of Kampala City

The railway network in Uganda is not functioning, so 92% or more of freight and passenger transportation is carried over roads. These roads are critical in terms of Uganda's economic development. Traffic congestion is a serious problem in the greater Kampala metropolitan area, where approximately 10% of Uganda's population (34.86 million in 2014) is located. The associated economic loss is a major obstacle to development. The growth rate of daily traffic volumes on major arterial roads was about 12% on average from 1997 to 2010, and about 80% (569,000 vehicles/day) of the traffic volume in the greater Kampala metropolitan area (713,855 vehicles/day) is concentrated in Kampala City. An influx of vehicles exceeding capacity continues at major junctions around the city. In addition, junctions in Kampala City must rely on traffic control by way of traffic signals installed in multiple locations and police. These junctions have been unable to handle the increasing traffic volume. Because of these conditions, traffic congestion in the morning and evening due to commuting from the suburbs to the city center has become serious. Traffic speeds during peak morning traffic in Kampala City are around 12 km/h, and as low as 3 km/h during peak evening traffic. Also, traffic congestion occurs constantly in the city centre, making traffic improvement in the Kampala city centre a critical issue.

In the Second National Development Plan (NDPII, 2015/ 16–2019/20), references are made to traffic improvement in the greater Kampala metropolitan area. And the Kampala Urban Traffic Plan, formulated by the government of Uganda in 2015 (target year: 2020), positions the improvement of the road network as one component of this, the improvements consisting of the widening of major arterial roads and their increased standardization, as well as improved junctions (including the installation of traffic signals).

2. Background for the Requested Project

The government of Uganda requested Japan conduct the "The Project for Development of ITS Centre in Kampala City" (called "The Project for Improvement of Traffic Control in Kampala City" after a name change; hereinafter referred to as "this project") to establish a traffic control centre and install traffic signals in the city for the purpose of improving traffic in Kampala City.

Japan established environmental improvements to realize economic growth as a priority area in the country-specific development policy in the Republic of Uganda (June 2012). Paying attention to the formulation of projects that make use of Japanese technologies and expertise, Japan is set to contribute to the smooth transport of goods, essential for the economic growth of this landlocked country, through infrastructural improvements over a wide area (roads and electric power) and support for their operation and maintenance. In addition, in the JICA Country Analysis Paper for the Republic of Uganda (March 2015), improving traffic in the greater Kampala metropolitan area is analyzed as a critical issue in the road division. Past experience of offering support in this field includes, traffic improvement facilities and equipment procurement for improving six existing junctions and two related roads in the city center through the grand aid cooperative "Project for the Improvement of Traffic Flow in Kampala City, 1st and 2nd Period" (2005, 2006); and personnel training related to the operation and maintenance of traffic signals and the formulation of specification standards accompanying junction improvement through the technical cooperative "Project for Capacity Enhancement of KCCA in Management of Traffic Flow in Kampala City."

The purpose of this work is to confirm the necessity and validity of the project plan, as well as to create the appropriate design outline for the grant aid project, formulate a project plan, and integrate the project outline costs.

3. Requested Contents

This project aims to improve traffic congestion in Kampala City by establishing a traffic control centre and installing traffic signals at junctions in the city. The expectation is to thereby contribute to the improvement of the traffic environment in order to realize economic growth in Uganda.

[Overall Goal]

To ensure smooth and stable traffic in Kampala City.

[Project purpose]

To establish a traffic control centre and install traffic signals at target junctions in Kampala City.

[Outcome]

Installation of traffic signals at 30 junctions in Kampala City, controlled by the traffic control centre constructed by the Kampala Capital City Authority.

[Projects in Partner Countries]

Transfer of utility facilities, existing traffic signals, and cultural facilities, placement of C/P, formulation of maintenance plans

[Project Sites]

Kampala Central Division, Nakawa Division, and Kawempe Division

[Beneficiaries]

Direct beneficiaries: 1.507 million citizens of Kampala City

Indirect beneficiaries: 2.116 million citizens of the greater Kampala metropolitan area (Kampala City, Entebbe, Kira, Mukono, and Wakiso)

[Supervisory/ Executing Agency]

Kampala Capital City Authority (KCCA)

4. Summary of the Survey Results

JICA dispatched the study team twice in June and September of 2017 to conduct field surveys. At the same time, JICA held discussions with the KCCA on intersection improvement and on the outline of the control centre. In May 2018, JICA again dispatched the study team to the field and gave an explanation regarding the preparatory survey locally, gaining agreement from the KCCA.

The traffic control centre shall be newly constructed on the premises of the KCCA, and the facility plan is to ensure the function of the current parking lot on the planned site. In addition, the control centre is planned to be used as a centre for traffic safety education aimed at citizens and will include space for traffic education and tours.

The control system introduced in the traffic control centre adopts the Japanese MODERATO system, which is capable of the sensitive control of the significant variations in traffic congestion found in Kampala City. This system can handle up to 128 junctions to deal with future expansion.

The targets of the control system are the traffic bottlenecks in the Central Division, found in the Kampala city centre, and 30 junctions along the Kampala-Entebbe Road, a major arterial road in the citycentrer. In addition, JICA plans to control a majority of the critical junctions in the city center, expecting that junctions included in the loan aid project “Kampala Flyover Construction and Road Upgrading Project,” scheduled for parallel implementation with this project, will also fall in the network.

Dedicated optical fiber without signal loss that will be unaffected by future build-up is to be laid for the connections between the controlled junctions and the traffic control centre.

The project is divided into two parts—infrastructure (facility construction) and system (equipment provision)—and executed with consideration toward development.

Table: Project Components

Component (Package)	Particulars	Details
Facility construction	Junction improvement (civil engineering)	Improvements of 30 junctions (A=34,200m^2, Overlay A=14,600 m^2, 321 lanterns for vehicles, 220 lanterns for sidewalks, 28 controllers, 37 image detectors, ultrasonic detector, ducting and wiring work)
	Construction of traffic control centre (architecture)	Reinforced concrete construction. Semi-basement and three floors above ground (A=2,390.8m^2) Internal/external finish, outer walls: mortar bed, coating finish (wall coat); floors: porcelain tile, coating finish (urethane coating), etc. Inner walls: mortar bed, coating finish Ceiling: rock wool acoustic boards (T-frames, system ceiling)
	Development of information infrastructure	Laying flexible fiber optic cable (12C:6,640 m, 60C:9,790 m) Flexible Conduit: 12,654 m; Concrete pipes:1,650 m
Equipment provision	Traffic control equipment	One signal control block, one system management block, one signal control subordinate device, central display boards (twenty 55-inch monitors), one controller for the central display boards, one central display board HMI, seven HMI units

Figure: Traffic Control Centre Floor Plan

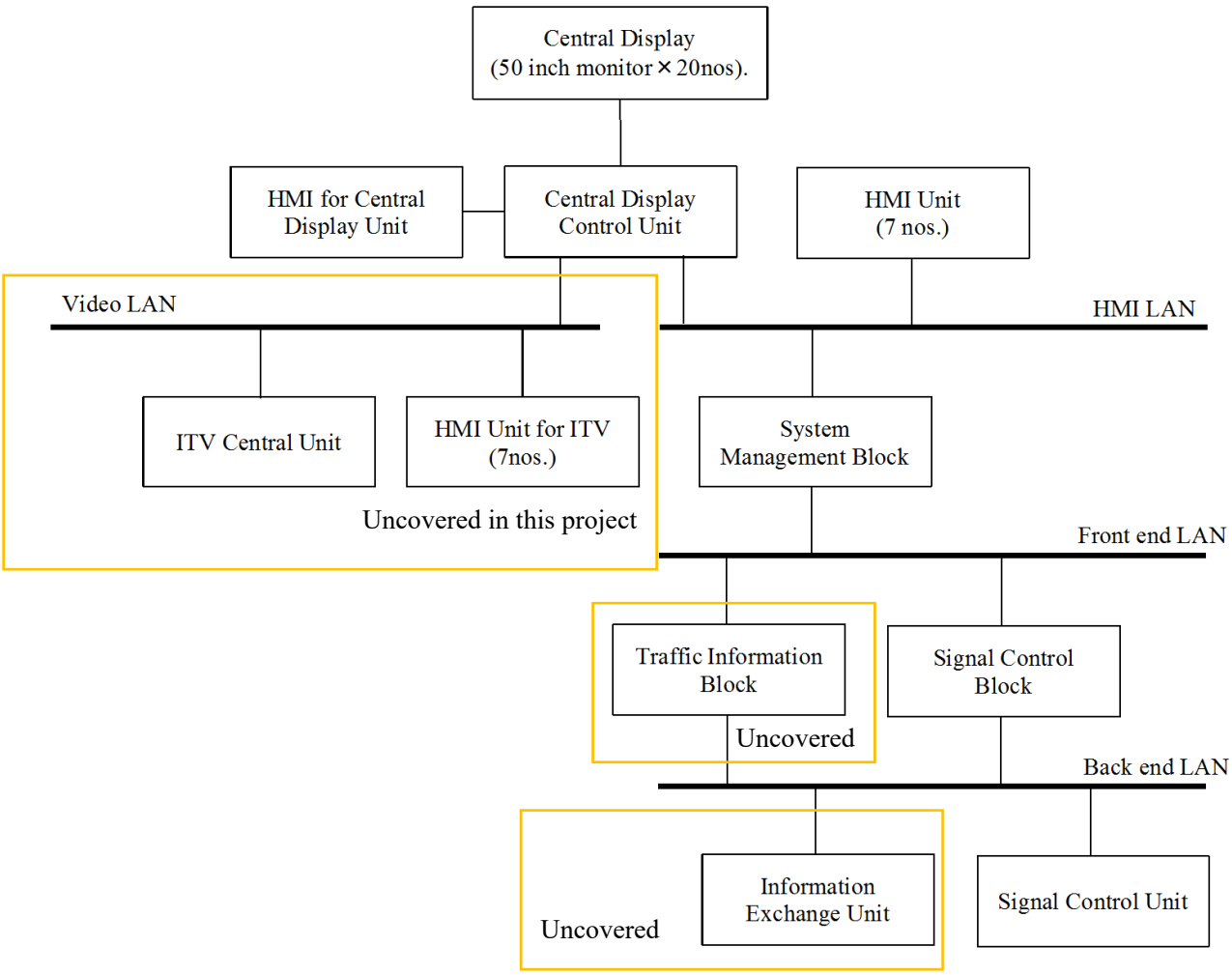

Figure: Outline of Traffic Control System

5. Project Construction Period

The construction period for the project is scheduled to take 37 months. This includes detailed design (4 months), bidding-related (3 months), and equipment hauling and construction work (30 months). Uganda's portion of the estimated project costs required to implement the project are estimated at approximately 500 million yen.

6. Project Evaluation

Validity

Vison 2040, Uganda’s development plan, cites the development of economic infrastructure as a critical issue. This development of infrastructure is expected to facilitate the movement of people and goods, invigorating the economy. The development of economic infrastructure is achieved by implementing the following four initiatives.

- Improved infrastructure and transport sector governance.
- Improved accessibility by connecting international arterial roads and road networks connecting local areas.
- Smoother economic activities through improvements to transportation infrastructure and the competitiveness of airports and railways.
- Citizens are able to use high-quality transportation infrastructure.

Improved junctions and advanced control of traffic will improve road traffic efficiency (competitiveness). Citizens

will then be able to use high-quality transportation infrastructure.

Quantitative Effect

a. Reduced travel times

Improved junctions and control using MODERATO will improve the travel speeds inside the network

Table: Effects of Project Implementation

		Reference Value (Y2017)	Target Value(Y2025) (after 3 years from the Project Completion)
Average Travel Speed (km/h) [1]		10.95	14.70
Average Travel Time (Min)	In	10.4	8,7
	Out	13.8	10.0
Average Passengers (Pax/dat)		424,100	597,800

b. Number of junctions controlled manually by traffic police

Junction improvement will eliminate the need for manual control, allowing for controlled junctions with regularity.

Table: Effects of Project Implementation (Manual Control)

	Without Development	Junction Improvement
Number of Junctions (inside target area)	17	0

Qualitative Effects

The qualitative effects expected with the implementation of this project are shown below.

a. Improved urban efficiency

Travel times on the city center road network can be reduced, with invigorated economic activity and stabilized daily life in the greater Kampala metropolitan area expected, contributing to improved urban efficiency and, secondarily, reduced poverty.

b. Reduced accidents at junctions

Junction improvement will reduce minor accidents caused by traffic congestion and improve traffic safety. Also, the improvement of moving from the current roundabouts to signal junctions will shorten pedestrian crossing distances, which is expected to reduce accidents resulting in personal injury or death.

c. Expansion of employment

In addition to the influx of engineers and laborers to Uganda, the commutable area will expand due to reductions in time and costs related to access to large stores scheduled to enter Kampala City. This is expected to bring new employment opportunities to many areas.

[1] The target to be monitored is an intersection where the congestion at the peak time (measurement time zone 7: 00-8: 00) is conspicuous and the road network shape is complicated (In: start point 5. Station / end point 24. Mulago, Out: start point 24. Mulago / End point 5. Station) We selected a network including five places. The "average travel speed" was the average value of In / Out.

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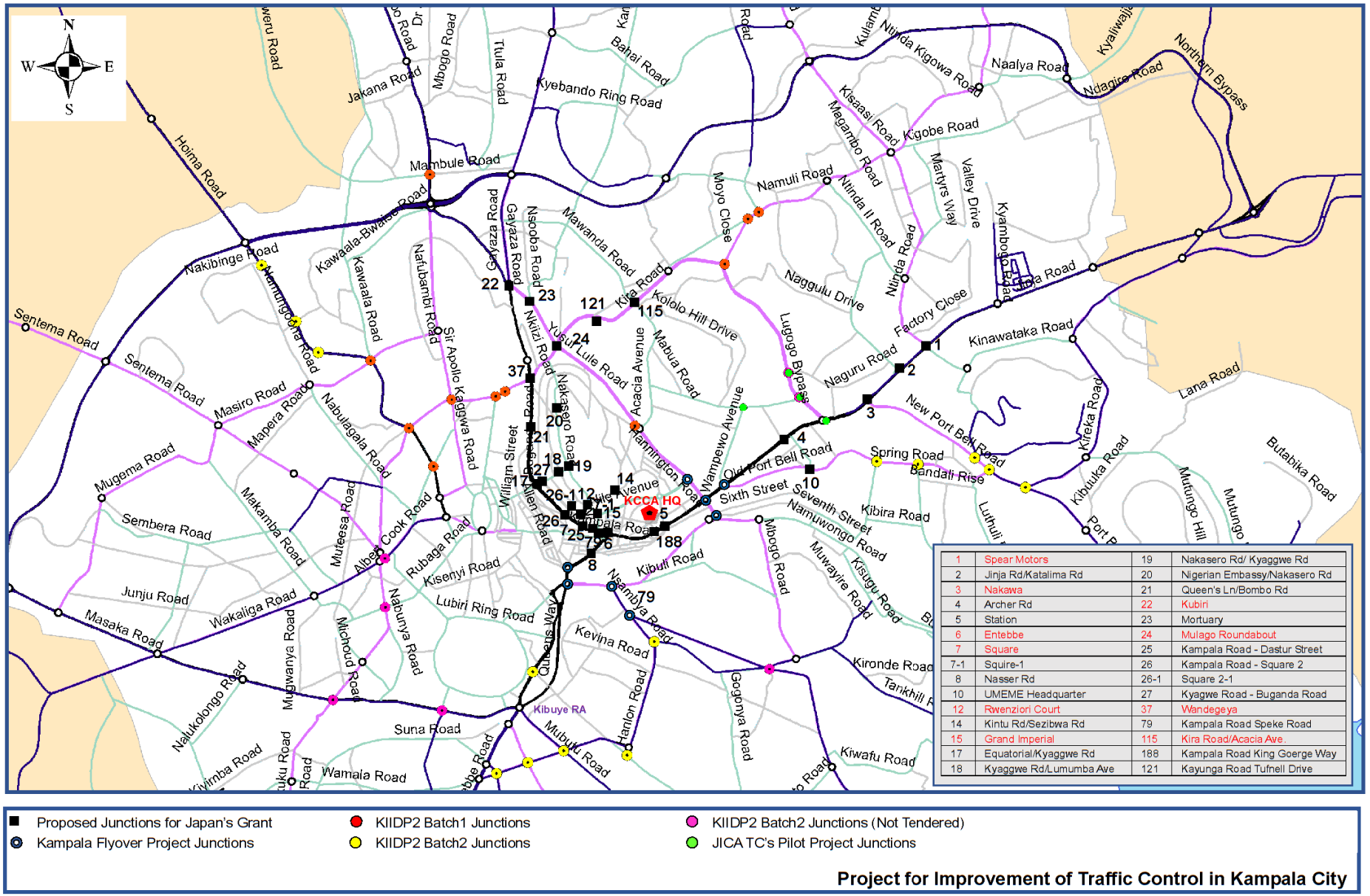
Project Location

Basic Data on Uganda (as of June 2017. Source: Ministry of Foreign Affairs)

■Area	Approx. 241,550 km^2 (2015. World Bank)	■Economic growth rate	5.1% (2015. World Bank)
■Population	39,032,000 (2015. World Bank)	■Rate of inflation	5.1% (2015. World Bank)
■Population growth rate	3.3% (2015. World Bank)	■Unemployment rate	2.28% (2015. World Bank)
■Capital	Kampala City	■Currency	Ugandan Shilling (UGS)
■Ethnic background	Baganda, Lango, Acholi, etc.	■Exchange rate	Maintaining around 1 USD ≒ 3,600 UGS (June 2017)
■Languages	English (1st), Swahili (2nd)	■Japanese assistance (Assistance up until 2014. Ministry of Foreign Affairs)	(1) Loan aid: 28.738 billion yen (2014: - yen)
■Religion	Christian (60%), traditional religions (30%), Islam (10%)		(2) Grant aid: 55.451 billion yen (2014: 2.705 billion yen)
■Major industries	Service; agriculture, forestry, and fisheries; manufacturing and construction; etc.		(3) Technical assistance: approximately 27.011 billion yen (2014: 1.728 billion yen)
■GNI	27.257 billion USD (2015. World Bank)		
■GNI per capita	700 USD (2015. World Bank)		



1	Spear Motors	19	Nakasero Rd/ Kyaggwe Rd
2	Jinja Rd/Katalima Rd	20	Nigerian Embassy/Nakasero Rd
3	Nakawa	21	Queen's Ln/Bombo Rd
4	Archer Rd	22	Kubiri
5	Station	23	Mortuary
6	Entebbe	24	Mulago Roundabout
7	Square	25	Kampala Road - Dastur Street
7-1	Squire-1	26	Kampala Road - Square 2
8	Nasser Rd	26-1	Square 2-1
10	UMEME Headquarter	27	Kyagwe Road - Buganda Road
12	Rwenziori Court	37	Wandegeya
14	Kintu Rd/Sezibwa Rd	79	Kampala Road Speke Road
15	Grand Imperial	115	Kira Road/Acacia Ave.
17	Equatorial/Kyaggwe Rd	188	Kampala Road King Goerge Way
18	Kyaggwe Rd/Lumumba Ave	121	Kayunga Road Tufnell Drive

Figure: Proposed Junctions for Project

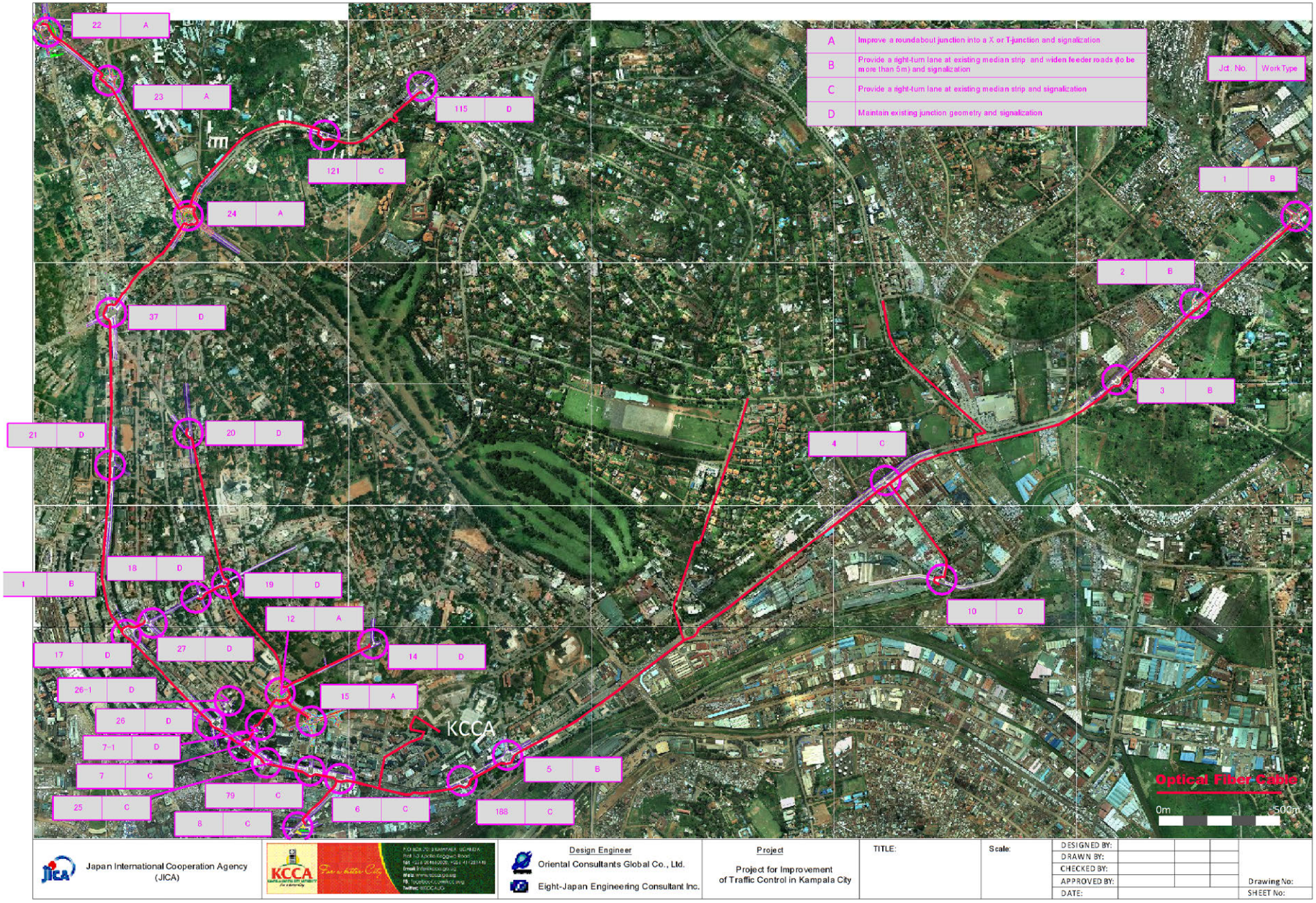


Figure: Proposed Junctions for Project

CONCEPTIONAL IMAGES

Overview of Traffic Control Centre

Overview of Traffic Control Centre

Control Room

Control Room

Road Safety Educational Space

Server Room

Traffic Control Centre

Improved Signalized Junctions from Roundabouts

PHOTOS

Kyaggwe Road
Shops along the roadside have been developed, motorcycle taxis waiting for shoppers and customers, crowded with passing traffic.

Junction with Kampala Road and Kyaggwe Road(Semi Roundabout）
It is crowded with traffic flowing into Kyaggwe Road.

Junction with Namirembe Road and Nakivudo Place Road
In areas where New Taxi Park and shops are located, traffic volume of pedestrians and light vehicles is larger than the traffic volume of vehicles.

Junction with Namirembe Road and Ben Kiwanuka Street
Although roads are crowded with taxis and buses, there is little general through traffic.

Entebbe-Kampala Road Junction
Improved by Japan's Grant Aid in 2005

Typical Grid Lock scene at un-signalized junction

Figures & Tables

ABBREVIATIONS

A/P	AUTHRIZATION TO PAY
AASHTO	AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
AC	ASPHALT CONCRETE
AIDS	ACQUIRED IMMUNE DEFICIENCY SYNDROME
BOD	BIOCHEMICAL OXYGEN DEMAND
CBD	CENTRAL BUSINESS DISTRICT
CBR	CALIFORNIA BEARING RATION
CCTV	CLOSED-CIRCUIT TELEVISION
CD	CADMIUM
CNDPF	COMPREHENSIVE NATIONAL DEVEOPMENT PLANNING FRAMWORK
CO	CARBON MONOXIDE
COD	CHEMICAL OXYGEN DEMAND
COMESA	COMMON MARKET FOR EASTERN AND SOUTHERN AFRICA
CR	CHROMIUM
CU	COPPER
DFID	DEPARTMENT FOR INTERNATIONAL DEVELOPMENT
E/N	EXCHANGE OF NOTES
EAC	EAST AFRICAN COMMUNITY
EIA	ENVIRONMENTAL IMPACT ASSESSMENT
EIR	ENVIRONMENTAL IMPACT REVIEW
EU	EUROPEAN UNION
FS	FEASIBILITY STUDY
G/A	GRANT AGREEMENT
GDP	GROSS DOMESTIC PRODUCT
GKMA	GREAT KAMPALA METROPOLITAN AREA
GNI	GROSS NATIONAL INCOME
H2S	HYDROGEN SULFIDE
HG	HYDRARGYRUM
HIV	HUMAN IMMUNODEFICIENCY VIRUS
IEC	INTERNATIONAL ELECTROTECHNICAL COMMISSION
ISO	INTERNATIONAL ORGANIZATION FOR STANDARDIZATION
JICA	JAPAN INTERNATIONAL COOPERATION AGENCY
KCCA	KAMPALA CAPITAL CITY AUTHORITY
KIIDP-2	KAMPALA INSTITUTIONAL AND INFRASTRUCTURE DEVELOPMENT PROJECT PHASE 2
KPDP	KAMPALA PHYSICAL DEVELOPMENT PLAN
LAN	LOCAL AREA NETWOK
LED	LIGHT EMITTING DIODE
MATA	METROPOLITAN AREA TRANSPORT AUTHORITY
MC	MEDIA COVERTER
MODERATO	MANAGEMENT BY ORIGIN-DESTINATION RELATED ADAPTION FOR TRAFFIC OPTIMAZATION
MOWT	MINISTRY OF WORKS AND TRANSPORT
MOWHC	MINISTRY OF WORKS HOUSING AND COMMUNICATION
MOWT	MINISTRY OF WORK AND TRANSPORT
NDB	NON DIRECTIONAL RADIO BEACON
NEMA	NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY
NMT	NON-MOTORIZED TRAFFIC
NO2	NITROGEN DIOXIDE
NOX	NITROGEN OXIDE
NRSA	NATIONAL ROAD SAFETY AUTHORITY
NSSF	NATIONAL SOCIAL SECURITY FUND
NWSC	NAATIONAL WATER SWEREGE CORPORATION
O3	OZONE
OJT	ON THE JOB TRAINING
RA	ROUNDABOUT
SO2	SULFUR DIOXIDE
SOX	SULFUR OXIDE
T-N	TOTAL NITROGEN
T-P	TOTAL PHOSPHORUS
TCC	TRAFFIC CONTROL CENTRE
TSDP	TRANSPORT SECTOR DEVELOPMENT PROJECT
UBOS	UGANDA BUREAU OF STATISTIC

UGX	UGANDAN SHILLING
UNRA	UGANDA NATIONAL ROADS AUTHORITY
URA	UGANDA REVENUE AUTHORITY
UTMP	URBAN TRAFFIC MANAGEMENT PLAN
VLAN	VIRTUAL LAN
WB	WORLD BANK
WHO	WORLD HEALTH ORGANIZATION
ZN	ZINC

CHAPTER 1 PROJECT BACKGROUND AND HISTORY

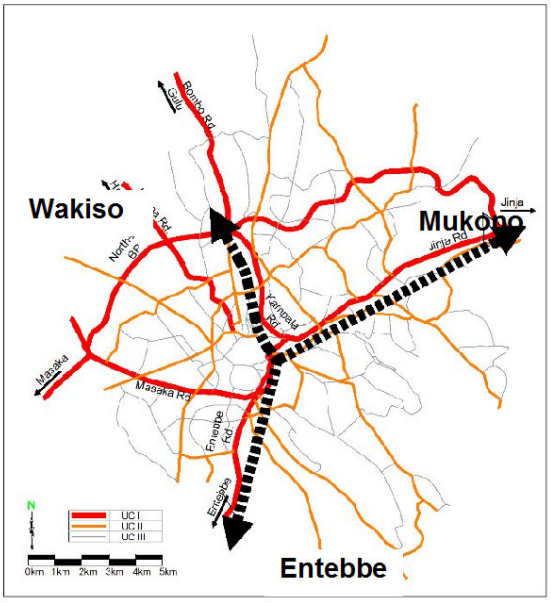
1.1 Existing Status and Challenges in the Sector

1.1.1 Existing Status and Challenges

Uganda's economy has been growing rapidly. Its economic growth rate in 2015 was estimated to be 5.0% and it is also expected to be between 5.0% and 5.8% after 2016. Traffic congestion is heavy especially in Kampala City. The traffic speed at various places in the city at peak hours in the morning and evening is 10km/hr. or less.

Various factors including a rapid increase in traffic volume due to development of economic activities are causing traffic congestion. The following are the causes that are related to UG's traffic management and road network.

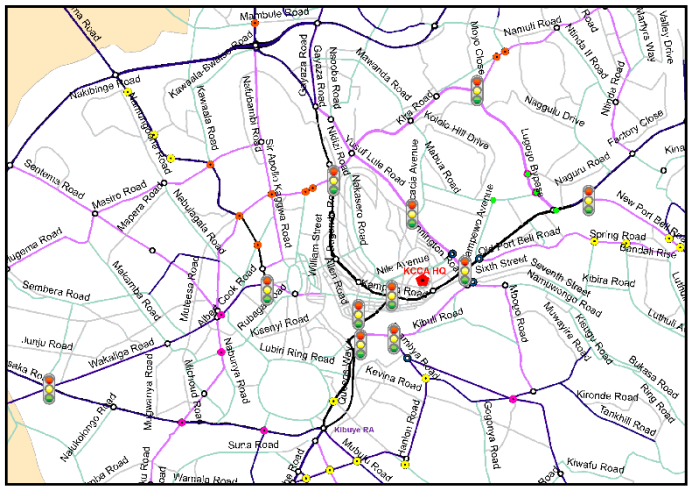
(1) Underdeveloped Infrastructure for Traffic Management and Lack of Plans for Traffic Improvement



Source: JICA Study Team

Figure 1.1 Road Network in Kampala

The number of signalized junctions in Kampala City is only 11 although the city, which has a population of 1.65million people, is one of the largest cities in the East African Community ("EAC"). Kampala Institutional and Infrastructure Development Project 2 ("KIIDP2"), whose objective is signalization of junctions in the city to improve the shortage of signalized junctions, is being implemented by Kampala Capital City Authority ("KCCA") with financial support of the World Bank. Except for some junctions, the Central Division, which is the political and economic center of UG and where the KCCA main building is, is not covered by the project to avoid overlapping with the Bus Rapid Transit Project ("BRT") for which the same World Bank has offered financial support.



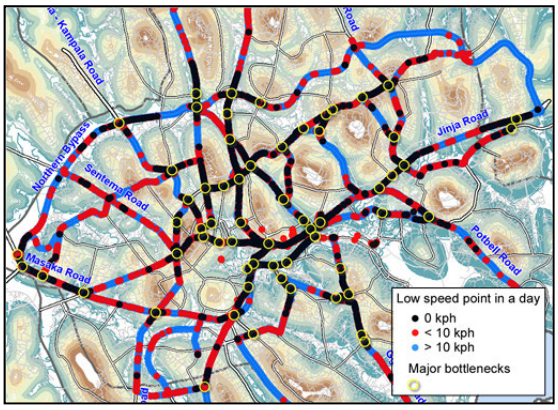
Source: JICA Study Team

Figure 1.2 Signalized Junctions in Kampala City

Since the finishing of the detailed design of BRT, its operations in the pilot corridors were supposed to commence in 2018. However, KCCA hasn't found any operating body. It is not clear when they will be able to launch the project including construction of its infrastructure. BRT was also introduced in Dar es Salaam, Tanzania, which is another metropolis in the above-mentioned EAC. It took almost 10 years for them to complete design and construction and start to operate BRT. A similar period of time also should be considered for Kampala. To improve the traffic conditions in Kampala CBD, the most important area in UG, the Study Team need to consider and implement short-term programme that can handle future projects.

(2) Presence of the Disorganized Road Network and Bottlenecks

Since Kampala is surrounded by seven hills, its terrain is rich in undulations. Since the road network is developed around valleys, it's irregularly shaped along the terrain. In addition, due to the unregulated urban development, trunk roads flowing into the vicinity of the city are not systematically arranged. There are also many roundabouts on the highways and due to low traffic capacity of the roundabouts (hereinafter referred to as RA), there is a prominent gridlock during the morning and evening peak hours. This gridlock, then, affects junctions in the surrounding areas, which causes traffic congestion on all the city center road network.

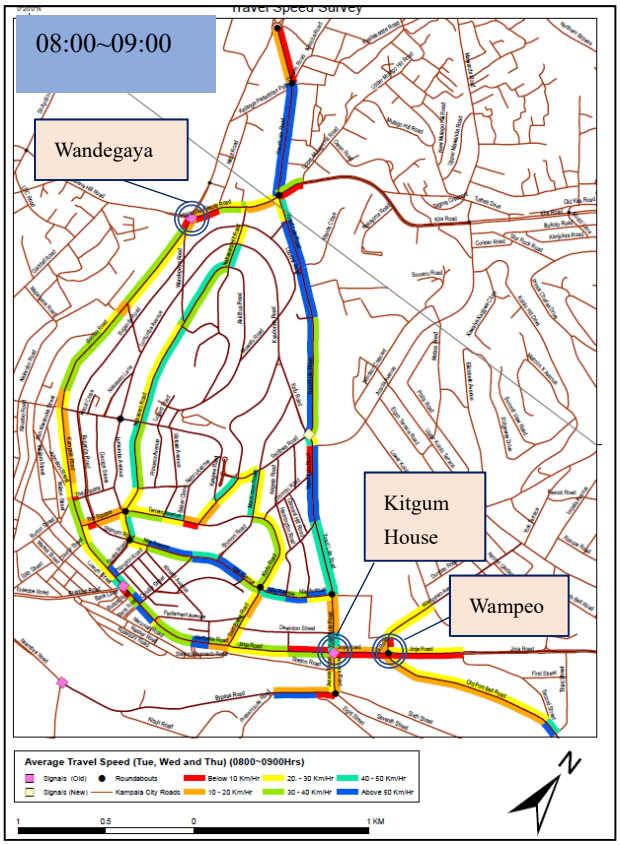


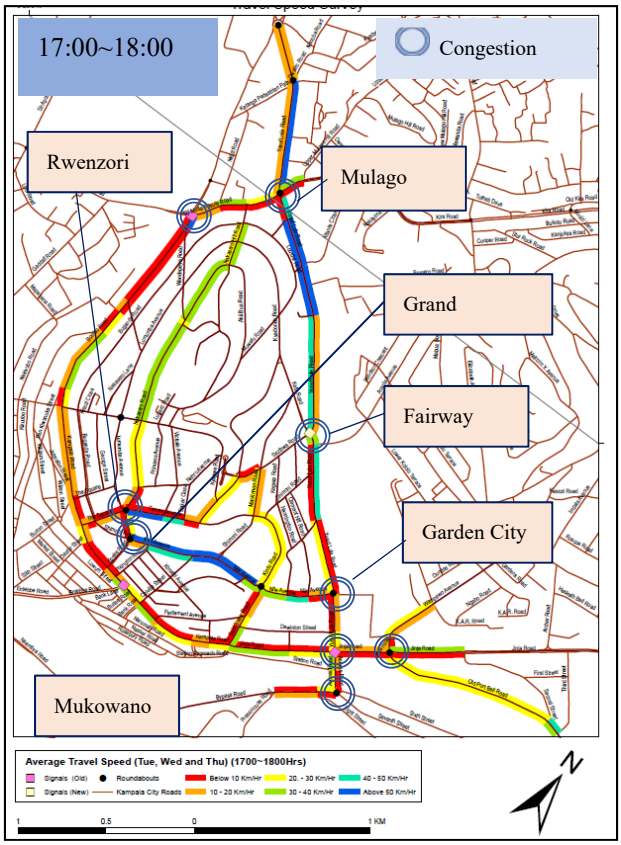
Source: Technical Cooperation Project

Figure 1.3 Traffic Speed and Congestion Points in the Center of Kampala

Figure 1.3 shows bottlenecks on the road network based on results of the traffic speed survey conducted by JICA, "the Project for Capacity Enhancement of KCCA in Management of Traffic Flow in Kampala City" (Technical Cooperation Project: TCP).

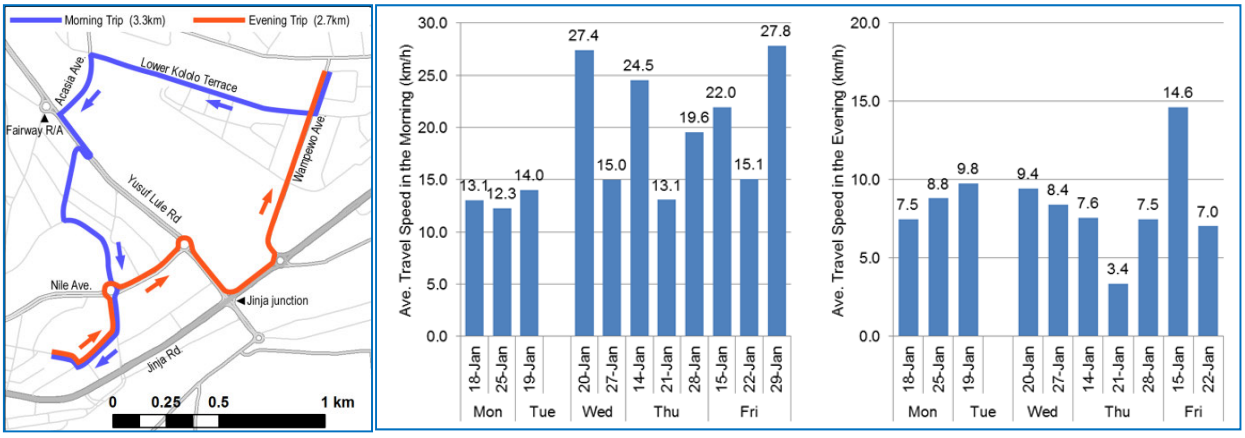
Figure 1.4 shows results of the speed survey (June 2017) conducted by TCP. It shows that in the Central Division, traffic congestion is generated in 6 RA points, namely Wampewo, Mulago, Garden City, Rwenzori, Grand Imperial and Mukwano and in 3 junctions, namely Wandegeya, Fairway and Kitgum.





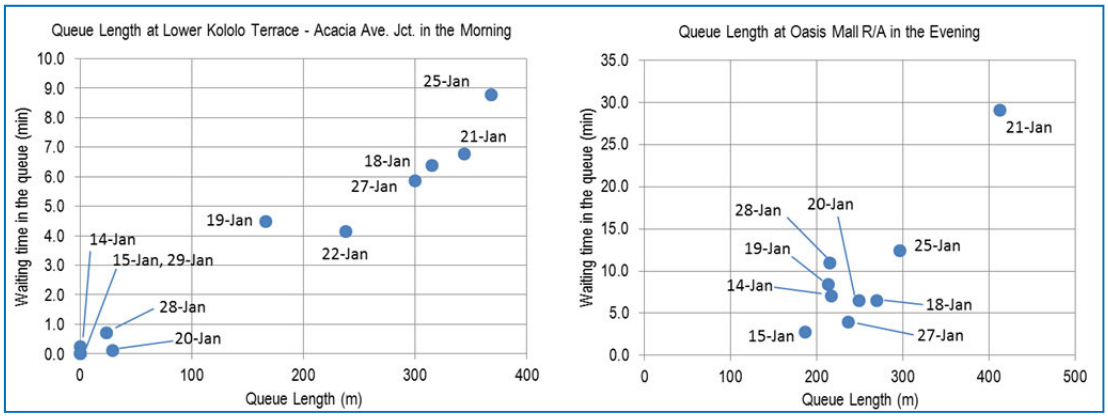
Source: Technical Cooperation Project

Figure 1.4 Kampala CBD Congestion Points



Source: Technical Cooperation Project

Figure 1.5 Average Travel Speed (Peak Time)

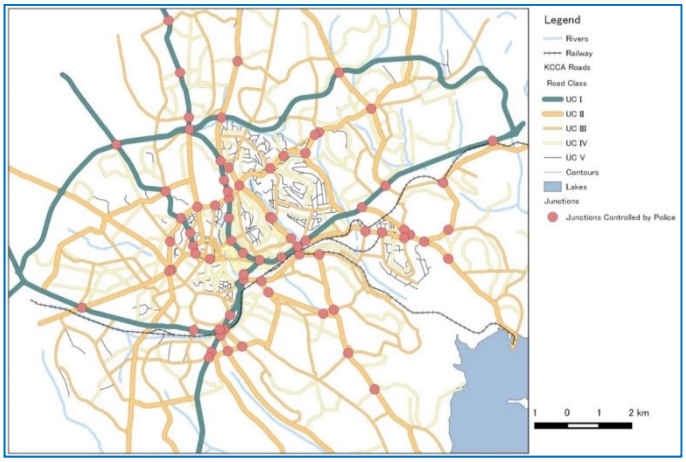


Source: Technical Cooperation Project

Figure 1.6 Queue Length (Peak Time)

(3) Signal stages incompatible with the changing traffic volumes and inefficient manual control by the traffic police.

Today's currently installed traffic signals in Kampala cannot cope with demand fluctuations, so traffic control is being carried out by means of manual control by traffic police officers for emergency cases. Manual control at junctions requires a lot of traffic police officers but due to insufficient resources and insufficient traffic control literacy among the traffic police officers, manual control at junctions has no sufficient effect.



Source: Technical Cooperation Project

Figure 1.7 Manually Controlled Junctions

Also, synchronization of the traffic cycle between adjacent junctions is not automated. The police officers do it by means of radio and mobile phone communications, which tends to cause unnecessary time gaps.

(4) Traffic Rules Have Become a Formality

Boda-boda (bike taxi) riders, minibus (taxis without designated routes) drivers tend to disregard traffic rules by selfishly driving on the roads. Sudden overtaking, lane changing and driving towards opposite traffic spur traffic congestion.

1.1.2 Development Plan

(1) Vision 2040

The government of Uganda formulated its Vision 2040 with 2040 as the planned year as the follow-up paper to the 2007 Comprehensive National Development Planning Framework (CNDPF). This Vision 2040 aims to grow Uganda from a low-income nation to a middle-income nation with economic competitiveness within 30 years.

The development concept in Vision 2040 is to strengthen infrastructure such as energy, transportation, water, oil, gas, ICT, etc. with oil and gas, tourism resources, minerals, ICT business, and the abundant labor force found in Uganda as the backbone. This will enrich science, technology, engineering, and innovation (STEI); land; urban development; human resources; and peace, security, and defense fields.

Vision 2040 sets target socio-economic indicators such as a per capita income of 9500 USD/year, a proportion of the population below the poverty line of less than 5%, and 80% or more of road networks be paved. These are utilized as monitoring indicators to achieve the Vision 2040 objective.

(2) Second National Development Plan (NDPII) (2015/16–2019/20)

NDPII, launched in June 2015, was created with the theme of "Strengthening Uganda's Competitiveness for Sustainable Wealth Creation, Employment and Inclusive Growth." Also, NDPII follows up on Vision 2040, identifying key areas of development such as agriculture, tourism, mineral resources, oil and gas development, infrastructure development, and human capital development. It places particular focus on agricultural development, aiming to integrate 72% of the total labor force and achieve 54% of total exports and 25.3% of the GDP (2012/13). In addition to this, NDPII cites private sector utilization, including public-private partnerships (PPP), development partners, and other non-state actors as sources of medium-term development funds.

(3) Kampala Physical Development Plan (KPDP)

The KCCA formulated the Updating Kampala Structure Plan and Upgrading Kampala GIS Unit (hereinafter "KPDP") with the aim of formulating comprehensive urban planning for the greater Kampala metropolitan area (hereinafter "GKMA").

The KPDP predicts population frames according to the following three scenarios.

- Present case scenario: This scenario assumes that current economic growth and other social indicators will remain relatively the same as they are today. In this scenario, it is predicted that the polarity of the city will increase and that disparity will expand. It is the most realistic scenario; it is also an undesirable one.
- Worst-case scenario: In this scenario, the concentration of the population in urban areas is accelerated, and a large, unstable, and inconvenient city is formed. If such conditions continue over the long-term, they will result in major delays in terms of development when compared to other African cities. This is a scenario that must be avoided.
- Best-case scenario: Planned investment leads to the development of areas in the city, leading to a modern, highly-efficient city. This scenario is the one drawn up in the NDP; it is also one that can be realized when investment in the city is conducted skillfully. It assumes that the rebuilding of the urban structure and improvements to urban infrastructure are conducted systematically.

Population projections for the future based on these scenarios are as shown in Table 1.1.

Table 1.1 GKMA Population and Household Projections by Scenario

Assumption and Projection	2011 Estimate	Business as Usual 2040(2022)	Worst Case 2040(2022)	Best Case 2040(2922)
Growth Assumption		Consistent 4.75%	Increasing to 6.5% by 2040	Reducing to 3.5% by 2040
Natural Growth Assumption		Reducing to 2.0% by 2040	Reducing to 2.0% by 2040	Consistent 2.25%
In- migration		Increasing to 2.75% by	Increasing to 4.5% by	Reducing to 1.25% by

Assumption		2040	2040	2040
Population	3,150,000	12,000,000 (5,000,000)	15,600,000 (6,000,000)	10,000,000 (4,800,000)
Kampala born	45%	46%	39%	55%
House hold size	3.9	3.5	3.3	3.7
Households	800,000	3,430,000	4,730,000	2,700,000

Source：KPDP

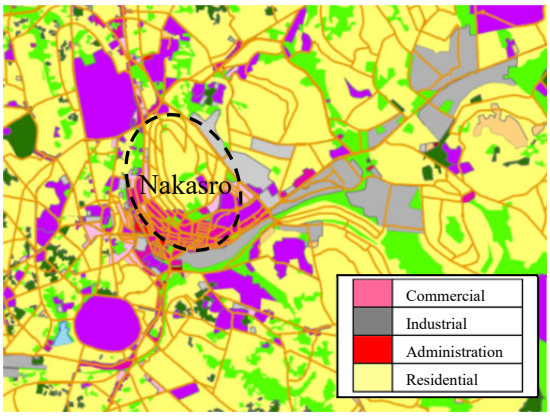
Table 1.2 Kampala City Population Projections

Division	2011	2022	2022/2011
Central	104,000	139,000	133.7%
Kawempe	425,000	555,000	130.6%
Makindye	450,000	609,000	135.3%
Nakawa	354,000	542,000	153.1%
Rubaga	417,000	603,000	144.6%
KCCA	1,750,000	2,448,000	139.9%

Source：KPDP

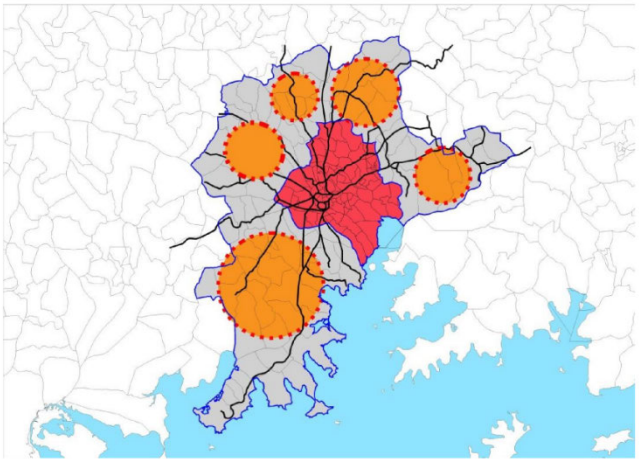
The above population frames are also adopted in BRT and Japan's loan aid project “Kampala Flyover Construction and Road Upgrading Project” (hereinafter “Kampala Flyover”), which is scheduled to be implemented in Kampala City.

The KPDP proposes four models for the distribution of urban functions, strategies for the improvement of the urban structure.

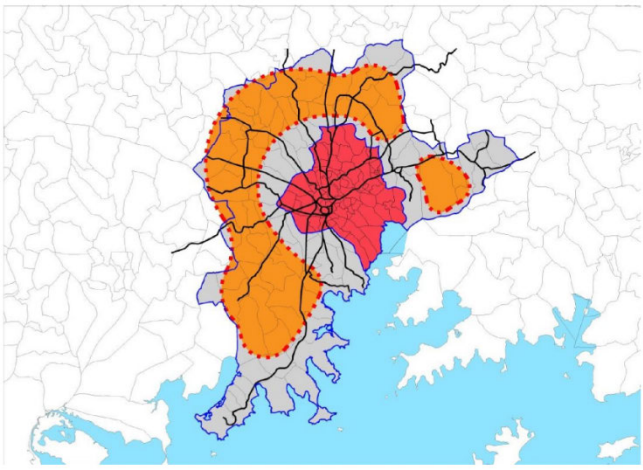


Source: JICA Study Team

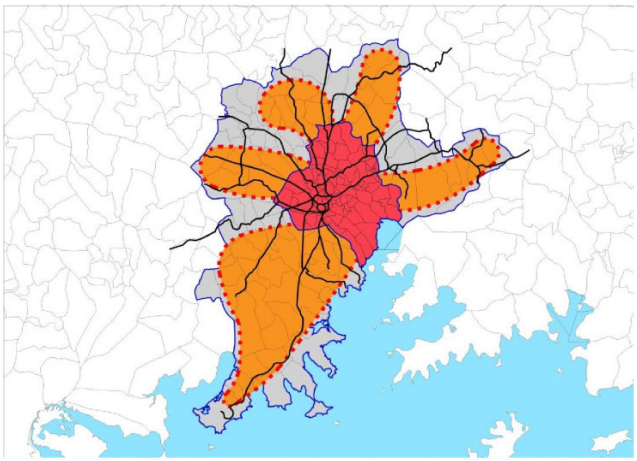
Figure 1.8 Urban Structure of Kampala



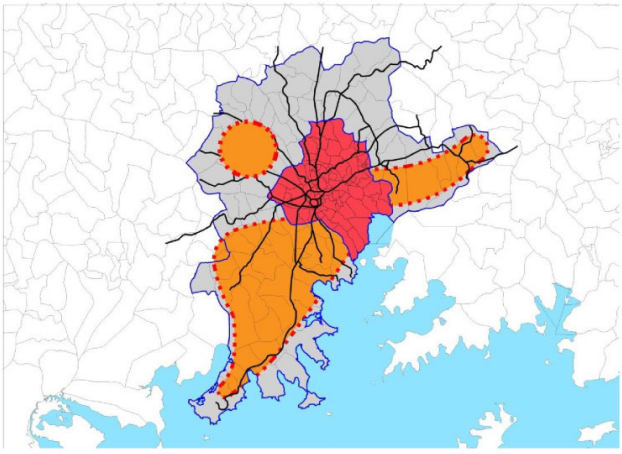
Satellite Model: In the satellite model, new clusters are established like satellites around the urban functions established in the Kampala city center (e.g. Mukono and Wakiso) to improve efficiency by distributing these urban functions. In this model, construction of highly reliable modes of transportation are critical for connecting the satellites and the city center.



Belt Model: The belt model distributes urban functions in the shape of a belt; development continues the extension of the belt. The advantage of this model is to not induce further concentration of urban functions in Kampala City. However, it requires the construction of highly reliable modes of transportation in the shape of a belt.



Radial Model: This model is similar to the Belt Model, but the distribution proceeds along the current radial roads. The advantage of this model is that the amount of development investment can be kept to a minimum. However, it requires improving the function of existing radial roads.



East-West Axis Model: This model features the same concept as the Radial Model, but the distribution of urban functions is limited to the east-west axis. Considering the expansion of the current urban area, this model is the most realistic.

Source：KPDP

Figure 1.9 Urban Function Assignment Plan

1.1.3 Review of the Urban Traffic Management Plan (UTMP)

Traffic flow technology professionals developed the “Urban Traffic Management Plan (UTMP)”, a strategic document for road network management. In this UTMP, three points, “traffic flow”,” traffic safety” and “control of traffic demand”, were designated as the main challenges, considering Kampala’s current traffic situation. The necessity for installation of traffic signals and a traffic control system was thus raised as a countermeasure to the challenges.

The UTMP aims to achieve the 3S namely, ‘Smooth Flow’, ‘Safety’ and ‘Shifting Demand’, and suggests a traffic strategy of the 3E policies, namely, ‘Engineering’, ‘Enforcement’ and ‘Education’ to achieve the 3Ss.

Table 1.3 Traffic Management Policy of the UTMP

		Traffic Management Policy		
		Engineering	Enforcement	Education
Planned Objectives	Smooth Flow Promotion of Traffic Safety	-Improvement of geometric design standards for roads and junctions. Junction improvement works -Signalization of junctions -Centralization of traffic signal control. -Installation of road signs and markings. - Installation of protective fences on sidewalks.	-Introduction of traffic regulations that correspond to the road geometry. -Strict regulations on the inflow of large vehicles into the city center. -One-way traffic	-Development of a traffic safety manual. -Promotion of education in traffic safety. -Carrying out regular traffic safety campaigns. -Review of the driving license system
	Shifting of Traffic Demand	Improve the quality of public transport services such as the introduction of city buses, park & ride etc.	Measures to prioritize public transport. - Regulations on the inflow of boda-bodas and taxis into the city center	PR activities that contribute to demand management. - Enhancement of KCCA’s ability to develop traffic plans.

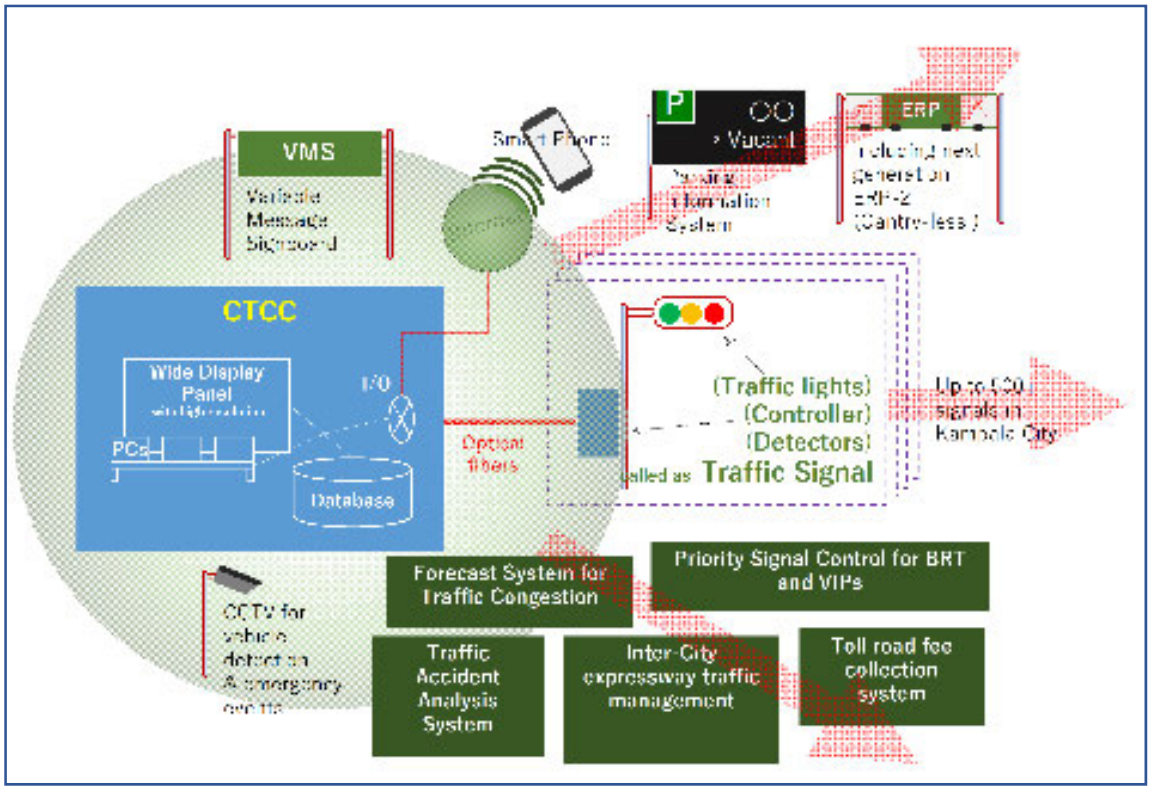
Source: Technical Cooperation Project

Table 1.4 UTMP's Plan for Traffic Improvement

Planned Objectives	Implementation Plan
Eliminate traffic bottlenecks to achieve smooth traffic flow	- Identify bottleneck points. - Improvement of junction and RA geometry. - Signalize junctions - Introduce an area traffic control system - Establish a central control center
Use ITS to provide drivers with information on traffic conditions ITS	Identify traffic information to be provided. - Collect and analyze the data. - Integrate with the area traffic control system.
Plan to disperse generated traffic volumes through demand management.	- Introduction of road pricing and area restriction. - Introduction a time-difference commuting system. - Introduction of the park & ride system. - Introduction of the ride-sharing system. - Develop a traffic environment that corresponds to non-motorized transport (NMT).
Ensuring safe and smooth traffic by strengthening supervision.	- Impose more strict penalties on driving through a red light. - Introduction of hourly traffic flow for heavy vehicles. - Impose more strict penalties on traffic violators. - Strengthen crackdown on illegal parking. - Introduce one-way traffic. - Enforcement of the traffic impact assessment.
Plan to optimize traffic safety, attitude on roads and transport means through awareness campaigns.	- Conduct traffic safety campaigns. - Conduct PR activities on traffic safety. - Provide information on traffic congestion.
Secure sufficient financial resources to enable the implementation of proper policies.	- Secure a budget for the maintenance of the area traffic control system. - Secure a budget for the maintenance of traffic safety facilities. - Secure a new budget for traffic management.

Source: Technical Cooperation Project

Some of the proposals include the introduction of a central control system with the main objective of facilitating smooth traffic flow and enhancement of traffic safety, including the introduction of traffic signals that correspond to the system. It also refers to the efficient operation of the road network using the traffic information provided by the central control system.



Source: Technical Cooperation Project

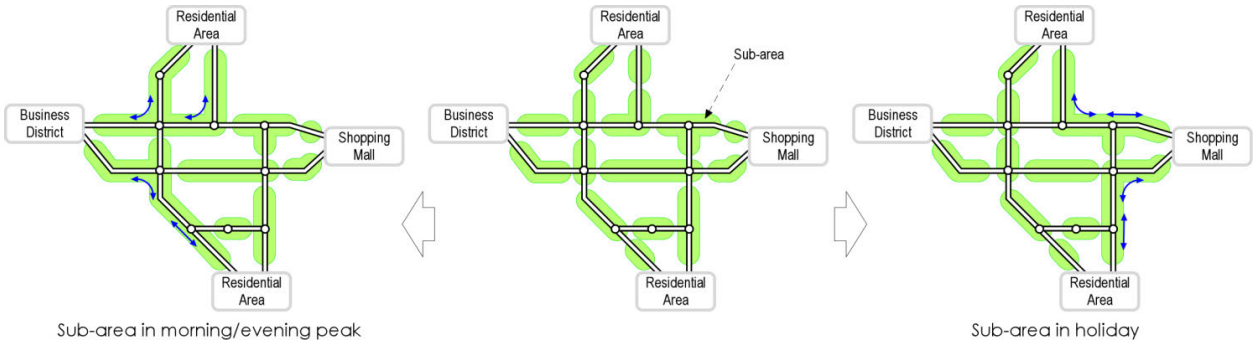
Figure 1.10 Outline of the Central Control System

UTMP proposes the adoption of Japan's MODERATO as the central control system because of the following reasons:

[A] Configuration of the Kampala Road Network

The road network in Kampala has an intricate configuration that is fitted with Kampala's rolling geographic features. SCOOT and SCATS are systems suitable for grid (lattice) networks but since MODERATO was developed in Japan (with a similarly rugged terrain), it can cope with complicated road network shapes. MODERATO designates a number of subareas and control is area wise.

SCOOT also employs a similar method; however, it only optimizes traffic within a subarea and cannot coordinate subareas when they are organically connected.



Source: JICA Study Team

Figure 1.11 Flexible Setting of Subareas by MODERATO

[B] Characteristics of Traffic in Kampala

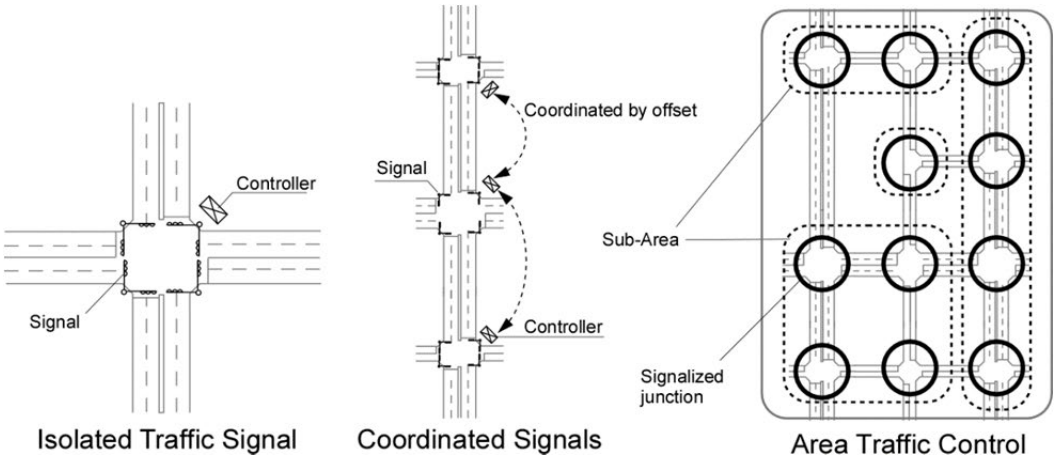
Because the traffic volume per hour or location fluctuates widely due to various factors, very long traffic jams can be generated in Kampala. For this reason, a traffic control system that can oversee a daily varying traffic flow is required. Since the SCOOT and SCATS systems principally assume one detector for an inflow route, they are not capable of capturing a bird's eye view of the traffic congestion situation. On the other hand, MODERATO can adjust the number of detectors according to the conditions of each location in order to control traffic, taking into account the overall traffic conditions.

[C] Response to the provision of traffic information.

In SCOOT and SCATS, information from vehicle detectors is used only for setting of traffic signals at specific junctions, and they are not capable of collecting data to provide drivers as traffic information. On the other hand, since MODERATO supports multiple detectors and it also can collect information and output it for analysis, it is possible to integrate the traffic information provision system. In Japan, information from the traffic control system is provided via TV, radio, Internet, VMS, etc.

[D] Traffic Safety Consideration

During off-peak hours such as during nighttime, a number of vehicles run through the city's main roads at high speeds but because of MODERATO's high-speed actuated control, it is capable of detecting these vehicles and enabling a fast response control by displaying the red signal at the junctions ahead. Besides, additional functions such as dilemma control for prevention of rear-end accidents can be installed.

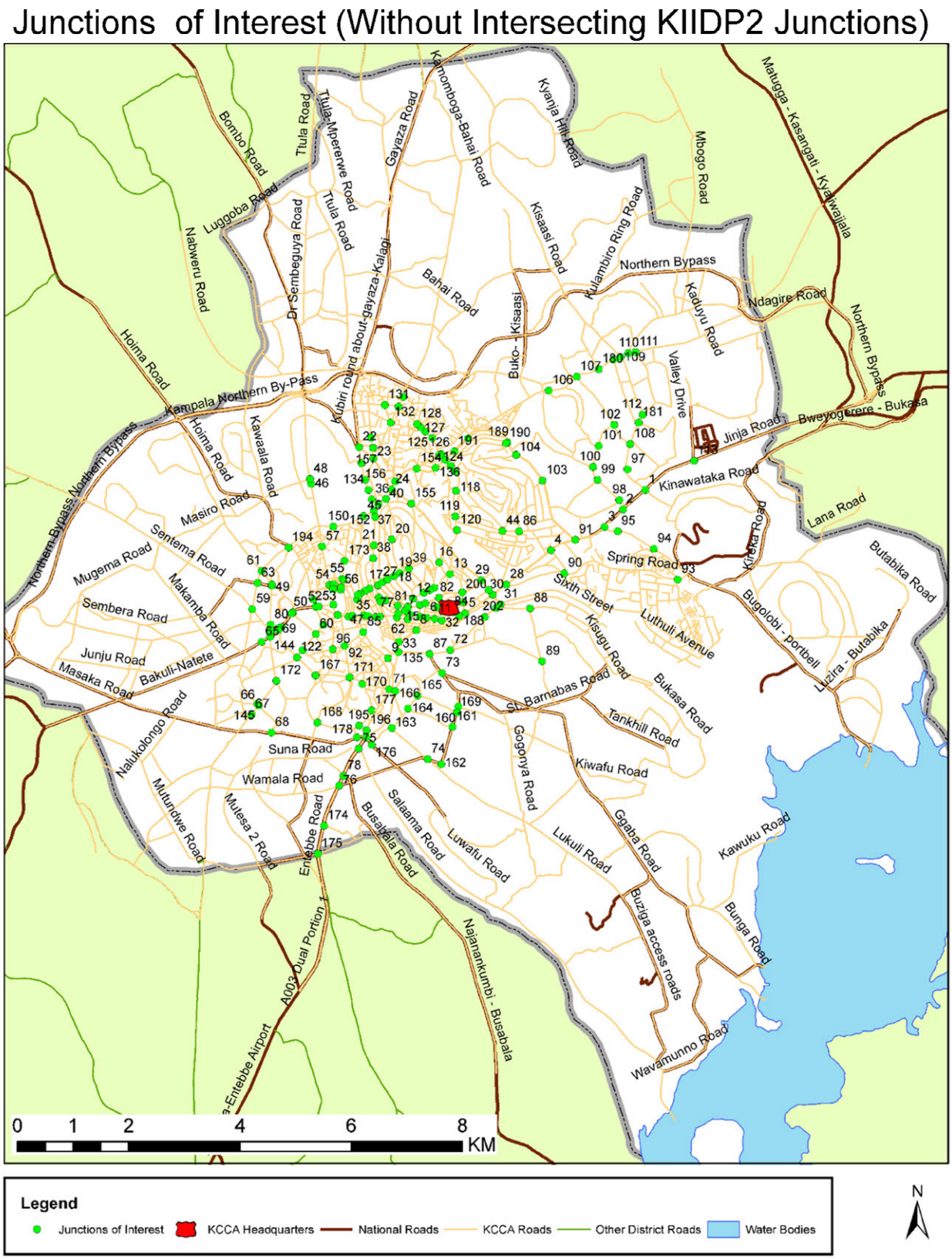


Source: Technical Cooperation Project

Figure 1.12 Conceptual Diagram of the Area Traffic Control System

However, in order to effectively utilize these systems, compliance with traffic regulations and improvement of road users' manners on roads are essential. Proposals for traffic control regulations and education programme are also being made. In the Technical Cooperation Project, a list of junctions to be signalized in the future was compiled, with consideration to avoid any duplication with other road development programme. Figure 1.13 shows the designated 201 junctions. In this survey, the following evaluation items were used to select 80, out of the 20, junctions to be given priority for improvement:

- Degree of importance by road type.
- Positional relationship with the Central Business District (CBD).
- Relevance with road improvement strategies.



Source: Technical Cooperation Project

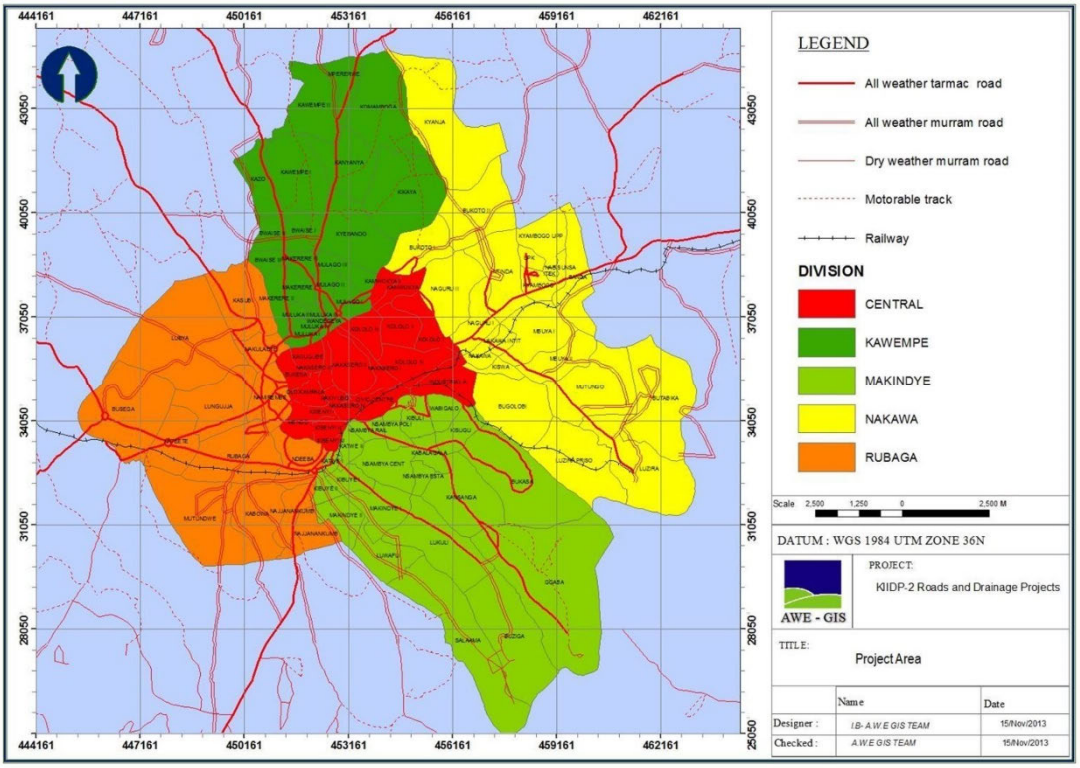
Figure 1.13 Target Junctions for Signalization (UTMP).

1.1.4 Socio Economic Condition

Not only is Kampala City the capital of Uganda and the center of politics, it also functions as the center of Uganda's commercial, manufacturing, and transportation industries. Furniture and machine parts make up the primary manufacturing industry there. It boasts the ninth largest production volume in the world for coffee, and is also a center for exporting cotton, tea, and sugar overseas.

(1) Divisions

Kampala City consists of five divisions: Central, Kawempe, Makindye, Nakawa, and Rubaga. The mayor of each division is chosen via election. The term for mayor is five years. Table 1.5 through Table 1.8 show the results of the 2014 census.



Source: Resettlement Policy Framework for proposed KIIDP II Projects

Figure 1.14 City Administrative Boundary

Table 1.5 Popultion by Sex and Age

Age Group	Kampala District		
	Male	Female	Total
0-9	195,332	182,208	377,540
10-19	137,414	181,628	319,042
20-39	295,908	348,163	644,071
40-59	71,264	66,188	137,452
60+	12,844	16,131	28,975
Total	712,762	794,318	1,507,080

Table 1.6 Numbers of Household by Age

Age	Kampala District					
	Central	Kawempe	Lubaga	Makindye	Nakawa	Total
15-24	21,231	91,308	102,224	105,630	83,391	403,784
15-29	31,186	132,072	150,130	155,662	123,670	592,720

15-49	24,636	109,139	125,688	127,277	101,980	488,720
65+	1,031	3,696	4,378	4,340	3,468	16,913

Table 1.7 Literacy Rate

	Kampala District					
	Central	Kawempe	Lubaga	Makindye	Nakawa	Total
Literate	44,956	178,851	204,273	212,493	172,865	813,438
Not Literate	3,211	11,034	11,117	13,375	9,868	48,605

Table 1.8 Emplyment Rate

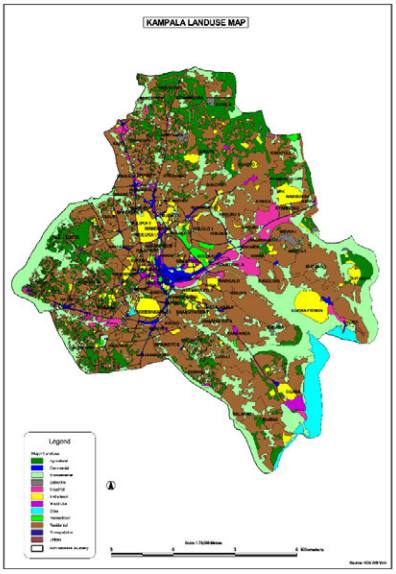
		Central	Kawempe	Lubaga	Makindye	Nakawa	Total
Age+15	Working	33,704	132,381	148,607	164,137	125,995	604,824
	Not Working	19,237	78,771	91,189	87,246	76,286	352,729
Children 10-17 years	Working	1,451	6,173	6,378	9,056	5,236	28,294
	Not Woking	9,802	45,854	53,054	53,363	42,261	204,334

Table 1.9 Numbers of Household by Income

		Central	Kawempe	Lubaga				Makindye	Nakawa	Total
Total Household		23,322	94,683	105,778				108,778	84,242	416,803
Main Source of livelihood	Subsistence farming	164	1,227	1,170				1,157	1,043	4,761
	Other source	21,158	93,456	104,608				107,621	83,199	412,042
	Percentage depending on farming	0.7	1.3	1.1				1.1	1.2	1.2
Household received remittances	Number	5,802	24,423	25,111				25,778	20,264	101,378
	Percent		24.9	25.8	23.7	23.7	24.1	24.3		

Land Use

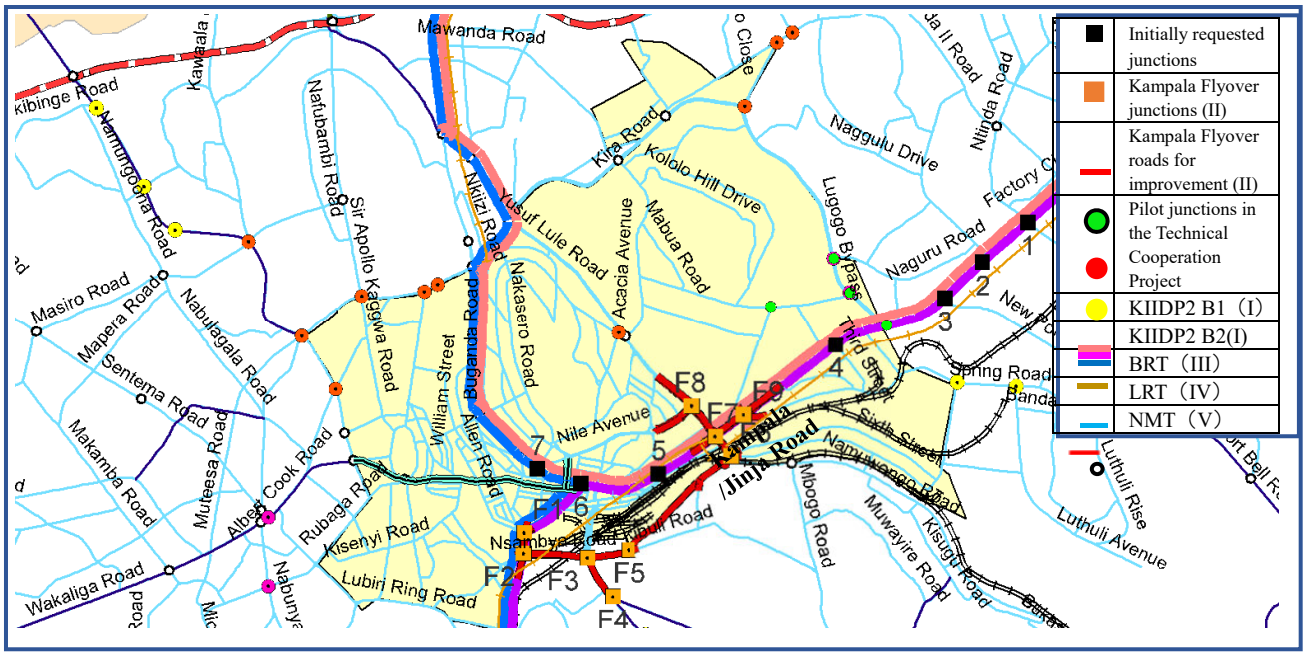
Land use in Kampala city is largely divided into commercial areas, residential areas, and small-scale farmland. Small-scale farmland extends throughout the city except in the CBD. And according to a 1993 survey by Kampala Urban Study, residential areas, and farmland account for 32.2% and 41.2% respectively.



Source：KCCA

Figure 1.15 Landuse

1.2 Assistance Trends of other Donors.



Source: JICA Study Team

Figure 1.16 Locations of Transport project in Kampala City

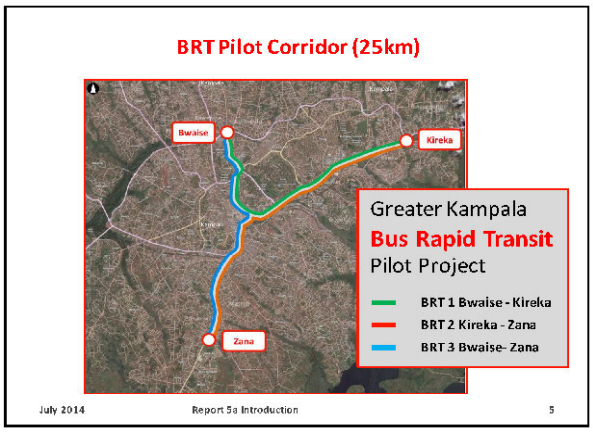
1.2.1 The World Bank (WB)

(1) Second Kampala Institution and Infrastructure Development Project (KIIDP-2)

WB has financed $175million to the junction and road improvement project marked as a contribution to relieving traffic congestion in Kampala city.

(2) Transport Sector Development Project

WB implemented the Transport Sector Development Project (TSDP-Project ID: P092837 Credit No. IDA 46790), with The Ministry of Works and Transport (MoWT) as its implementation body. The project consists of the following five components, with a project budget totaling USD $198 million:



Source：KBRT Final Report

Figure 1.17 BRT Pilot Route

[A] Improvement (paving) of roads in Northern Uganda with a total length of 159km. Road improvement design for roads with a total length of 299km, in the same area, and preparation of their bidding documents.

[B] Capacity building for traffic safety, establishment of National Road Safety Authority (NRSA) and establishment of a crash database.

[C] Support for transportation projects in Kampala City.

[D] Capacity building of MoWT in traffic management and outsourcing of regulatory functions to an organization that will be newly established.

[E] Capacity building of national road management through UNRA.

Of the above, component [C] is intended for the Bus Rapid Transit System (BRT) and the Metropolitan Area Transport Authority ("MATA"). As an administrative body beyond the administrative boundaries of Kampala, MATA will supervise public transport in the greater Kampala metropolitan area. In recent years, there are many African countries moving for the introduction of BRT and success cases can be found in Johannesburg of South Africa and Lagos of Nigeria. Kampala is also planning to introduce the BRT system. A preparatory field survey on BRT for Kampala was conducted in 2010 with WB's financial support. After that, as a component of TSDP, a field survey on its pilot corridors and detailed design was conducted. After the detailed design, the next stage will be carrying out civil works for the pilot route. Although WB is considering support for the construction works after the establishment of MATA, it takes several years for the parliament to approve its establishment, which creates uncertainty with the project timetable.

1.2.2 European Union (EU)

The EU is providing support for the construction of the Northern Bypass.

Northern Bypass: Construction work begun in 2004 with financial support from the EU and was completed in 2009. With its completion, the bypass enabled international logistics traffic to travel without passing through the city. Although the bypass was planned to have 2 lanes on each side with 4 lanes in total, the Gayaza Road and the Bombo Road section is the only one with 4 lanes and the rest having only 2 provisional lanes. UNRA is carrying out the construction of the full 4 lanes on the northern bypass with EU and other European international organizations providing financial support for this construction. The total project cost is estimated to be 60 million Euros. EU also provides financial assistance to CROSSROAD in cooperation with the Department for International Development (DFID) of England. The objectives of CROSSROAD are to develop and enable grow the constructional industry of Uganda through both financial and technical support for private contractors in the construction industry.

1.2.3 The Export-Import Bank of China (China Exim Bank)

The China Exim Bank is providing support to the construction of the Kampala-Entebbe expressway. It has loaned USD $350 million out of the total construction cost of USD $476 million. Construction started in November 2012 with the China Communication Construction Company (CCCC) as the main contractor in charge of construction. The planned construction period was four years; however, the project is behind schedule due to problems with land acquisition.

CCCC, the contractor for the Kampala-Entebbe expressway, is implementing the expansion project for the Entebbe airport. The details of the project are as follows:

Improvement and expansion of the current passenger terminal.
Structural enhancement and expansion of Apron 1.
Construction of a new international passenger terminal
Expansion of the parking area.
Construction of a new domestic passenger terminal.
Widening and structural enhancement of the main runway 17/35 and its taxiway.
Widening and structural enhancement of the sub-runway 12/30 and its taxiway.
Improvement of Apron 2.
Structural enhancement and expansion of Apron 4.
Design and construction of a new airport control tower.
Update of NAVAID (Navigational Aides) and the communication system.
Update of Port Bell NDB (Non-Directional (Radio) Beacon).

Besides the above, The China Exim Bank is also considering financing a project for standardization of the Uganda National railway network and construction of a new Kampala port at Bukasa on Lake Victoria.

1.3 PROJECT SITE AND ITS CONDITION.

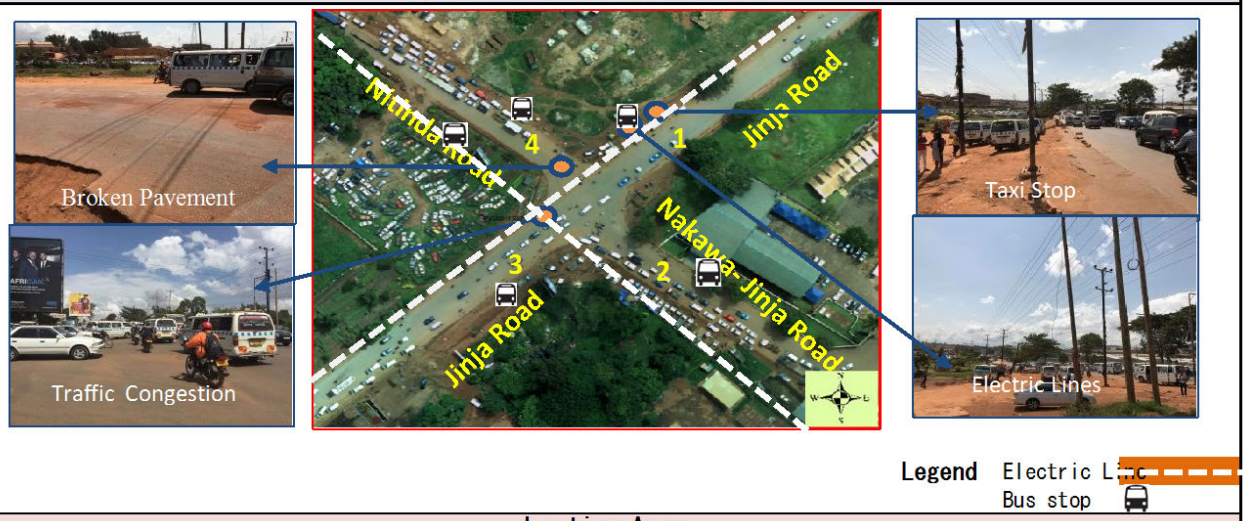
1.3.1 Status of Infrastructure Development.

(1) Important Junctions

JICA Study Team conducted a survey on important junctions listed in the original request shown in Figure 1.16. The results of the survey are shown Table 1.10.

Table 1.10 Survey Results of Important Junctions

Junction No. 1 (20170614 11AM)



Junction Area			
Location	0° 20'1.56"N, 32° 37'4.76"E	No of legs	4
Main Road	Jinja Road	Present Control Typ	Non Signalized
Sub Road	Nakawa-Jinja Road/ Ntinda Roa	Police	Yes (3)
Pedestrian Share	High	Surface Condition	Good
Large vehicle Share	High	Waterbody	Not Exist
Green Area	Not Exist	Monument	Not Exist
Billboard/Clock/Pole	4+1+3=8	Important Landmark	
UG Telephone Line	Exist	UG Water Line	Exist

Directional Information				
	Leg 1	Leg 2	Leg 3	Leg 4
Road Names	Jinja Road	Nakawa-Jinja Road	Jinja Road	Ntinda Road
Traffic Volume (nos/hour)	1350	1224	2304	492
Distance from Next Jct	430	360	580	490
Surface Condition	Good	Good	Good	Not Good
Road Width (m)	13	13	13	11
No. of Lanes	3	3	3	2
Right Turn Allowance	Yes	Yes	Yes	Yes
Right Turning Lane	Not Exist	Not Exist	Not Exist	Not Exist
Road Marking	Not Exist	Not Exist	Not Exist	Not Exist
Road Lane Width (m)	N/A	N/A	N/A	N/A
Median	Not Exist	Not Exist	Not Exist	Not Exist
Street Lighting	Not Exist	Not Exist	Not Exist	Not Exist
Bus Stop	Exist	Exist	Exist	Exist
Pedestrian Crossing	Not Exist	Not Exist	Not Exist	Not Exist
Pedestrian Walkway	Not Exist	Not Exist	Not Exist	Not Exist
Electric Lines	Exist	Exist	Exist	Exist
Green Area	Exist	Exist	Exist	Exist

Remark

◆ Practically the roads are used for 3-4 lanes as per the instruction of traffic police.

Junction No. 2 (20170615 9:00AM)

Junction Area			
Location	0° 19'50.25"N, 32° 36'51.45	No of legs	3
Main Road	Jinja Road	Present Control Typ	Non Signalized
Sub Road	Katalima Road	Police	Yes (1)
Pedestrian Share	High	Surface Condition	Good
Large vehicle Share	High	Waterbody	Not Exist
Green Area	Not Exist	Monument	Not Exist
Billboard/Clock/Pole	5+0+2=7	Important Landmark	
UG Telephone Line	Exist	UG Water Line	Exist

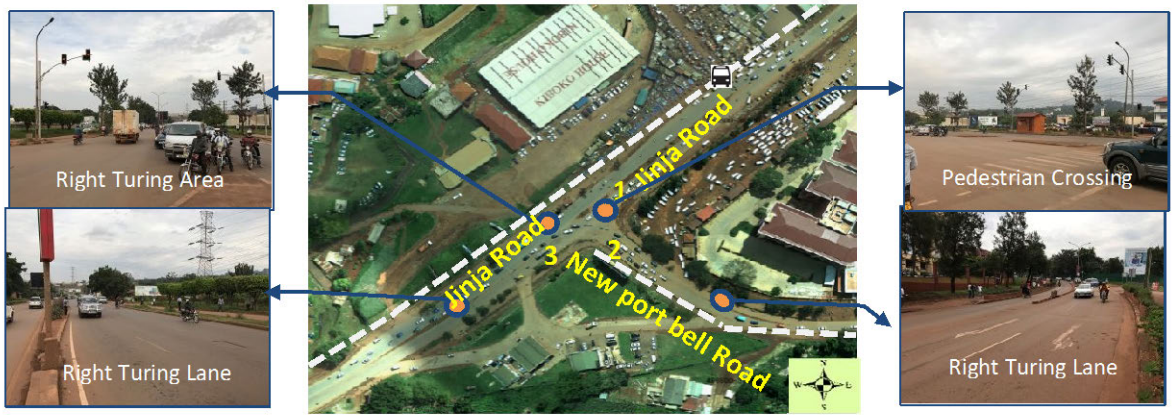
Directional Information

	Leg 1	Leg 2	Leg 3	
Road Names	Jinja Road	Jinja Road	katalima Road	
Traffic Volume (nos/hour)	3180	2526	564	
Distance from Next Jct	510	290	190	
Surface Condition	Good	Good	Good	
Road Width (m)	15	13	9	
No. of Lanes	3	3	2	
Right Turn Allowance	Yes	Yes	Yes	
Right Turning Lane	Not Exist	Not Exist	Not Exist	
Road Marking	Not Exist	Not Exist	Not Exist	
Road Lane Width (m)	N/A	N/A	N/A	
Median	Not Exist	Not Exist	Not Exist	
Street Lighting	Exist	Exist	Not Exist	
Bus Stop	Exist	Not Exist	Not Exist	
Pedestrian Crossing	Not Exist	Not Exist	Not Exist	
Pedestrian Walkway	Exist	Exist	Not Exist	
Electric Lines	Exist	Exist	Not Exist	
Green Area	Exist	Exist	Exist	

Remark

◆ Practically the roads are used for 4 lanes as per the instruction of traffic police.

Junction No. 3 (20170615 9:30AM)



Legend Electric Line
Bus stop

Junction Area

Location	0° 19'40.18"N, 32° 36'40.7	No of legs	3
Main Road	Jinja Road	Present Control Typ	Signalized
Sub Road	New port bell Road	Police	No
Pedestrian Share	High	Surface Condition	Good
Large vehicle Share	High	Waterbody	Exist
Green Area	Not Exist	Monument	Not Exist
Billboard/Clock/Pole	2+0+3=5	Important Landmark	Uganda National Roads
UG Telephone Line	Exist	UG Water Line	Exist

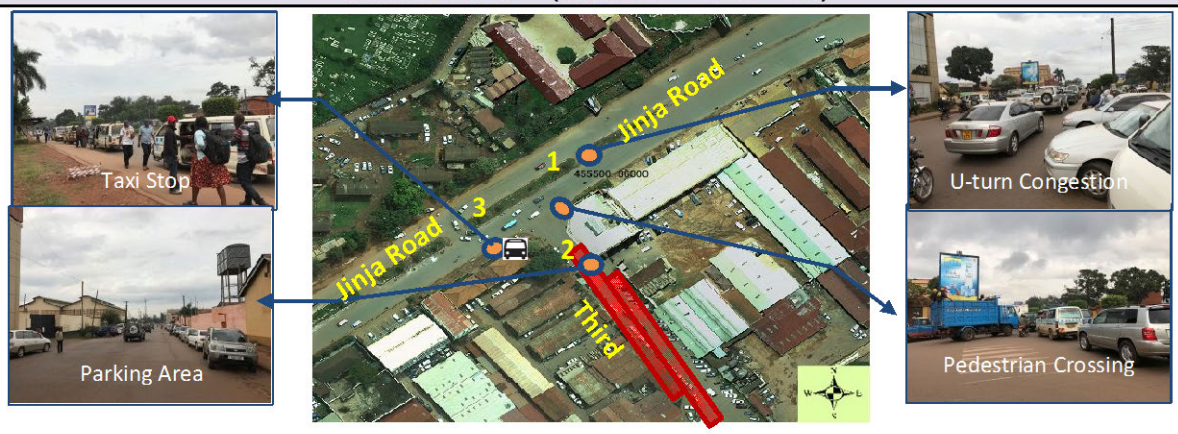
Directional Information

	Leg 1	Leg 2	Leg 3	
Road Names	Jinja Road	New port bell Road	Jinja Road	
Traffic Volume (nos/hour)	2778	1212	2526	
Distance from Next Jct	120	1500	600	
Surface Condition	Good	Good	Good	
Road Width (m)	18	12	18	
No. of Lanes	5	3	3	
Right Turn Allowance	Yes	Yes	No	
Right Turning Lane	Exist	Exist	Not Exist	
Road Marking	Exist	Exist	Exist	
Road Lane Width (m)	3.5	4	3.5	
Median	Exist	Exist	Exist	
Street Lighting	Exist	Exist	Exist	
Bus Stop	Exist	Not Exist	Not Exist	
Pedestrian Crossing	Exist	Not Exist	Exist	
Pedestrian Walkway	Exist	Exist	Exist	
Electric Lines	Exist	Not Exist	Exist	
Green Area	Exist	Exist	Exist	

Remark

- Road marking is not exist or fade away in some section.
- Practically the roads are used for 4 lanes.

Junction No. 4 (20170619 09:00 AM)



Legend Parking area
Bus stop

Junction Area			
Location	0° 19'26.22"N, 32° 36'9.65"	No of legs	3
Main Road	Jinja Road	Present Control Typ	Non Signalized
Sub Road	Third Street	Police	No
Pedestrian Share	High	Surface Condition	Good
Large vehicle Share	High	Waterbody	Yes
Green Area	Yes	Monument	No
Billboard/Clock/Pole	2+0+3=5	Important Landmark	School, Office
UG Telephone Line	Yes	UG Water Line	Yes

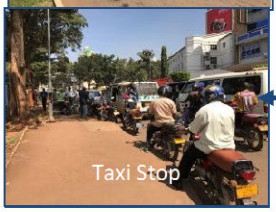
Directional Information

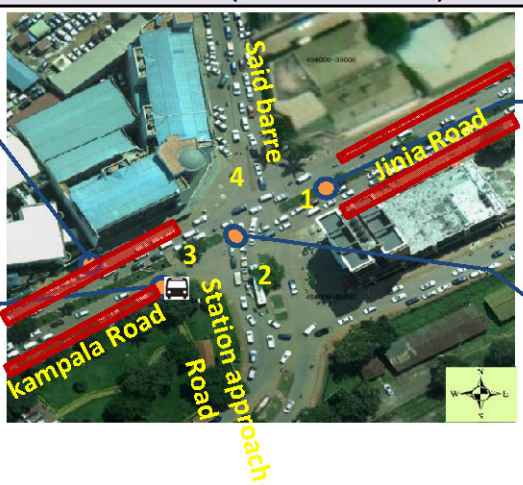
	Leg 1	Leg 2	Leg 3	Leg 4
Road Names	Jinja Road	Third Street	Jinja Road	
Traffic Volume (nos/hour)	3870	468	2742	
Distance from Next Jct	270m	150m	100m	
Surface Condition	Good	Good	Good	
Road Width (m)	24	9	24	
No. of Lanes	6	2	6	
Right Turn Allowance	No	No	No	
Right Turning Lane	Not Exist	Not Exist	Not Exist	
Road Marking	Exist	Not Exist	Exist	
Road Lane Width (m)	3.5,3.5,5	N/A	3.5,3.5,5	
Median	Exist	Not Exist	Exist	
Street Lighting	Not Exist	Not Exist	Not Exist	
Bus Stop	Not Exist	Not Exist	Not Exist	
Pedestrian Crossing	Not Exist	Exist	Not Exist	
Pedestrian Walkway	Exist	Exist	Exist	
Electric Lines	Not Exist	Not Exist	Not Exist	
Green Area	Exist	Exist	Exist	

Remark

- Road marking and pedestrian crossing are not exist or fade away.
- Many U-Turn vehicles are observed.
- School: Lugogo Vocational Training Institute. Office: JR Complex.

Junction No. 5 (20170616 10:00AM)





Legend Parking area
Bus stop

Junction Area			
Location	0° 18'49.39"N, 32° 35'1	No of legs	4
Main Road	Jinja Road/Kampala Road	Present Control Typ	Non Signalized
Sub Road	Stain approach Rd/Said barre	Police	No
Pedestrian Share	High	Surface Condition	Good
Large vehicle Share	Medium	Waterbody	Exist
Green Area	No	Monument	Not Exist
Billboard/Clock/Pole	1+1+5=7	Important Landmark	University, Bank, Goverment
UG Telephone Line	Exist	UG Water Line	Exist

Directional Information

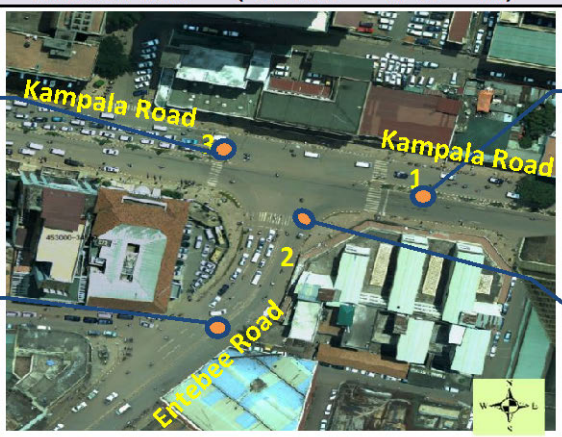
	Leg 1	Leg 2	Leg 3	Leg 4
Road Names	Jinja Road	tation approach Roa	Kampala Road	Said barre Road
Traffic Volume (nos/hour)	1980	1500	1506	726
Distance from Next Jct	330	30	110	100
Surface Condition	Good	Good	Good	Good
Road Width (m)	15	17	15	8
No. of Lanes	4	4	4	2
Right Turn Allowance	Yes	Yes	Yes	Yes
Right Turning Lane	Not Exist	Not Exist	Not Exist	Not Exist
Road Marking	Not Exist	Not Exist	Not Exist	Exist
Road Lane Width (m)	N/A	N/A	N/A	4
Median	Exist	Exist	Exist	Not Exist
Street Lighting	Exist	Exist	Exist	Not Exist
Bus Stop	Not Exist	Not Exist	Exist	Not Exist
Pedestrian Crossing	Exist	Not Exist	Not Exist	Not Exist
Pedestrian Walkway	Exist	Exist	Exist	Exist
Electric Lines	Not Exist	Not Exist	Not Exist	Not Exist
Green Area	Exist	Exist	Exist	Not Exist

Remark

- University:Victoria University, Bank:Bank of Baroda, Government:Social Security House
- Practically the roads are used for 3 lanes, and one lane is for parking area
- Next junction is very close to the Leg2.

Junction No.6 (20170620 11:00 AM)

Long line of cars wait to turn right



Disappeared Road Marking

Right Turing Lane

Disappeared Pedestrian Crossing

Junction Area			
Location	0° 18'46.48"N, 32° 34'57.3	No of legs	3
Main Road	Kampala Road	Present Control Typ	Signalized
Sub Road	Entebbe Road	Police	Yes(3)
Pedestrian Share	High	Surface Condition	Good
Large vehicle Share	Few	Waterbody	Yes
Green Area	No	Monument	No
Billboard/Clock/Pole	1+1+0=2	Important Landmark	Bank
UG Telephone Line	Yes	UG Water Line	Yes

Directional Information

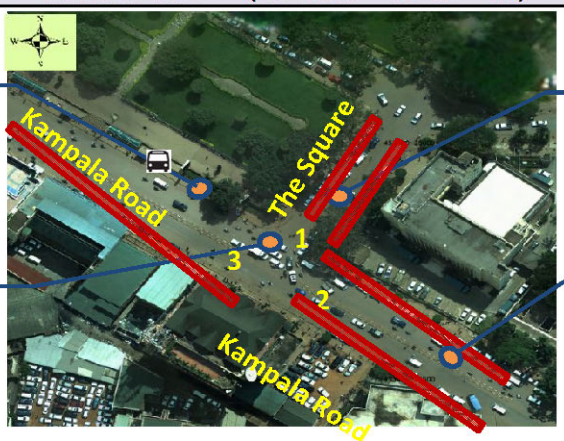
	Leg 1	Leg 2	Leg 3	Leg 4
Road Names	Kampala Road	Entebbe Road	Kampala Road	
Traffic Volume (nos/hour)	2118	2586	3222	
Distance from Next Jct	150m	60m	50m	
Surface Condition	Good	Good	Good	
Road Width (m)	18	18	18	
No. of Lanes	6	5	6	
Right Turn Allowance	No	Yes	Yes	
Right Turning Lane	Not Exist	Exist	Exist	
Road Marking	Exist	Exist	Exist	
Road Lane Width (m)	3	3.5	3	
Median	Exist	Exist	Exist	
Street Lighting	Exist	Exist	Exist	
Bus Stop	Not Exist	Not Exist	Not Exist	
Pedestrian Crossing	Exist	Exist	Exist	
Pedestrian Walkway	Exist	Exist	Exist	
Electric Lines	Not Exist	Not Exist	Not Exist	
Green Area	Exist	Exist	Exist	

Remark

- Road marking and pedestrian crossing are not exist or fade away.
- Bank: Barclays Bank, Tropical Bank.

Junction No. 7 (20170621 09:30 AM)


Traffic Congestion




Long line of cars wait to turn right

Legend Parking area
Bus stop

Junction Area			
Location	0° 18'50.87"N, 32° 34'44.91	No of legs	3
Main Road	Kampala Road	Present Control Typ	Non Signalized
Sub Road	The Square 2	Police	Yes (3)
Pedestrian Share	High	Surface Condition	Good
Large vehicle Share	Few	Waterbody	Yes
Green Area	No	Monument	No
Billboard/Clock/Pole	2+1+1=4	Important Landmark	Bank
UG Telephone Line	Yes	UG Water Line	Yes

Directional Information				
	Leg 1	Leg 2	Leg 3	Leg 4
Road Names	The Square 2	Kampala Road	Kampala Road	
Traffic Volume (nos/hour)	1242	3108	2046	
Distance from Next Jct	60m	100m	140m	
Surface Condition	Good	Good	Good	
Road Width (m)	14	20	20	
No. of Lanes	2	4	4	
Right Turn Allowance	Yes	Yes	No	
Right Turning Lane	Not Exist	Not Exist	Not Exist	
Road Marking	Not Exist	Not Exist	Not Exist	
Road Lane Width (m)	N/A	N/A	N/A	
Median	Exist	Exist	Exist	
Street Lighting	Exist	Exist	Exist	
Bus Stop	Not Exist	Not Exist	Exist	
Pedestrian Crossing	Not Exist	Not Exist	Not Exist	
Pedestrian Walkway	Exist	Exist	Exist	
Electric Lines	Not Exist	Not Exist	Not Exist	
Green Area	Exist	Exist	Exist	

Remark

- Bank: DFCU Bank-Kampala, Central Bank of Uganda.
- One lane is for bus stop at Leg 3.
- Parking area width at Leg 1: 2.5m.

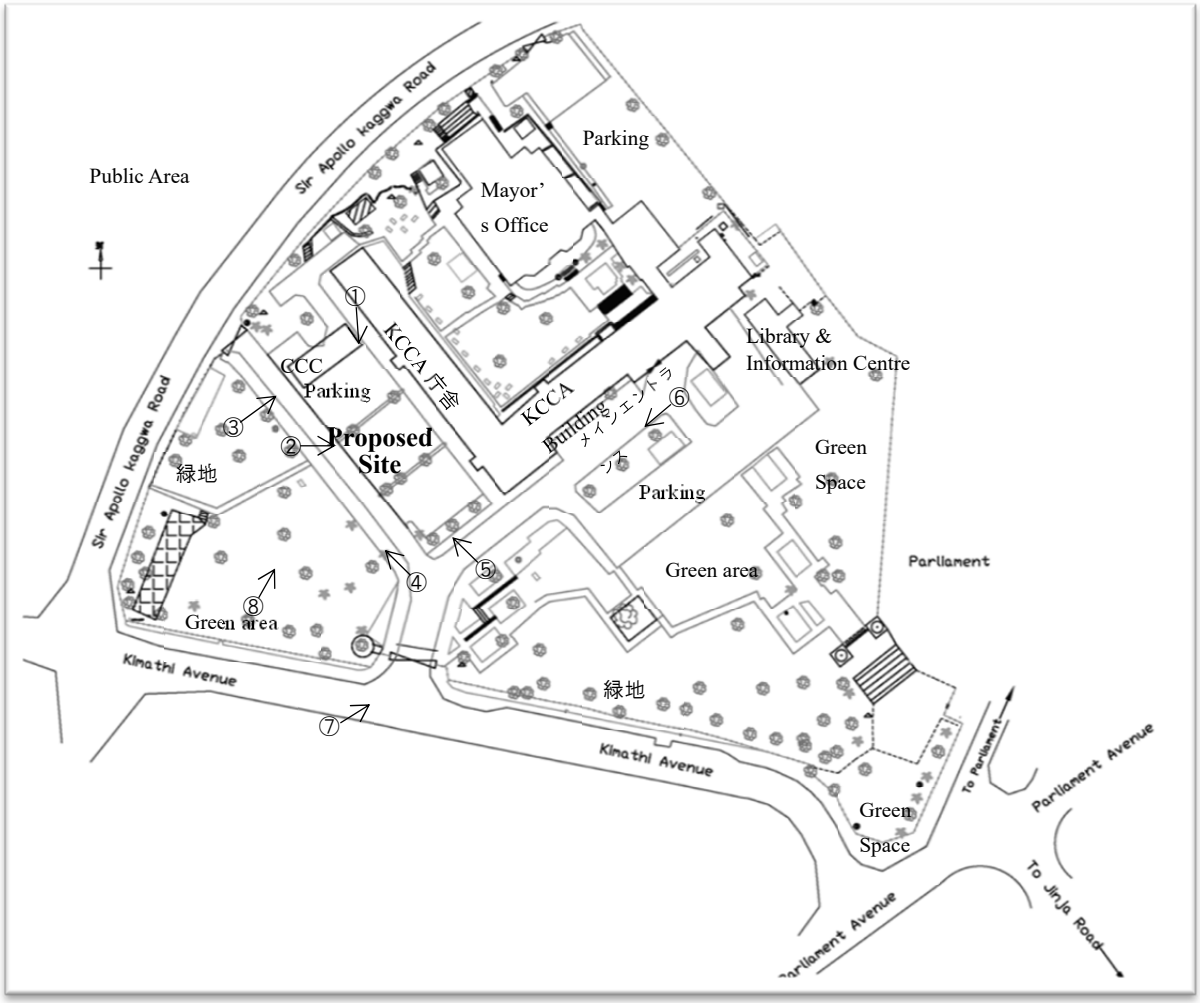
Source: JICA Study Team

As shown in Table 1.10, the junctions including connected road with an inflow traffic volume of 500 vehicles / hour or more per lane are No. 1 Spear Motors, No. 2 Jinja / Kamalima Road, No. 3 Nakawa, No .4 Archer road, No. 6 Entebbe road, No. 7 Square.

There were four junctions where manual control was being conducted by the traffic police.

(2) Planned Construction site for the Traffic Control Center.

KCCA is in the central urban area of Kampala City with the Parliament on the northeast side of its premises. On the northwest side, across Sir Apollo Kaggwa Road are government offices of the Ministry of Foreign Affairs and the Ministry of Finance. The area on the west side of KCCA's premises is the planned construction site for the traffic control center. It is surrounded by the existing KCCA building, Physical Planning and Land Transaction Client Care Centre (CCC), built in 2016, and the green area. Figure 1.18 shows the KCCA premises.



Source: KCCA

Figure 1.18 KCCA Premises.

The photos below show status of the planned site and its surroundings. The photo numbers correspond to those in Figure 1.18.

[A] An aerial view of the planned site. It is a flat parking lot (for about 25 vehicles) paved with asphalt. It needs to be demolished and removed for this project.

[B] The Study Team plan to remove the 7 existing trees on site

[C] CCC on the left, the sub-entrance of the existing KCCA building at the front, the planned site on the right.

[D] The green area on the left, the planned site on the right. The building in front is the CCC facility.

[E] The parking lot in front is the planned site. During construction, KCCA staff will use the sidewalk between the existing KCCA building and the planned site during construction.

[F] To the right is the main entrance to the KCCA government office. The parking lot is full, some cars are parked on the road shoulders.

[G] The KCCA main gate. You can enter the premises after having a security check.

[H] This green area is used for events once every two weeks. The planned site is on the right. It will be used as temporary parking space during construction.

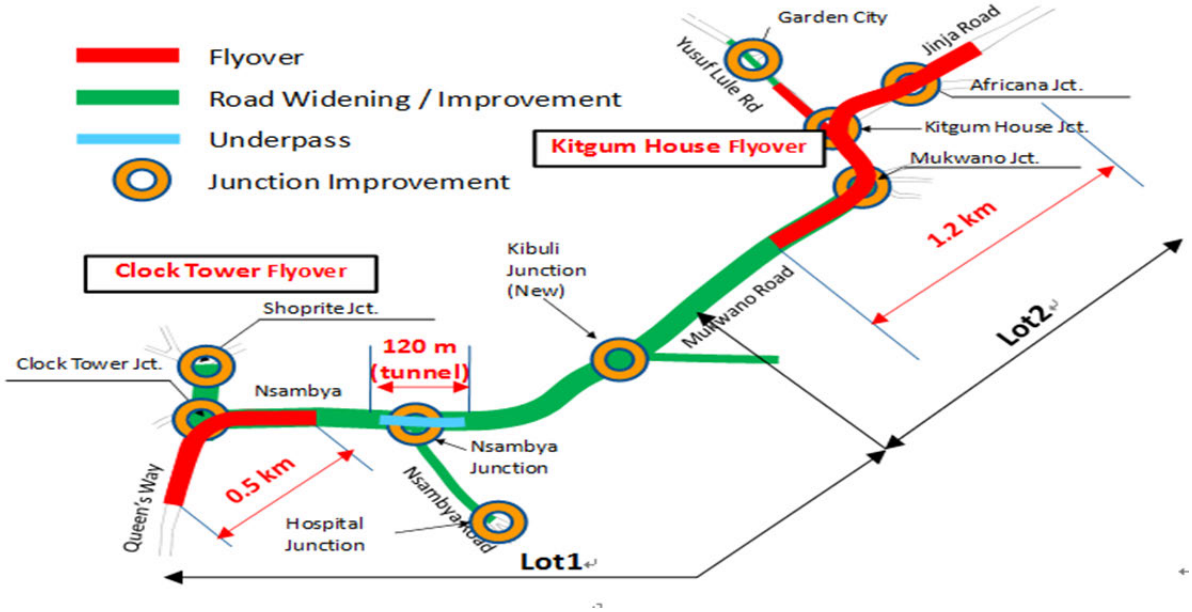
Source: JICA Study Team

Photograph 1.1 Existing Condition of Proposed Site of Traffic Control Centre

1.3.2 Related Projects

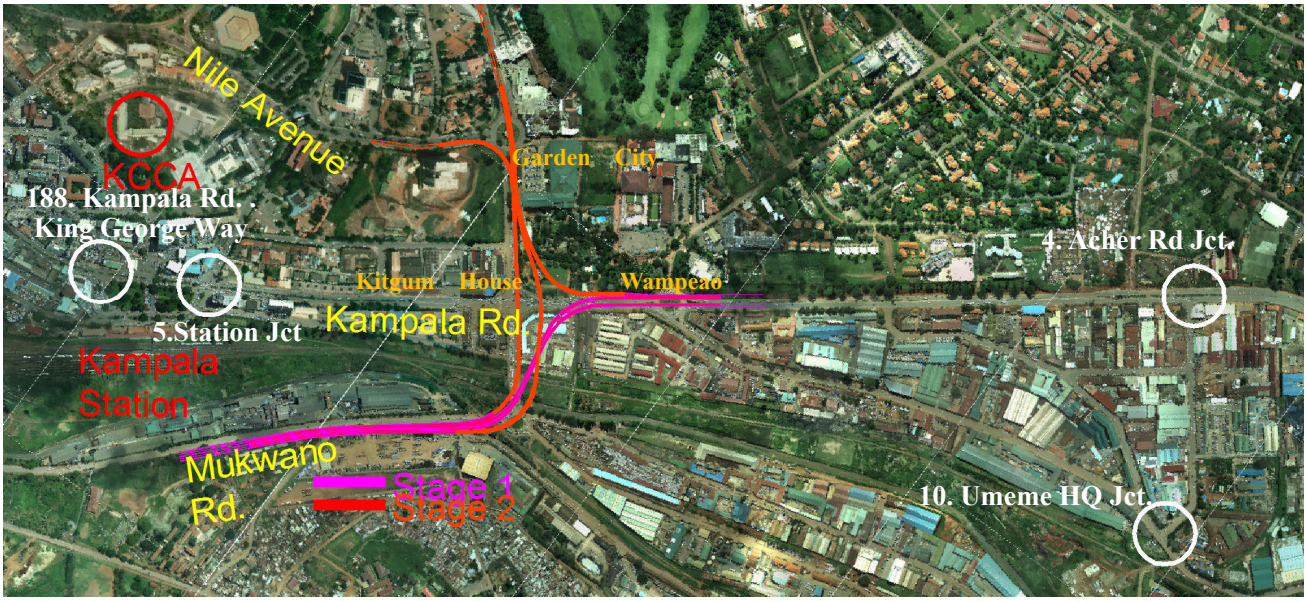
(1) Project for Construction of Flyovers and Improvement of Roads in Kampala (Kampala Flyover Project)

An improvement project using Japan's ODA loan for 9 junctions with intense traffic congestion. It is divided into two Lots. The total project cost is 24 billion yen (20 billion yen is yen-loan financed.). Procurement of contractors for Lot1 (Widening of Clock Tower / Shoprite / Nsambya / Mukwano roads) was completed as of April 2018



Source' The Study on the Project for Greater Kampala Road Network and Transport Improvement. (JICA)

Figure 1.19 Overview of the Kampala Flyover Project



Source: JICA Study Team

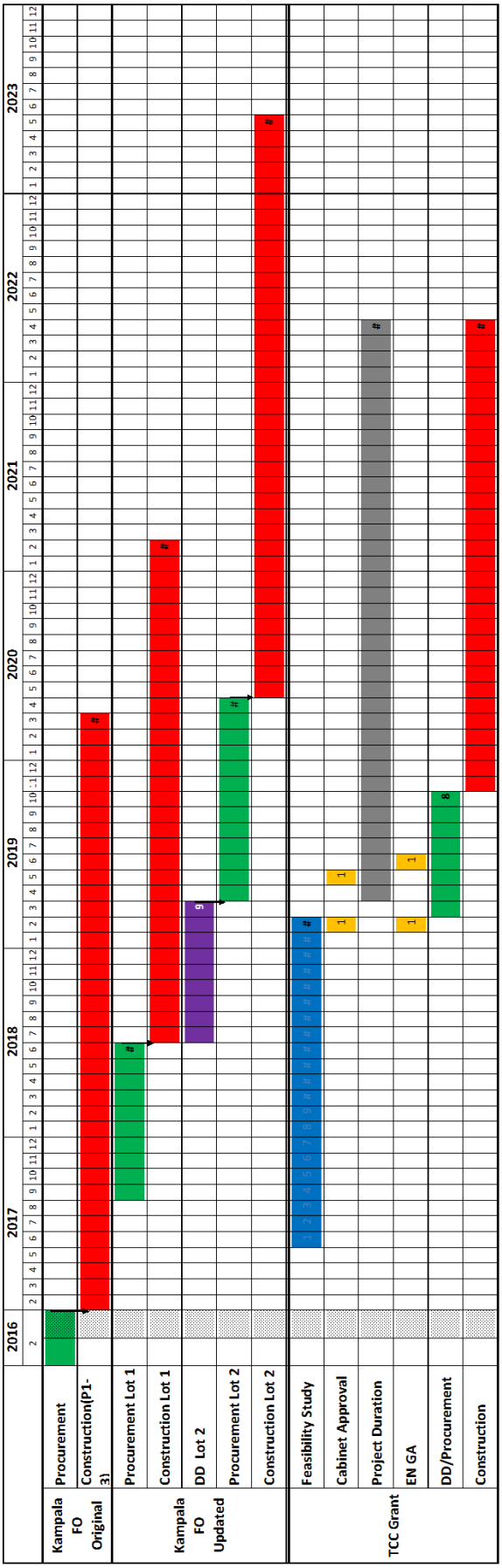
Figure 1.20 Location of Kampala Flyover Lot2

The Kampala Flyover Project covers Garden City RA, Kitgum House Junction and Wampewo Junctions, which are the usually most congested junctions in the CBD. Seven of the originally proposed junctions successively run from both ends of Kitgum House and Wampewo Junctions which are located at Kampala /Jinja Junction.

When the project for the control center was proposed, the project and the Kampala Flyover Project were supposed to be implemented almost simultaneously and the flyover junctions were going to be controlled under the traffic control center. By doing so, traffic flow at the major junctions of the arterial roads in the city was expected to be improved.

However, because it took time to make plan adjustments with the railway project whose railway is crossing with the Kitgum House Flyover in Lot 2, construction of this Lot will significantly be delayed and its completion is expected to be in July 2023.

Due to this delay, fundamental improvement in traffic in Kampala City is expected to be only after 2023. Therefore, there is need for some countermeasures against traffic congestion during the construction period.



Source: JICA Study Team.

Figure 1.21 Schedule for the Construction of the Kampala Flyover and Control Center Projects (August, 2017)

1.3.3 Second Kampala Institution and Infrastructure Development Project (KIIDP-2)

WB has made a loan contribution of USD $175 million to the road improvement project marked as a contribution to relieving Kampala city of traffic congestion. The project is divided into the following of two components.

Table 1.11 KIIDP-2 Projects/Components

Components	Cost (USD Millions)
Component 1-City Wide Road Infrastructure and associated investments	165.00
Component 2-Insytitutional and System Development Support	10.00

Source: JICA Study Team

Furthermore, component 1 is divided into two batches and batch 1 included the signalization of four junctions.

Table 1.12 Contents of the KIIDP2 Batch 1Construction.

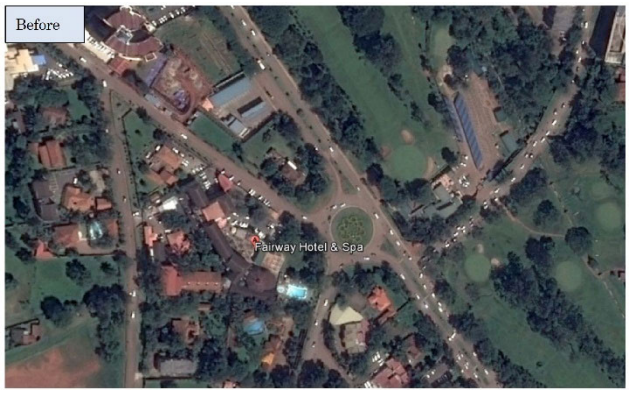
	Road	Length (km)	Lanes	Lane Length (Km)	Cost Estimates		KIIDP2 Funding	RAP Deficit
					Cost USD /km	Total Cost USD m)	UGX (Billion)	UGX (Billion)
1	Fairway Jct						9.29	0
2	Kira Rd	0.85	4	3.4	2.965	2.520	8.57	0
3	Kabira Jct						7.17	0
4	Mambule Rd	1.0	2	2.0	1.626	1.626	5.53	0
5	Bwaise Jct						6.61	0
6	Makerere Hill Rd.	1.7	4	6.8	2.564	4.359	14.82	0
7	Bakuli-Nakulabye-Kasubi Rd.	2.3	4	9.2	4.680	10.764	36.60	4.2
	Total	**5.85**		**21.4**			**88.59**	**4.2**

Source：KCCA

As of August 2017, road improvement works of junctions 1 & 2 and roads in Table 1.12 are almost complete while the others are significantly delayed.

This delay is due to budget shortage for site acquisition, to be done by Uganda, and the under-estimated work costs for utility relocation, which is included in the financing from WB.

Although the WB loan agreement deadline is December 2019, it's being considered difficult to complete the construction by this date so an extension to the contract is necessary.



Before Improvement

After Improvement

Source: Technical Cooperation Project

Photograph 1.2 KIIDP2 Fairway Junction Improvement Works

1.3.4 Natural Conditions

(1) Temperature and Humidity

Uganda is located right at the equator, on a plateau area that is 1,220m above sea level thus a warm climate. Due to the presence of L. Victoria and it being in the vicinity of Kampala, the average temperature in Kampala city is about 23℃ (minimum 19℃ ~ maximum 30℃) which makes Kampala City easily to live in.

Table 1.13 Average Temperature in Kampala City (2012-2016)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	平均
Ave Max Temp (°C)	31.4	32.7	32.7	29.4	29.6	28.9	29.4	29.8	30.3	30.6	30.0	30.3	30.4
Ave Min Temp (°C)	19.9	20.5	20.7	19.9	19.7	19.5	19.3	19.0	19.3	20.1	19.2	19.7	19.7

Source: Uganda National Meteorological Authority

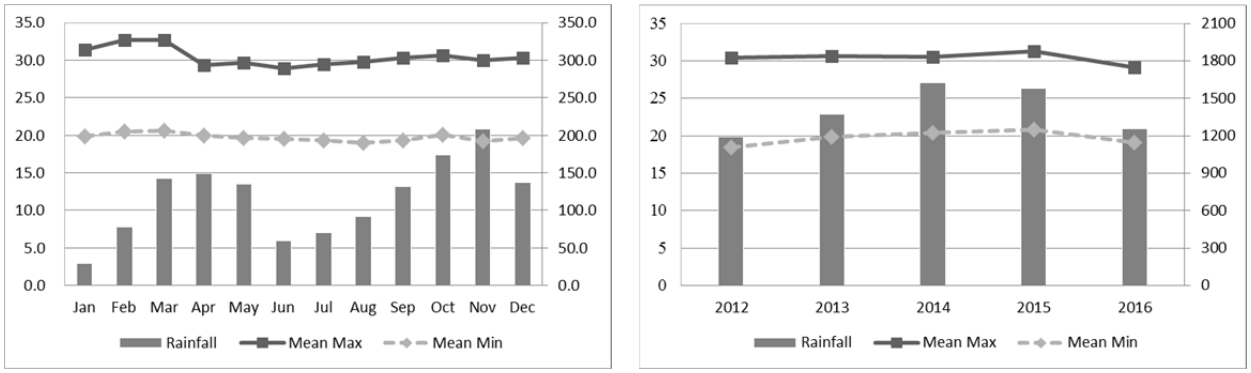
(2) Precipitation

The annual rainfall in Kampala City is about 1400mm per year (same as Tokyo), with two rainy seasons of March ~ May and September ~ November.

Table 1.14 Precipitation in Kampala City (2012-2016)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	合計
Rainfall (mm)	29	78	143	149	135	59	70	92	132	173	208	137	1405

Source: Uganda National Meteorological Authority



Source: Uganda National Meteorological Authority

Figure 1.22 Temperature and Precipitation data of Kampala City. (2012-2016)

1.3.5 Field Survey

(1) Geological Survey

A subcontractor to check the ground bearing capacity for the heavy Traffic Control Centre, through boring and standard penetration tests, conducted the ground survey.

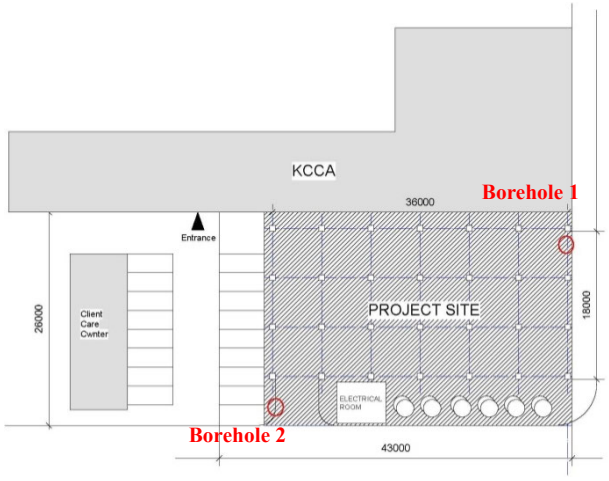
1) Subcontracting Company:

TECLAB LTD, Plot 15 Mapeera Road, Nalukolongo Industrial Area P. O. Box 24934 Kampala, Uganda

http://www.teclabafrica.com/

2) Survey Points

Two points were taken as shown in Figure 1.23.



Source' JICA Study Team

Figure 1.23 Survey Points for the Ground Survey

3) Dates of Survey

17th and 18th June 2017.

Borehole 1

Borehole 2

Source: JICA Study Team

Photograph 1.3 Standard Penetration Tests

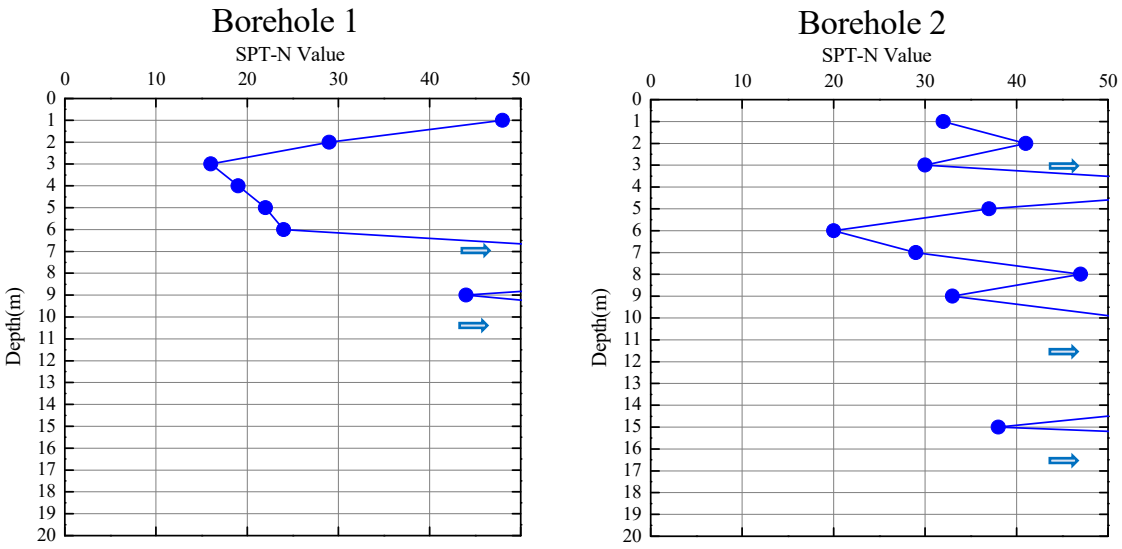
The stratum at the surveyed location is layers of silt or clay strata mixed with sand. Table 1.15 and Figure show results of the standard penetration tests.

At the two survey points, the N-value was 15 or more over almost all depths and it was hard ground with depths of more than 7m with an N-value of 30 or more, which proved that the ground is solid. Judging by the results, the ground has enough strength to support structures without any reinforcement.

Table 1.15 Results of Standard Penetration Tests

Borehole 1		Borehole 2	
Depth(m)	SPT-N Value	Depth(m)	SPT-N Value
1	48	1	32
2	29	2	41
3	16	3	30
4	19	4	69
5	22	5	37
6	24	6	20
7	64	7	29
8	80	8	47
9	44	9	33
10	70	10	52
11	>	11	>
12	>	12	>
13	>	13	68
14	>	14	62
15	>	15	38
16	-	16	>
17	-	17	107
18	-	18	>
19	-	19	>
20	-	20	>

※ (-): The standard penetration test at Borehole 1 was conducted to the depth of GL-15m.
※ (>): The number of blows per stratum was 50 times or more.
Source: JICA Study Team



Source: JICA Study Team

Figure 1.24 Results of standard penetration tests.

(2) TRAFFIC VOLUME SURVEY

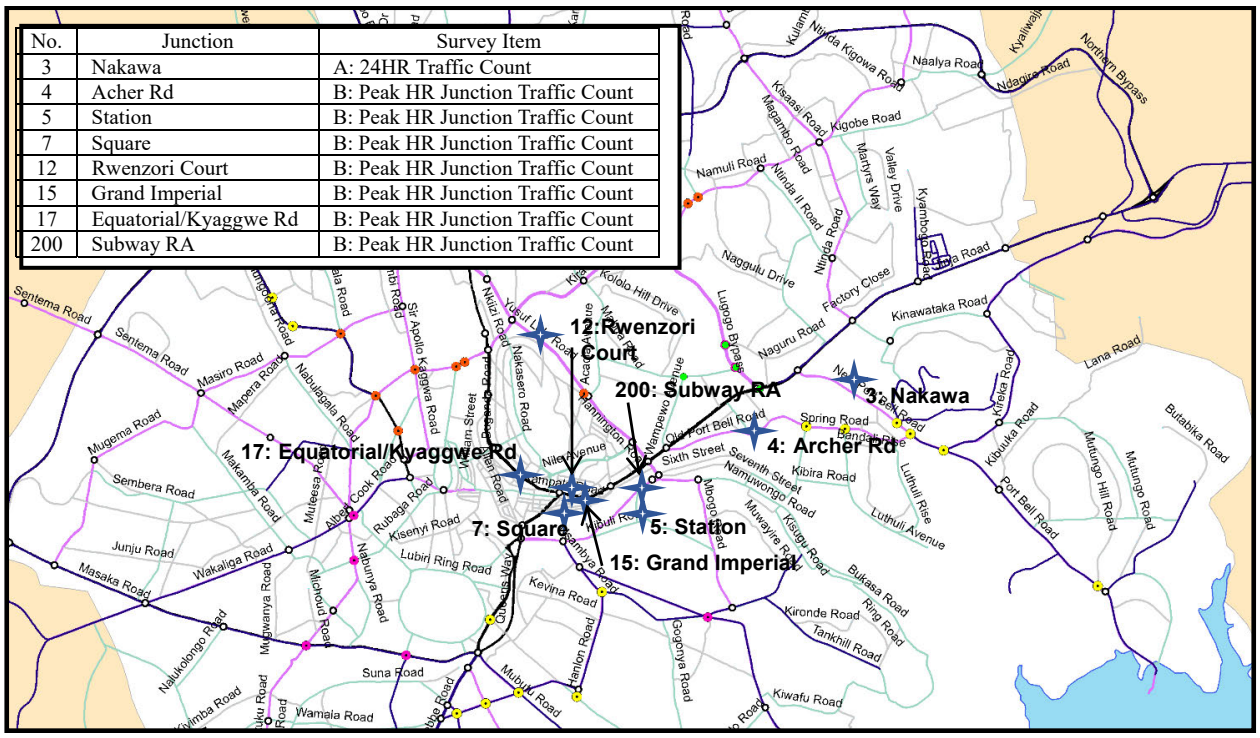
In order to calibrate the existing traffic volume data and understand the traffic flow of the main junctions, a subcontractor was outsourced to carry out a traffic volume survey.

1) Subcontracting Company

KKATT Consult, Plot 1207, Ggaba Road, Nsambya. | P.O. Box 25999 Kampala, Uganda.

http://www.kkattconsult.com/

2) Survey Points and Details



No.	Junction	Survey Item
3	Nakawa	A: 24HR Traffic Count
4	Acher Rd	B: Peak HR Junction Traffic Count
5	Station	B: Peak HR Junction Traffic Count
7	Square	B: Peak HR Junction Traffic Count
12	Rwenzori Court	B: Peak HR Junction Traffic Count
15	Grand Imperial	B: Peak HR Junction Traffic Count
17	Equatorial/Kyaggwe Rd	B: Peak HR Junction Traffic Count
200	Subway RA	B: Peak HR Junction Traffic Count

Source: JICA Study Team

Figure 1.25 Survey Points for the traffic volume survey

Table 1.16 Details of the Traffic Volume Survey

Jct No.	Junction Name	Date Surveyed	Method of Survey	AM Peak 07:00-10:00	PM Peak 16:00-19:00
4	Acher Road	22/06/'17	Video captured at an elevation attained by using two (2) lift cars	3 hours on 1day	3 hours on 1day
5	Station	21/06/'17	Video recording on top of Victoria University Building	3 hours on 1day	3 hours on 1day
7	Square	06/07/'17	Video recording on top of Mapeera Building	3 hours on 1day	3 hours on 1day
12	Rwenzori Court RA	21/06/'17	Video captured at an elevation attained by using one (1) lift car	3 hours on 1day	3 hours on 1day
15	Grand Imperial RA	27/06/'17	Video recording on top of UTL Building	3 hours on 1day	3 hours on 1day
17	Equatorial/ Kyaggwe Rd	11/07/'17	Video captured on top of Park Royal Building and at an elevation attained by using one (1) lift car	3 hours on 1day	3 hours on 1day
200	Subway RA	21/J06/'17	Video recording on top of Crested Tower	3 hours on 1day	3 hours on 1day
3	Nakawa	28-29/06/' 17	Video captured at Nakawa overhead pedestrian bridge manual day counts using 6 enumerators; 3 to cater for each side of the road. Night counts were only done manually	24 hours 7:00, 28/06-7:00, 29/06	

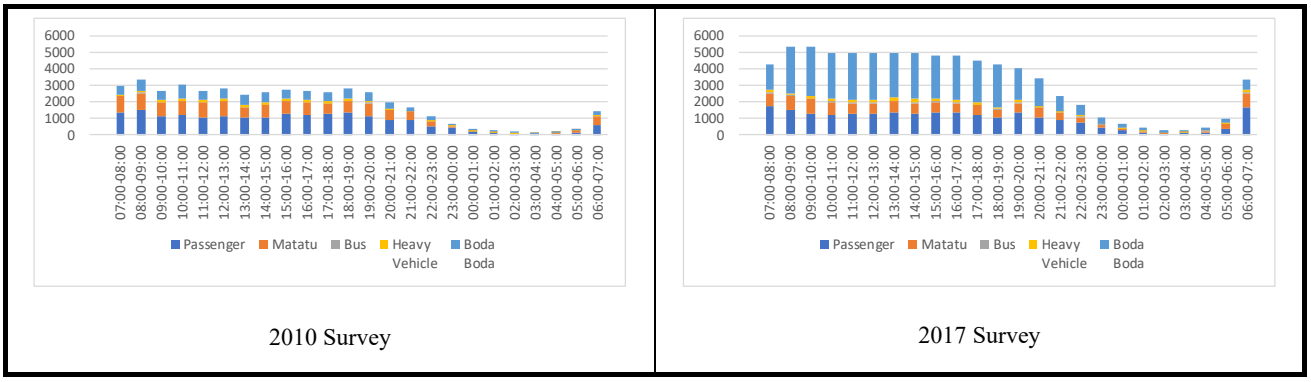
Source: JICA Study Team

(3) SURVEY RESULTS

1) Results of the 24hr Traffic Volume Survey.

A 24hr traffic volume survey was conducted at No.3 Nakawa Junction on the 13th of January 2010 as part of "The Study on Greater Kampala Road Network and Transport Improvement" by JICA.

Figure 1.26and Table 1.17 show comparison between those survey results of 2010 and 2017.



Source: JICA Study Team

Figure 1.26 Comparison of traffic volume by time zone (2010/2017)

Table 1.17 Comparison of traffic volume by vehicle type (2010/2017)

	Passenger	Matatu	Bus	Heavy Vehicle	Boda Boda	Total	W/O Boda Boda
Y2010	20,180	12,786	228	2,080	9,376	44,650	35,274
Y2017	23,665	11,643	813	2,993	38,423	77,537	39,114
Growth	117%	91%	357%	144%	410%	174%	111%
Annual Growth	2.3%	-1.3%	19.9%	5.3%	22.3%	8.2%	1.5%

Source: JICA Study Team

The results above were analyzed as below.

The total traffic volume in 2017 is 1.7 times higher than that of 2010, which is 8.2% when converted to annual rate. Although it seems to be a significant growth, the total traffic volume becomes only 1.1 times higher and the annual rate at 1.5% when Boda-bodas are not counted.

The reason for this low growth is due to lack of a margin in the surveyed road traffic capacity and that no more traffic can flow into the surveyed roads (points) as their traffic capacity is fully used.

Comparing the day/night (total traffic volume of 7am~7pm) ratios, the ratio[2] was 1.34 in 2010 and increased to 1.45 in 2017, which shows progress in the urbanization of Kampala.

Photograph 1.4 Pioneer Bus

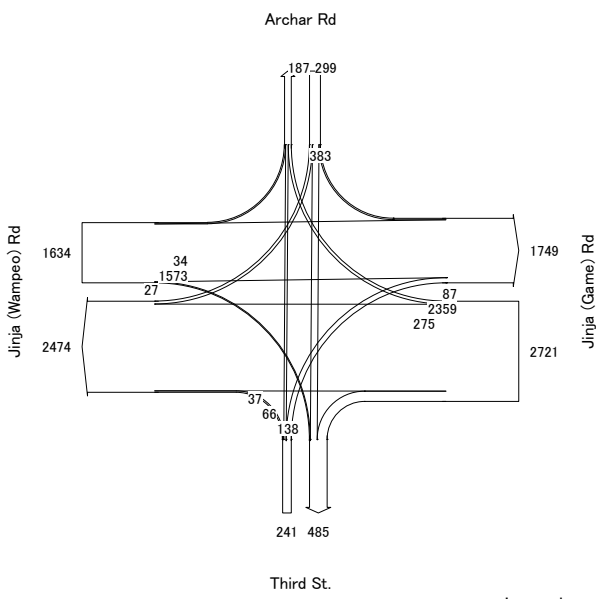
As shown in Figure 1.26, there is a daytime off-peak in the hourly fluctuation in the traffic volume of 2010. However, there is minor traffic fluctuation in 2017 survey.

[2] Calculations of traffic volumes excluding boda-bodas.

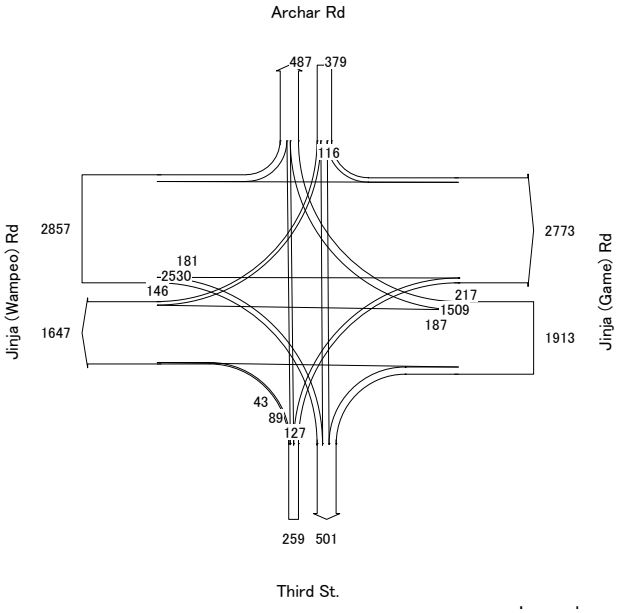
The traffic volume of matatu decreased while that of buses substantially increased. This is probably due to matatu switching to the Pioneer Easy Bus.

2) Directional Traffic Volumes of Junctions

Figure 1.27 shows traffic volume for each direction at peak hours at each survey point.

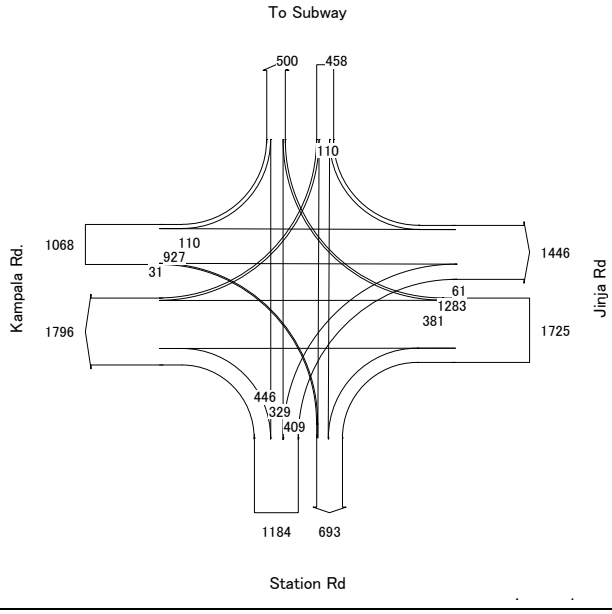


AM Peak



PM Peak

Junction 4 Archer Rd



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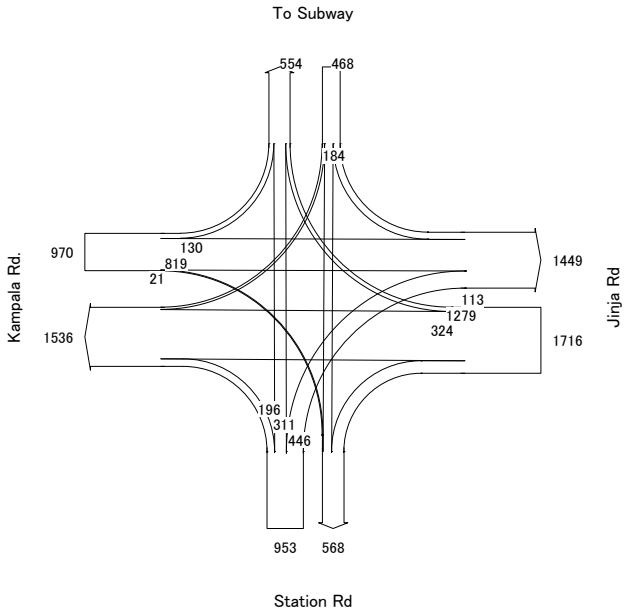

PM Peak

Junction 5: Station

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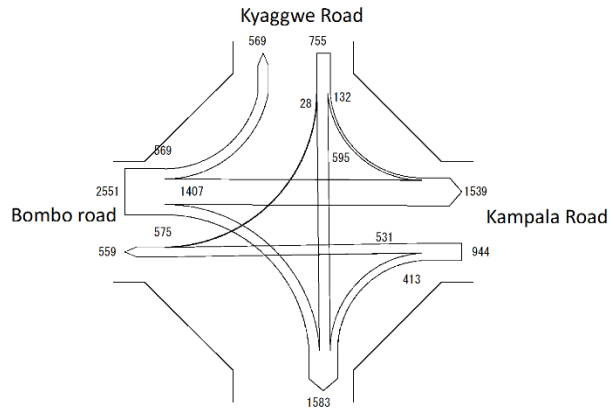
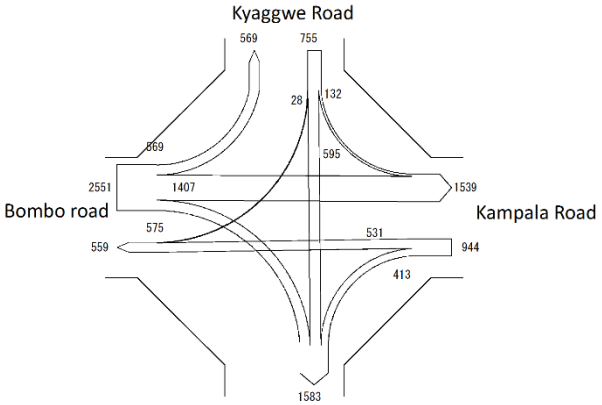
<tr><td> 
</td><td> 
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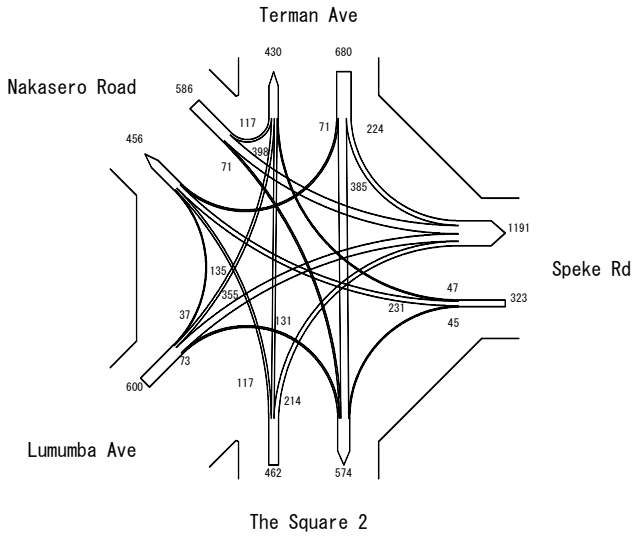
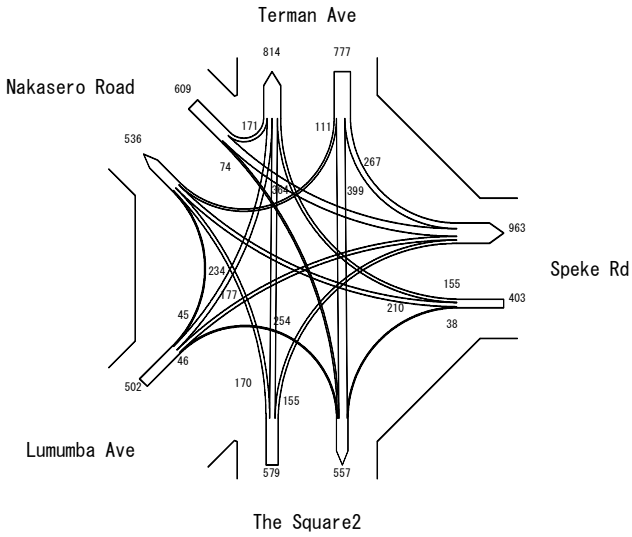
<tr><td> 
</td><td> 
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<tr><td colspan="2">Junctions 12: Rwenzori Court RA</td></tr>
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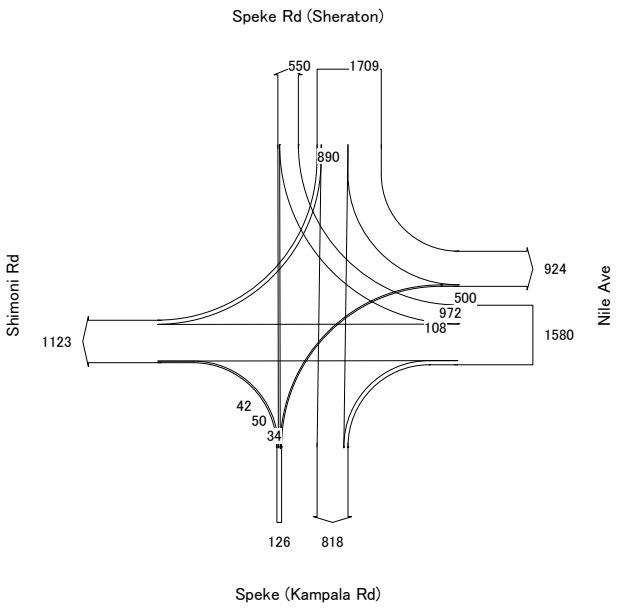
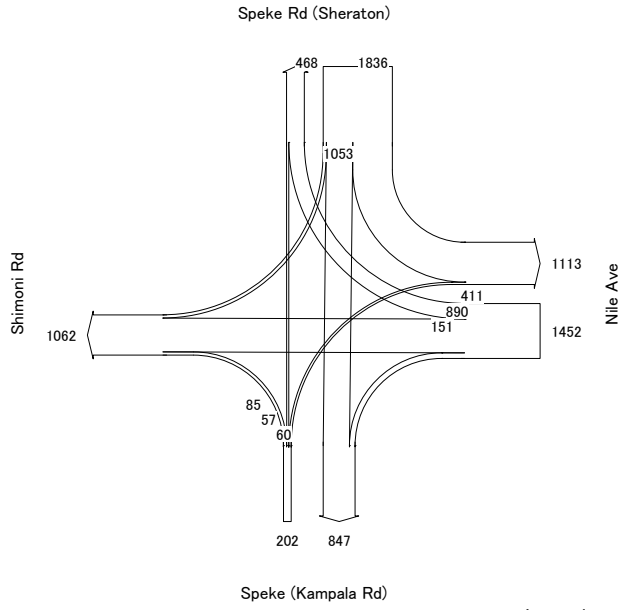
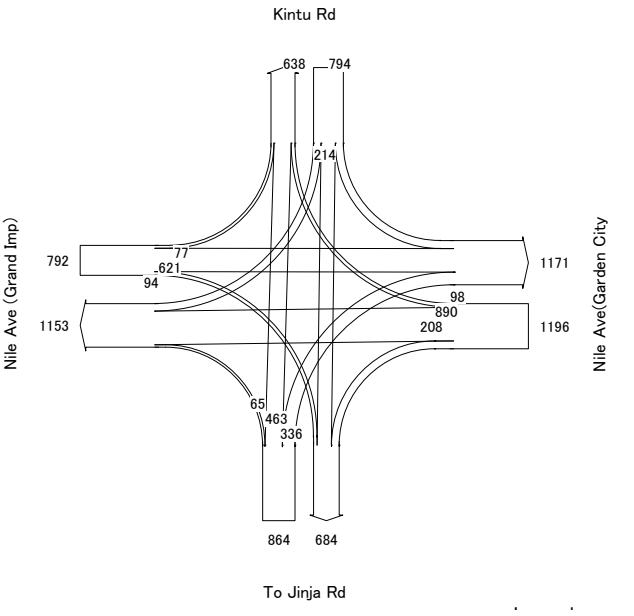
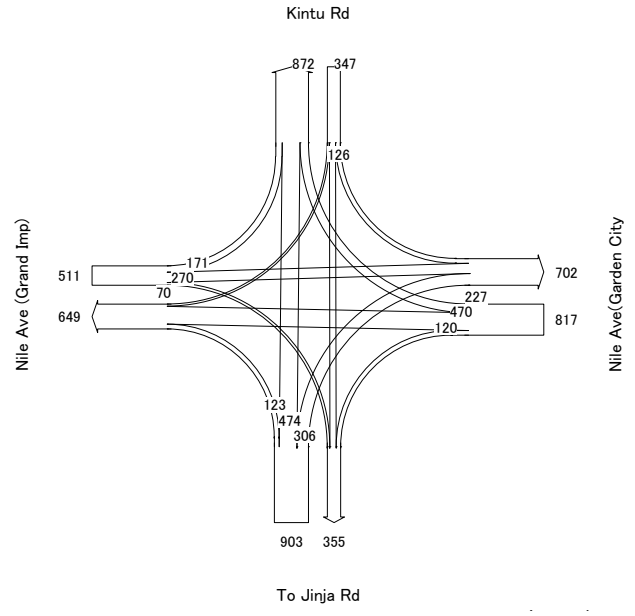




AM Peak | PM Peak

Junction 15: Grand Imperial RA





AM Peak | PM Peak

Junction 200: Subway RA

Source: JICA Study Team

Figure 1.27 Traffic Volume at Junctions.

1.3.6 Communication Network

(1) Objective of Field Survey

Field survey was carried out under the scope of technical cooperation project. Basic objective of the survey was to confirm the communication environment of Kampala which can connect the target junctions of grant aid project and traffic control centre (TCC). Therefore, survey has been taken place on ongoing dedicated Wi-Fi network system by KCCA, communication system of other major government establishment, contractors responsible for communication network setup and at the target junctions.

(2) Target Group and Survey Contents

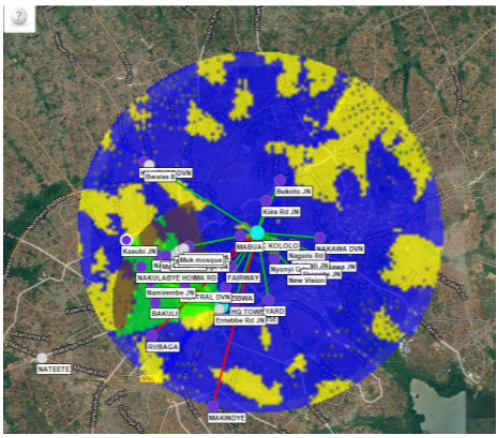
- KCCA⇒Dedicated Wi-Fi network set up plan and status
- Uganda Police Force⇒CCTV operation status
- National Social Security Fund: NSSF⇒Dedicated Wi-Fi operation status
- Contractors for communication network setup⇒Wireless system set up status

(3) Outcomes of Interview Survey

1) KCCA

Communication environment condition of dedicated private Wi-Fi network was checked in between KCCA and completed sites. Even though the installation company claimed the quality of the network would be very much reliable, practically packet loss of data was recognized.

Plan for Wi-Fi antenna set up is shown at Figure 1.28. According to this plan several antennas have already installed, however the operation is yet to be started.



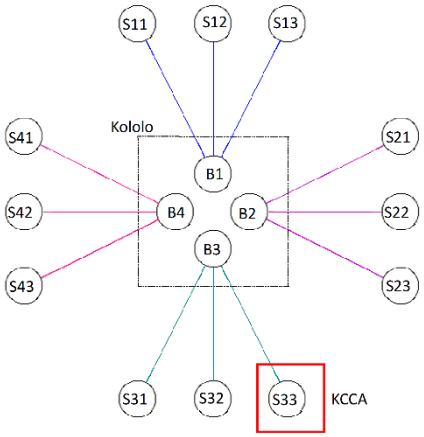
Source: Balton

Figure 1.28 Wi-Fi antenna Set up Plan

The problem identified of this network several junctions are not even visible from the base station located at Kololo due to geographical features. It is assumed that existing location of the buildings and trees on the way of network wave was not considered during the planning stage.

One of the antennas was set up at KCCA and communication signal from different sites are received via Kololo base station. For example, it becomes a course of S11-B1(wireless), B1-B3(wire), and B3-S33(wireless) in order to connect KCCA HQ office(S33) with site S11.

The planned speed of Wi-Fi is 2.5Mbps is highly possible if the connection can be performed using 1 to 1 pattern and obstacles are the minimum. However, if the connection appears as like the example (S33-B3) mentioned above data loss will appear in every section of data transmission route.



Source: Balton

Figure 1.29 KCCA Wi-Fi set up Plan

An example of radio wave strength calculation is shown Figure 1.29 at where the strength[3] of radio wave is shown during stable

[3] In general, packet loss starts from around -65dB. (There is variation by apparatus and it generates from around -60dB.)
If RSSI is -70dB, packet loss will occur by high frequency. (When the frequency of retransmission of messages increases, real access speed becomes less)

communication. However, when the communication situation of these junctions was checked packet loss had been observed. Therefore, the value of the radio wave strength of the plan document is doubtful.

Table 1.18 Design Properties of Wi-Fi set up Plan

Properties	*UBC KOLOLO*	*Bukoto JN*
Unit Name	HBS4	HSU
Height above Sea	1333 m	1233 m
Antenna Height	30 m	4 m
Regulation	5.8 GHz FCC/IC	5.8 GHz FCC/IC
Product ID	RW5000/HBS/5B00/F58/FCC/JET/INT	RW5000/HSU/5510/F58/FCC/SFF/INT/23
Antenna	Integrated Antenna	Integrated Antenna
Rate	300 Mbps	300 Mbps
TX Power	25 dBm	18 dBm
EIRP	48 dBm	44 dBm
RSSI	-54 dBm	-47 dBm
Fade Margin	10 dB	17 dB
HSS	HSC	INU
Azimuth	348.1°	203.4°
Elevation	-5.4°	3.2°

Source: Balton

2) Uganda Police Force

Uganda Police Force has set up CC cameras at several locations of the city to monitor the security situation. Connection was made by optical fiber network and usually 30frames/sec needs to send to the monitoring centre from the field. By paying to National Information Technology Authority （NITA-U） Uganda Police is using the optical fibre network installed by NITA-U.

Uganda Police has the plan to set up more CC Cameras in near future. The person in charge told that wireless network is not so much reliable and as at present the construction of the buildings is not so many inside Kampala in future when the numbers will increase the wireless connection would be affected.

3) National Social Security Fund: NSSF

Wi-Fi network is operating in between NSSF HQ and its branch offices. The building of NSSF is the highest in the city and is located excellent point of central Kampala. So it can penetrate branch offices from the rooftop. The distance with the most distant branch office is about 10km, the receiving strength (RSSI: Received Signal Strength Indicator) between this branch office and HQ is approximate -70dB. Although it is an allowable limit RSSI level, so far, no trouble has occurred in performing work. The frequency using by NSSF is open which does not require any license.

Reference: RSSI level and communication quality

RSSI	Quality	Explanation
-40dB	Excellent	Operation with design speed is possible
-60dB	Good	The data communications perform in the real time
-70dB	Allowable limit	the minimum level which can trust a packet
Below	Poor	There is a problem in reliability.

4) Communication companies (Balton and Samanga)

There are companies who are responsible for communication network set up and selling of equipment in Uganda. This time interview survey was carried out with 2 such companies. Both companies informed that they do sell the products for communication set up, however they do not guarantee the quality of communication. Regarding the maintenance of the installed equipment, it was understood that this can be a part of separate contract agreement subject to additional payment.

(4) Site Survey

Site survey was carried out at all 28 target junctions where traffic signals might be installed under the grant aid project and it was found that only 7 junctions can be visible from directly from Kololo base station. Specially the junctions located at central area were not visible due to existence of obstacles such as high-rise buildings, trees etc.

(5) Communication Speed Demand for MODERATO and CC Camera

The specified speed for traffic signal controller using MODERATO is mentioned as 9600bps. It is not always necessary to send and receive the data of this speed to and from traffic control centre, it is required only in specific situation. Each junction will be equipped with 5 numbers of CC cameras and each of these cameras needs app, 4Mbps of communication speed, which means 20Mbps speed is required for each junction.

In order to grasp the traffic situation at each junction usually 30frames/sec are sent; when the speed is not high enough it might be decreased down to 1frame/sec which is not acceptable.

(6) Conclusion

It was concluded that in order to achieve reliable communication speed when MODERATO and CC cameras would be installed communication between TCC and each of the junctions should be connected by optical fiber network. KCCA side also have agreed with this conclusion.

When the comparison was done between wireless and wired network, connection due to unreliable speed wireless network was not preferred.

In case of wired network, the only problem might arise if the optical fiber network would be damaged by underground installation work of utilities such as water, gas. However, this kind of problem is also very common even in the developed countries like Japan, so it will not be a unique problem of Uganda.

If new Wi-Fi network is going to be set up, devices need to set up at the top of the buildings and to ensure stable connections intermediate transmission devices might need to be installed. In case any problem occurs in one of those intermediate data transmission devices many junctions can be risked of out of network.

Even it seems that the set up wireless system is quite easy, however special type of cost such as rental fee to the building owners for setting up antennas will occur. Another point is as the frequency band using by Wi-Fi network is free and there is a possibility of using of same frequency later by other entities which would cause interference and the required speed might not be achieved in some days.

1.3.7 Assessments of Current Optical Fibre Network Operation and Maintenance by Private Sector in Kampala

As discussed in 1.3.6, the Consultant concludes the application of fibre cable as the communication mean between sites and centre. This clause describes assessment results of existing optical fibre cable network operation and maintenance by the Private Sector in Kampala.

In Kampala the fibre cable network has been developed and being served to tele-communication company and internet providers as IT sector is very active and growing. Against this backdrop, many private sectors have been entering the network development and maintenance business.

(1) Network Developer and Operator (CSquared)

Company Outline: CSquared develops broad-band infrastructure in Africa under Google. CSquared also serves network connectivity to the commercial providers. In Kampala, Csquared developed fibre cable network and started "Project-Link" in Kampala. Thereafter, it developed over in Entebbe (Uganda), Accra, Tema and Kumasi (Ghana) totaling of 1,600km which are currently being in operation.
http://www.csquared.com/

Interviewed:
Kutira Timothy (Design & Engineering), Ssegwanyi John (Network Deployment), Lukwago Patrick (Maintenance), Kemanzi Yvonne (Maintenance), Isaac Kisaakye (Network Deployment)

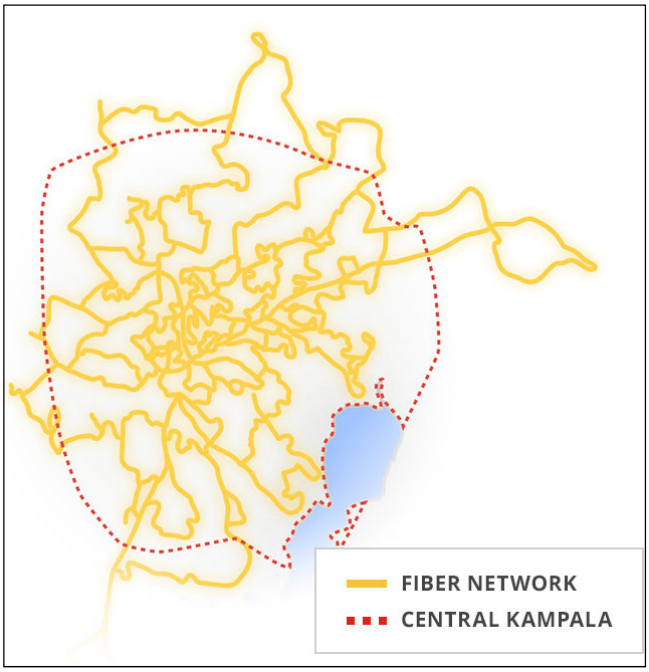


Figure 1.30 CSquared Network

[A] Summary of Interview

- KCCA is the authority to give commercial operation permission of optical fiber in Kampala. In this JICA grant aid, since KCCA will be the project executing agency, there will be no problems of cable installation and subsequent operation.
- The National Information Technology Authority - Uganda (NITA - U) is the authority to give the business permission of Internet Service in Uganda.
- It is observed that there are many delays in permission of installation and operation from KCCA and NITA - U, making business plan difficult for private sector.
- There is no designated contractor by the Authority for installation work of the optical cable, the operator selects the contractor according to its own standard and consigns it. CSquared outsources cable installation work to ATX Technology. It also entrusts maintenance work to ATX Technology. Uganda has two major cable maintenance operators, and ATX Technology is one of them.
- One of the major operational risks is the suspension of services due to cable disconnection (cutting). Early restoration action is necessary, but the maintenance operator is likely unresponsive that may result in the prolongation of non-operational time. Case disconnection cases in Kampala are often found in the suburbs, most of which is the cutting by heavy machinery during excavation work on road construction. There is no such case of cable disconnection in CBD.

- The maintenance contract does not include the constant stock of cables. The Contractor procures according to its needs, and claim procurement costs later.
- Commissioning of cable operation (commission) is usually conducted by foreign engineers invited outside the country, but technical transfer to Ugandan engineers is also carried out at the same time to support their technical independence. In the case where the commission of the junctions are given at different times at JICA project, it is realistic that the Japanese engineers carryout only a few early places and the Ugandan engineers do the rest.

(2) Network Maintenance Operator

1) ATX Technology

Company Outline : Found in 2003, Operation Service Provider (OSP) of fibers and power lines based in Uganda and Rwanda Major Client: C-Squared, Airtel, Roke Telecom, Zuku Cable Interviewed: Andrew Malagala (Product Development Manager)

[A] Summary of Interview

- ATX Technology has two bases which are at Nakasero and UBOS in Kampala City, and it carries out installation and maintenance work of fiber cable and power line.
- There are two types of maintenance contract, which are with comprehensive (framework) and order-base. ATX established the said two stations that enable to respond to accidental breakdowns for 24 hours.
- ATX Technology provides following services,
  - Emergency response.
  - Routine maintenance (cleaning, repairs)
  - System upgrades
  - Supply of materials
  - Daily checks to all sites.
  - Fiber cable installation.
  - Repair of damaged cables.
  - Power backup during main supply grid shutdown.
  - Wifi maintenance.
  - Commissioning of sites.
  - Stock keeping to enhance response time to client during emergencies.
- Maintenance and maintenance contracts are based on service hours, non-service hours other than external factors are considered for payment.
- Maintenance Framework Contract usually does not include stocks of cables, but those with common cable are stocked. Because there is no cable market in Uganda, this is part of customer service that stocks in advance and responds quickly to problems.
- There are many cases where cables have not been installed as designed in Uganda, that makes maintenance works difficult. Also, vandalism of cables by third parties is one of the challenges of maintenance work.
- ATX can offer proposal and design of maintenance management system in addition to cable maintenance management.

2) SOLITON/Telmec

Company Outline: Found in 2005, Head office is at Nairobi, Kenya Major Client: Safaricom, Orange, Airtel, Kenya Airways (Kenya), NITA-U, CSquared (Uganda) Interviewed: Hamdi Ali Mohamed (Project Manager)

[A] Summary of Interview

- SOLITON has a headquarter in Kenya, and is a total network solution company that offers design, facility construction and maintenance.
- As for experience in traffic management, there are violation detection and providing traffic information (Client: Safaricom, https://africabusinesscommunities.com/news/kenya-safaricom-and-google-launch-traffic-information-solution.html)
- Main clients for maintenance contract are NITA-U (2,500 km) and CSquared (850 km).
- SOLITON is possible to do not only cable installtion work but also maintenance management proposal. In addition, it is possible to propose a network monitoring system. As one proposal for maintenance management for JICA project, SOLITON proposes that NITA-U network may be considered to use as a backup.
- Since the fiber cable market has not been developed in Uganda SOLITON recommend to stock 10% of designed cable length.

(3) Site Visit (Kampala, Contractor: ATX Technology)

Overhead Cable Installation

Underground Cable Installation

Underground Cable Installation

Photograph 1.5 Fiber Cable Installations

(4) Conclusion

- The market related to the installation and operation and maintenance of optical cable in Uganda has been developed with a certain extent, and two major companies capable of cable maintenance are confirmed.
- As a result of the interviews, it was confirmed that cable disconnection is the greatest risk of network operation, but there is no case in CBD, Kampala.
- If the cable is released to the general Internet Service Provider (ISP), revenue is expected from that and it will be expected to be arranged for maintenance and maintenance budget, but technical risks need to be studied.

1.3.8 Environmental and Social Considerations.

This project dose not conform " the Project are likely to have significant adverse impacts on the environment and society" according to the "JICA Environmental and Social Consideration Guidelines (April 2010)" (Environmental Guideline), " This is judged that the undesirable influence is not serious, therefore it is classified into Category B which requires environmental impact assessment by the Initial Environment Evaluation (IEE).

On the other hand, from the National Environmental Management Agency (NEMA), which is the jurisdiction of the Environment Impact Study (EIS) in the Uganda, commented that "Although this project involves a construction work in urban areas, the construction work extent is limited as it will be carried out in the existing ROW and land acquisition /resettlement accompanying the work is not planned, so that it falls under category II which does not require EIS study".

(1) Outline of Project Component impacting on Environment and Social Consideration

1) Construction of Traffic Control Centre (TCC)

Traffic Control Center is a three (3) stories building including the facilities detailed in Table 1.19.

Table 1.19 Outline of Facilities in TCC

Building Description	Description of the Facilities
Traffic Control Centre (in total 4 levels, where 3 floors will be above ground)	Basement: Parking, Security Check, Electrical Room, Water Reservoir, Stair Case Ground Floor: Parking, Stair Case 1st Floor: Director's Office, Secretary, Office (Centre Operation and System Operation), Machine Room, Vault, Maintenance Room, Communication Network Room, Meeting Room (1&2), Toilet for Male and Female, Stair Case, Common Corridor. 2nd Floor: Control Room, Facilities Room, Waiting Room for Police, Security Surveillance Room, Rest Room, Pantry, Locker Room for both Male and Female, Cat Nap Room, Halogen Fire Extinguishing Chamber, Vault, Toilet for Male and Female, Toilets for Physically Challenged People, Stair Case, Common Corridor, Connecting Bridge to Existing Building.

Source: JICA Study Team

Source: JICA Study Team

Figure 1.31 Proposed Location of TCC (marked in red)

2) Junction Improvements

Project signalizes thirty (30) junctions. The geometrical improvement works are categorized into four types work as follows,

Table 1.20 Types of Junction Improvement

Type	Types of junction improvement（traffic signal installation is compulsory）
A	Convert a roundabout junction into a Cross or T-junction.
B	Utilize the existing median strip to make a right-turn lane. Widen a section of the current narrow roads. (From about 3m to 5m).
C	Setup a right turn lane using the existing median strip.
D	Install a traffic signals without doing any road improvement (Overlaying the pavement and marking of the road are done)

Source: JICA Study Team

Table 1.21 Images of Types of Junction Improvement

<table>
<tr><th>Type A （e.g. No.15 Rwenzori Roundabout）</th><th>Type B （e.g.No.1 Spear Motors Junction）</th></tr>
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 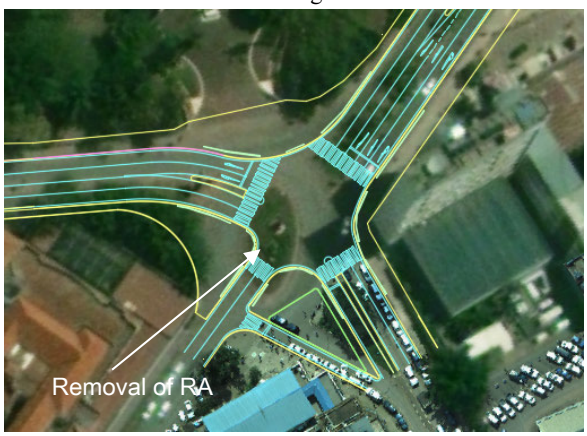
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 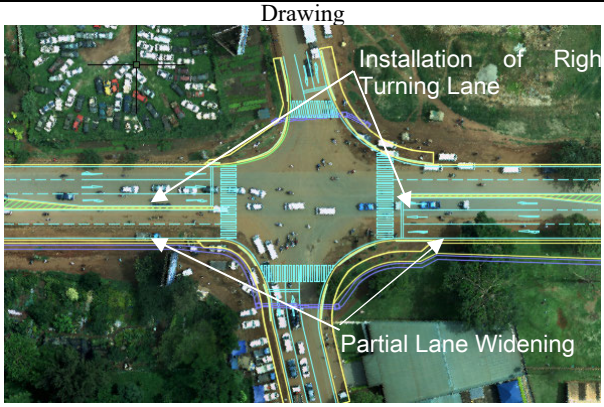
</td></tr>
<tr><td>Work Outline
<u>Removal of Existing Roundabouts.</u>
- Removal of plants, drainage, curs, clock towers and commercial billboards.
- Removal of the existing underground.
- Relocation of the existing underground structures and overhead lines (Covered by Uganda Government)
<u>New Construction Work</u>
- Pavement, drainage, and road markings.
- Installations of traffic signals and road lighting.</td><td>Work Outline
<u>New Construction</u>
- Construction and pavement of new right-turn lanes, road marking work.
- Installation of median strips.
- Overlay work of the existing paved section.
- Installation of traffic signals and road lighting.</td></tr>
<tr><th>Type C （e.g. No.5 Station Junction）</th><th>Type D （e.g. No.18 Kyaggwe Rd/Lumumba Ave Junction）</th></tr>
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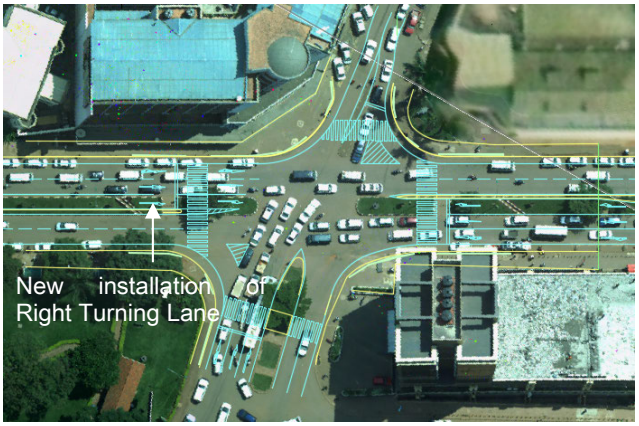
 
</td><td>Drawing
 
</td></tr>
<tr><td>Work Outline
<u>Removal of the existing median strips.</u>
- Removal of plants and curbs.
<u>New Construction</u>
- Construction and pavement of new right-turn lanes, road markings.
- Installation of median strips.
- Overlay work of the existing pavement section.
- Installation of traffic signals and road lighting.</td><td>Work Outline
<u>New Construction</u>
- Installation of traffic signals and road lighting.</td></tr>
</table>

Source: JICA Study Team

Table 1.22 Work Type Applications to Proposed Junctions

No	Junction Name	Existing Geometry of Junction	Manual Control by Police	Improvement Work Type
1	Spear Motors	X-junction	Applied	B
2	Jinja Rd/Katalima Rd	T-junction	Applied	B
3	Nakawa	T-junction (signalized)	Not Applied	B
4	Archer Road	T-junction	Not Applied	C
5	Station	X-junction	Applied	C
6	Entebbe	T-junction (signalized)	Not Applied	C
7	Square	T-junction	Not Applied	C
7-1	Square -1	X-junction	Applied	D
8	Nasser Road	X-junction	Applied	C
10	UMEME Headquarter	T-junction	Not Applied	D
12	Rwenzori Court	Roundabouts	Not Applied	A
14	Kintu Rd/Sezibwa Rd	T-junction	Not Applied	D
15	Grand Imperial	Roundabouts	Applied	A
17	Equatorial/Kyaggwe Rd	X-junction	Not Applied	D
18	Kyaggwe Rd/Lumumba Ave	X-junction	Not Applied	D
19	Nakasero Rd/ Kyaggwe Rd	X-junction	Not Applied	D
20	Nigerian Embassy/Nakasero Rd	T-junction	Not Applied	D
21	Queen's Ln/Bombo Rd	T-junction	Applied	D
22	Kuburi Roundabout	Roundabouts	Not Applied	A
23	Mortuary Roundabout	Roundabouts	Not Applied	A
24	Mulago Roundabout	Roundabouts	Not Applied	A
25	Kampala Road- Dastur Street	T-junction	Applied	C
26	Kampala Road - Square 2	X-junction	Applied	D
26-2	Square -2	X-junction	Applied	D
27	Kyagwe Road- Buganda Road	X-junction	Not Applied	D
37	Wandegeya	X-junction	Applied	B
79	Kampala Road Speke Road	X-junction	Not Applied	D
115	Kira Road/Acacia Ave.	X-junction	Not Applied	D
188	Kampala Road King Goerge Way	X-junction	Not Applied	D
122	Kayunga Road Tufnell Drive	X-junction	Not Applied	D

Source: JICA Study Team

(2) Existing Environmental Conditions

1) Meteorology

Refer to 1.3.4.

2) Topography

Kampala, the capital city of Uganda is located in 0°15_N and 32°30_E with an altitude between 1,100 m and 1,200 m and located at 45 km north of the Equator. It has a total area of 190 sq. km. The city centre is situated 8 km north of Lake Victoria, the third largest lake in the world (the second largest inland fresh water lake) with an altitude of 1,135 m.

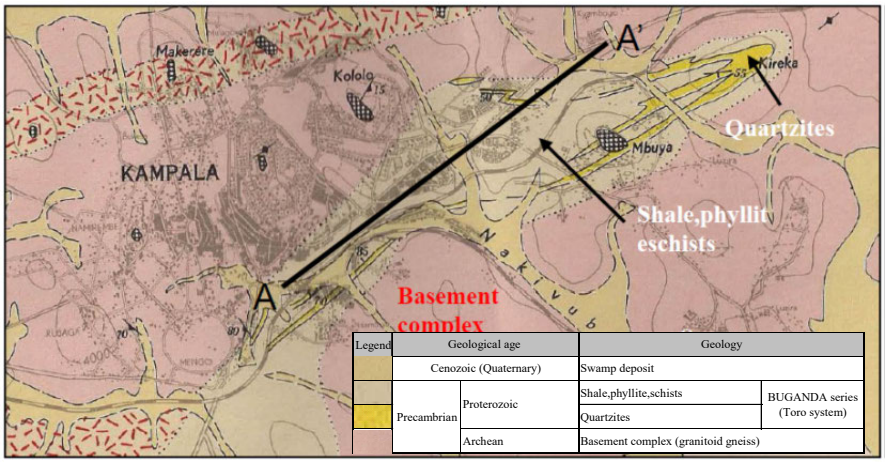
3) Geography

Kampala City is located at the edge of the Congo craton. This area is also affected by organic belt in the Precambrian age named Kibaran orogeny and by the processes of formation of the Rift Valley. Geological map around Kampala City is shown in Figure 1.32. Characteristic features of the geology around Kampala City are described as follows:

[A] **Archean:** Basement complex (granitoid gneiss) is a dominant rock not only around Kampala City but even in the whole of Uganda. This rock is interpreted as being predominantly of sedimentary origin.

[B] **Proterozoic:** Shale, phyllite, and schist, which are known as Buganda Toro Series are also distributed at the lower valley in Kampala City, along the railway line. These are classified as metamorphic rocks with low to high metamorphic grade.

[C] **Cenozoic:** Laterite which was formed in tertiary is mainly seen on the top of the hills. Lateritic gravels at the top of the hills are generally 1 m to 2 m thick. Recent quaternary swamp, alluvium, and lacustrine deposits partly exist near the valley, river, and Lake Victoria.



Source：Ministry of Energy and Mineral Development

Figure 1.32 Geological Map around Center of the Kampala City

4) Soil

Most of the project area is composed of mainly clays, silts and sands overlying completely weathered bedrock (tropical residual soils) which are in turn underlain by the undifferentiated gneisses. Tests. Available test results show that the soils are shared amongst low plasticity clays (CL), intermediate plasticity clays (CI), high plasticity clays (CH), silty gravels (GM), and clayey sands (SC), silty sands (SM), sandy silts (ML). Generally, the particle size distribution curves show that silts, clays, and sands underlie the site. Natural moisture content values range between 6.9 to 33.9%. A detailed assessment of the data reveals that moisture contents are higher at higher water tables which as should be expected.

5) Air Quality and Noise Level

[A] Baseline Monitoring Points

The Project includes four types of construction work as described in Table 1.21. The Type A is considered giving some impacts on natural and social environment while the others do not as the works only include installations of signals devices and cables.

Given that consideration, the Study Team conducted the environmental baseline data survey at the junctions where the Type A is applied. The baseline survey points are shown in Figure 1.33

a. Survey Conditions

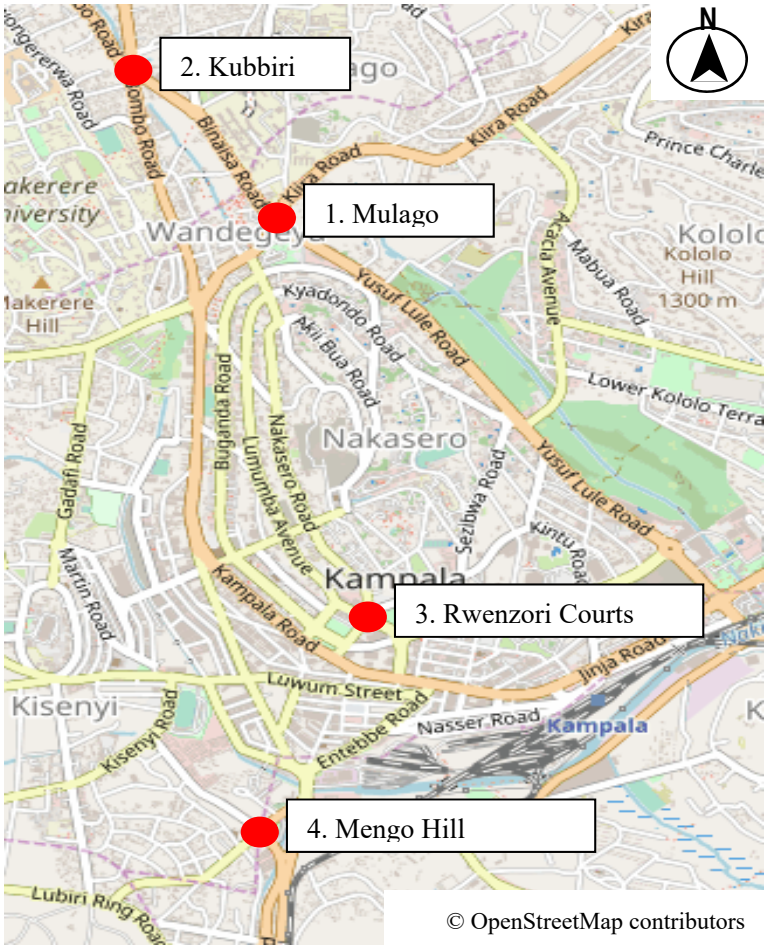
Survey conditions are described in Table 1.23.

Table 1.23 Air Quality and Noise Level Survey Conditions

	Air Quality	Noise Level
Survey Points	1. Mulago Roundabout 2. Kubbiri Roundabout 3. Rwenzori Courts Roundabout 4. Mengo Hill Road Roundabout	
Survey Dates	25th September to 4th October, 2017	
Survey Time	AM7:00～PM7:00（12 Hours） 2days for each point	
Survey Time	Continuous measurement for 1 hour every 10 minutes	Continuous measurement for 1 hour every 10 minutes
Survey Items	PM2.5 [μg/m^3]、PM10 [μg/m^3] SO_2 [ppm] NO_2 [ppm] H_2S [ppm] CO [ppm]	Equivalent continuous A-weighted sound pressure Level：L_{eq} [dBA]
Equipment	CEM DT-9881 Particle Counter（PM2.5、 PM10） IBRID MX6 Multigas Monitor（SO2、NO2、H2S、CO）	Extech Data Logger Sound Level Meter

Source: JICA Study Team

Survey points are the roundabouts to be improved with signalization, where the traffic volume is large and the existing junction geometry is greatly improved. The survey position is shown in Figure 1.33.



Source：JICA Study Team

Figure 1.33 Environmental Survey Positions

b. Survey Result

・ Air Quality

In general, the concentration of gases depends on the time of the day due to variations in humidity and temperature as well as the traffic levels. The levels for CO were 0.4 -130 ppm, SO2 were 0.01–5.5 ppm, H2S were 0.02-0.8 ppm, volatiles were not detected, NO2 levels range was 0.04-1.9 ppm, O2 levels range was 20.8%-21.1%, and O3 range was 0.01-0.03 ppm.

Table 1.24 Air Quality Survey Results（Average for 12 hours）

Roundabout	PM2.5 (μg/m^3)	PM10 (μg/m^3)	SO_2 (ppm)	NO_2 (ppm)	H_2S (ppm)	CO (ppm)
Mulago	115	71	0.08	0.20	0.23	10.0
Kubbiri	122	91	0.21	0.15	0.08	13.9
Rwenzori Courts	110	47	0.09	0.13	0.17	7.2
Mengo Hill Road	230	134	1.29	1.12	0.23	56.0
[1]NEMA Ambient Air Standard*	-	-	0.15	0.10	15.0	9.0
[2]WHO	25	50				

1: Draft Air Quality Standards for Ambient Air and Point Source Emissions, 2006 (NEMA)

2: Global Ambient Air Guidelines, 2005 (World Health Organization)

Source: JICA Study Team

For CO, NO2, and SO2, the concentrations tend to exceed the NEMA Standards for ambient air (Annex III) at some periods of the day especially morning and evening hours of high traffic jam. For O3 and H2S the concentrations remain within the acceptable limits throughout the day. Of the 4 RAs, the highest concentrations of gases were measured at Mengo Hill Road RA. Morning and evening hours are peak hours characterized by high traffic jam with carbon monoxide concentrations of up to 10 ppm measured at Rwenzori Courts RA, 15 ppm at Mulago RA, 28 ppm at Kubbiri RA, and very high levels of up to 105 ppm taken at Mengo Hill Road RA. Such very high values are due to idling during traffic jam when incomplete combustion of the fuel generates high quantities of CO. Low values for Carbon Monoxide were measured at midday, a period when traffic volumes are usually low. Concentrations for SO2 also follow a similar pattern with the highest concentration of 5.5 ppm registered at Mengo Hill Road RA. Concentrations for ozone reach a peak of 0.03 ppm between 11.00 am and 4.00 pm when the temperature is high and humidity is low that favours the generation of ozone. The highest concentration for NO2 of 1.9 ppm was measured at Mengo Hill Road RA and low values of ≤ 0.4 ppm were measured at Kubiri RA, Rwenzori Courts RA and Mulago RA.

・ Particulate Matter

The results for particulate matter are presented based on size (PM_{10} and $PM_{2.5}$) as well as concentrations in terms of particles per unit volume and mass concentration i.e. mass per unit volume. Similar to the concentration gases, Mengo Hill Road had the highest concentration of particulate matter. NEMA draft standards allow for a maximum of 300 μg/m^3 for total suspended particles (TSP). However, the standards do not provide for specific limits for PM2.5 and PM10. Comparing with WHO Guidelines (2005), the results for PM2.5 and PM10 are above the limits.

Table 1.25 Mean Concentration of Particulate Matter

Roundabout	12-hour mean PM10 particles /m^3	12-hour mean PM10 concentration μg/m^3	12-hour mean PM2.5 particles/m^3	12-hour mean PM2.5 concentration μg/m^3
Mengo Hill Road	148,781	134	765,917	230
Rwenzori Courts	52,138	47	366,756	110
Kubiri	100,487	91	572,890	122
Mulago	78,281	71	385,580	115
[1]NEMA Ambient Air Standard*	-	-	-	-
[2]WHO	-	50 μg/m^3	-	25 μg/m^3

[1]Draft Air Quality Standards for Ambient Air and Point Source Emissions, 2006 (NEMA) [2] Global Ambient Air Guidelines, 2005 (World Health Organization)

Source: JICA Study Team

- Noise Level

The noise levels measured were in the range of 28.1 to 112.9 dBA. High noise levels were mainly attributed to moving police vehicles with sirens and ambulances at the time of assessment which were above the permissible limit of 70 dBA for commercial areas as prescribed in the National Environment (Noise Standard and Control) Regulations, 2003.

The noise levels do not follow any particular pattern but largely depend on the type of vehicle traffic approaching or negotiating the roundabout i.e. heavy-duty trucks and trailers emit noise levels of more than 80dBA while light duty trucks and small private cars emit relatively lower noise levels. Many heavy-duty trucks that come from Kalerwe pass via Kubiri and Mulago RAs while few of them use the Rwenzori Courts RA. Another factor that contributes to noise levels is the location of the roundabout. For example, Mengo Hill Roundabout is associated with higher noise levels because vehicles must accelerate more as they join the RA from Kabaka Anjagala Road.

Table 1.26 Noise Survey Result (Leq) 12 Hour Average

Roundabout	Day 1 (dBA)	Day2 (dBA)
Mulago	73.8	69.1
Kubbiri	78.5	79.2
Rwenzori Courts	66.1	68.3
Mengo Hill Road	66.1	69.9
[1]NEMA Noise Standard*	70	

1: The National Environment (Noise Standards And Control) Regulation, 2003 (NEMA)
Source: JICA Study Team

6) Flora

Tree survey during site visit was carried out in June 2017. The approximate number of trees that are subject to compensation (except the tree which has not reached 2 m height and every palm tree) by the construction at each junction or roundabout is shown in Table 1.27.

Table 1.27 Likely Affected Trees and Their Species

Junction No.	Junction / Roundabout	Approximate Number of Likely Affected Trees	Tree Species
1	Spear Motors	1	Common Trees
2	Jinja Rd/Katalima Rd	0	-
3	Nakawa	0	-
4	Archer Road	0	-
5	Station	3	Common Trees
6	Entebbe	0	-
7	Square	0	-
7-1	Square-1	0	-
8	Nasser Road	3	Common Trees
10	UMEME Headquarter	0	-
12	Rwenziori Court	5	Common Trees
14	Kintu Rd/Sezibwa Rd	0	-
15	Grand Imperial	3	Common Trees
18	Kyaggwe Rd/Lumumba Ave	0	-
19	Nakasero Rd/ Kyaggwe Rd	0	-
20	Nigerian Embassy/Nakasero Rd	0	-
21	Queen's Ln/Bombo Rd	0	-
22	Mortuary	0	-
23	Kubiri	0	-
24	Mulago Roundabout	0	-
25	Kampala Road - Dastur Street	0	-
26	Kampala Road - Square 2	0	-
26-1	Square 2-1	0	-

27	Kyagwe Road - Buganda Road	0	-
37	Wandegeya	0	-
79	Kampala Road Speke Road	0	-
115	Kira Road Acacia Avenue	0	-
188	Kampala Road King George Way	0	-
121	Kayunga Road Tufnell Drive	0	

Source: JICA Study Team

Tree to be relocated（Junction No12）

Tree to be relocated（Junction No1）

Source: JICA Study Team

Photograph 1.6 Trees to be relocated

7) Socio Economic

Socio economic data from the Census 2014 are described earlier in 1.1.4.

8) Ethnic Group

Within the Project area, the dominant ethnic group is the Baganda who are, by nature, very accommodating to other ethnic groups in Uganda. The communities are mostly patrilineal with men dominating the decision-making process.

9) Public Infrastructure and Utilities

The roadsides are channels for various infrastructures particularly those related to water main, electricity line, and telecommunications in underground. According to National Water Sewage Corporation (NWSC), the project area along the Centenary Park is the most significant transit region for the water that serves most of Kampala.

Table 1.28 Public Utilities within the Project area

Responsible authorities	Public Utilities
Power Distribution Company (UMEME)	Overhead Power Cables, Underground Cables, and Power Stations
Kampala Capital City Authority (KCCA)	Signals and Street Lights
Airtel, MTN, Africell, NITTA-U	Telecommunications Lines (Optical Fiber Cables)
National Water and Sewage Corporation (NWSC)	Watermains, Sewerage Lines

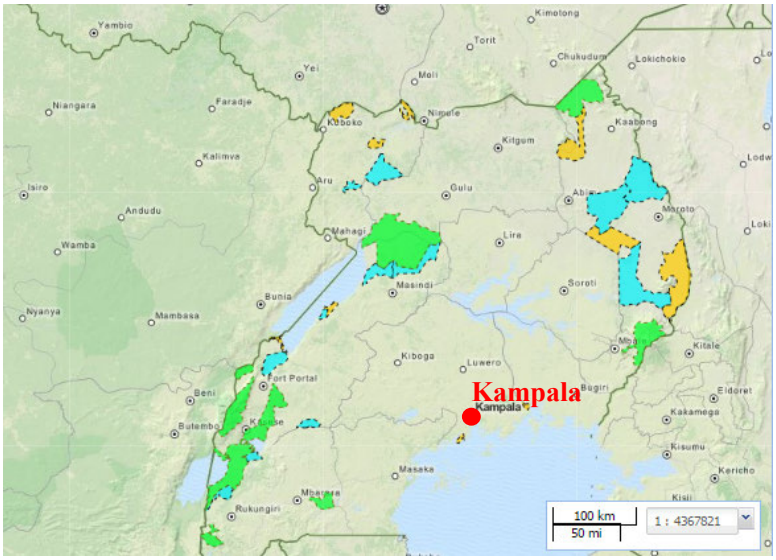
Source: JICA Study Team

10) Waste Management

Presently the waste management system within the city may be described as inadequate. People tend to dump waste at the nearest point which waste ends into the drainage system together with storm water. In the past, this has led to blocking of drainage and subsequent road damage. Areas for waste management are to be established later as the study progresses.

11) Conservation Area

There are no rare species included in the red list designated by the International Conservation Union for Nature Conservation (IUCN) in the target site. In addition, outside of the project site, there is a registered wetland of "Lutembe Bay Wetland System" in the Lake Victoria basin. The distance to the wetland is about 20 km away from the project site and has little impact on wetland conservation.



Source: JICA Study Team

Figure 1.34 National Parks and Conservation Areas

12) Archaeological and Cultural Heritage

There is the Impedance Monument near Grand Imperial Roundabout (15) and another is also a monument at Mengo Hill roundabout (9) in the project sites. Both monumental structures are expected to be relocated to available land near original positions prior to the implementation. Permissions of removal and relocation positions need to be addressed to the Uganda Museum.

Other archaeological and cultural heritages existed in Kampala are listed in Table 1.29

Table 1.29 Archaeological and Cultural Heritages in Kampala City

No	Name	Description
1	Independence Monument	Statue representing 1962 Independence Monument (An adult person lifting a new born infant(Uganda)
2	Independence Tablet	Commonwealth independence October 9 -1962, Jubilee park.
3	Kololo Monument	50 years of independence
4	Kololo Hero Monument	Ignatius Musaazi independence liberation hero
5	Kololo/ceremonial grounds	Commemoration of independence/raisin g of Uganda's flag on the 9th 0ctober 1962
6	Mackay Memorial, Natete	Anglican Church at the 1st site of occupation by the CMS missionaries in the country (1890), headed by Reverend Mackay
7	Busega Martyrs Memorial	Rubaga, Three Anglican Martyrs were killed and buried here
8	Bulange	Royal seat of the Buganda Kingdom
9	Nagalabi Buddo	Coronation site for Buganda Kingdom Kings
10	All Saints Church Kisozi	One of the first and oldest churches in Uganda
11	Shree Shanathan Dharma	1954 Hindu Temple, original form, rich oriental architecture &traditional building skills
12	Rubaga Cathedral	Head of the Catholic churches
13	Namirembe Cathedral Hill	Head of Anglican Churches, historic cave, and historic buildings by the missionaries. The 1st cathedral was built in 1st March 1890-1894 made up of mud and wattle, and grass by architect Nicodemo Sebwato and opened by Bishop Alfred Tucker collapsed after two years. THE SECOND CATHEDRAL WAS DESIGNED BY APOLO Kagwa in 1894 opened 14th July 1895. In 1901 King Daudi Cwa laid the foundation

No	Name	Description
		stone for the third Cathedral to begin, which was also destroyed by fire after lightning stroke. In 1902.8th November 1915, Kabaka Daudi Cwa laid the foundation for the fourth cathedral and consecrated 13th September 1919 by Bishop Willis. In more permanent materials. it had three Chapels, Bishop Hannington Chapel, Mary Nsubuga Chapel, and Canon Apolo Kivebulaya. It acquired an organ in 1923 which is still used to date.
14	Gadaffi Mosque	The main seat for the Chief Khadi of the Muslim faith Uganda
15	Kibuli Mosque	Seat for the Muslim faith built in 1945 by the Aghakan and Prince of Buganda
16	Bahai Temple	Seat for the Bahai Faith
17	Lusaze Lubya Church	Catholic mission of 1879 Kijukizo church
18	Fort Lugard, Old Kampala	Established by Captain Lugard 1890 where he raised the British flag, served as, and headquarters up to 1894 Survived by the first museum in the country and the Gaddafi mosque
19	Aga Khan Mosque	Old Kampala
20	St Athanasius Bazzekuketta	Mengo Memorial, Catholic Martyr
21	St Matia Kalemba Mulumba	Site in memory of the oldest Martyr of the 22 Catholic martyrs
22	High Court building Nakasero	Seat of Highest Court building in the country
23	The Parliamentary Building	Set where the law makers of the country meet to transact business
24	Uganda Bookshop	Oldest bookshop plot 4 Colville street 1927 publishing and printing house
25	Makerere University Building	Ivory Tower building as one of the oldest iconic education institutional seat
26	Basiima Bakyagaya house	Late Sir Apollo, Kagwa's house, on Kabaka Njagala Road, built 1903
27	Buganda court building	Mengo
28	Dorset building	At Makerere University
29	Nagulu communications mast	Two nationals for television and radio
30	Uganda Museum	Oldest Museum in East Africa
31	National Theatre	National Culture Centre
32	Public Library	On Buganda Road House in an Indian Building
33	Nommo Gallery	African village
34	Tulifanya Gallery	Art gallery and craft shop
35	St. Balikudembe (Owino) Market	Traditional market in centre of city
36	Nakasero Market	Built in 1927
37	Mulago hospital	National Referral Hospital. Old Mulago was founded in 1913 by Sir Albert Ruskin Cook, while the New Mulago facility was completed 1962
38	Musa body metal works	Katwe plant that fabricates oil refineries and brick making.
39	Twekobe Palace	Kabaka Mutesa II Residential palace
40	Buttikiro	Katikkiro of Buganda Official residence.
41	Kabaka lake	Man-made Cultural Water Body.
42	Kampala Club	At Sezzibwa road is the oldest club in Kampala
43	Kisingiris House	One of those historic buildings of the Kabakas Chiefs.
44	Tefio Kisonsokole	
45	Sir Albert cooks house	Makindye, Kabaka Birth place.
46	Kawutas house	Ring road.
47	CHOGM Monument	Officially known as the CHOGM monument, commemorates the hosting of the heads of government meeting in Uganda 2007. An Imposing copper structure
48	Clock Tower	Commemorating the queen visit in 1954 built within the Queens way
49	Kololo Airstrip	Monuments, burial for heroes, airstrip national functions.
50	Constitutional square	Upper part commemorates World war 2 victims, lower part is Monument of the constitutional square.
51	Kasubi Masjid Tawahud Mosque	Grass thatched round house containing the tombs and insignia of Mutesa I, and three northern subsequent rulers of Buganda Monument of the constitutional square.
52	Kasubi Masjid Tawahud Mosque	Built by Mutesa I in 1870 when he first had his capital at Kasubi, Nabulagala.
53	Wamala Tombs	Grass thatched round hut very similar to Kasubi tombs, containing the tombs of Sunna II of the Buganda Kingdom 1856.
54	Mapeera Bakateyamba, House Nalukolongo.	Established by Mapeera to treat the disabled and the elderly.
55	Kiwewas Tombs	At Masanafu in Kampala is the Tombs of King Kiwewa.
56	Old railway house	Railways building –More information
57	GOU analytical lab	Built in 1992, a historical building
58	Corner House	Plot 44 Rashid Hamis road (historic buildings)
59	St Peters boys Nsambya	One of the first schools by the Hill Mill Fathers 1907
60	Nsambya convent	Several historic buildings (assign someone to take the history)
61	Musajalumbwa house	
62	Kisingiris house Mengo	Residential

No	Name	Description
63	Kakungulus house	
64	Gomboloa House	Balintuma road
65	Speke hotel	Built in 1920, historical and has maintained the colonial look.
66	Port Bell pier	1st- pier for large ships landing in Luzira
67	Grand Imperial Hotel	One of the oldest hotels in Kampala Initially known as Grand hotel
68	Ruparellia Building	Martin Road
69	Mawandas House	Salaama Road
70	Jimmy Purmas house	Salaama Road
71	Centenary Monument	Monument commemorating 100 years
72	**Mutesa Monument**	**Located at Grand Imperial round about.**
73	Pan African Square	Beginning of African to fight for independence
74	Naksero Photo	Old military base for the British.

Source: JICA Study Team

The monument at Ground Imperial Roundabouts will only be one to be relocated.

72
Edward Mutesa II Monument
Grand Imperial Roundabout

Source: JICA Study Team

Photograph 1.7 Monument to be relocated.

The monument is planned to relocated to the open space near the junction taking into consideration maintaining cultural and historical contexts of the monument.

13) Others

a. Billboards

The following existing billboards will be affected by the Project. The billboards are located in the site of KCCA and is posted by the private sector, but if the billboard interferes with KCCA's projects, the KCCA will consult the relocation destination and the advertiser (KCCA does not make monetary compensation for relocation) according to the contract.

Relocation of billboards was also carried out in KIIDP 2, and the advertiser promptly relocated the facility after consultation with KCCA. Therefore, it is not expected to be a problem in the implementation of this Project.

Table 1.30 Billboards to be removed,

Name of Junction	Facility	Location
No.1: Spear Motors	Clock Tower & Billboard	Roadside
No.15: Grand Imperial Roundabout	Clock Tower & Billboard	RA
No.22: Kubiri	Clock Tower & Billboard	RA
No.24: Mulago Roundabout	Billboard	RA

Source: JICA Study Team

JCT No.22

JCT No.24

Source: JICA Study Team

Photograph 1.8 Billboards to be relocated

14) Poverty

As this survey does not carry out assessment surveys by re-entrustment, the Study Team analyzes poverty in project areas from existing documents.

According to a survey conducted by the Ministry of Land (Housing and Urban) Ministry (MoLHU) in 2008, residences in Kampala has increased by 20% to about 170,000 households (about 64%) in the six years since 2002. According to the survey by the World Health Organization (WHO) (2010), 60% of the residents of Kampala live in the slum area and is impossible to access public facilities and amenities. Likewise, UN - Habitat (2007) states that over 60% of the population of Kampala lives in slums.

In addition, the following indices related to poverty were obtained from existing documents.

a. Income level

According to Uganda National Household Survey 2012/13, the average monthly income per household in Kampala is 287.62 dollars, which is much higher than the national average of 133.50 dollars and the highest in the country. However, the cost of living for four families and one household is high (excluding residential expenses) and it is high about 1,610 dollars / month, urban poverty is one of the problems of Kampala.

b. Enrollment rate

Elementary school education is compulsory in the country, enrollment rate is high at 80.31%, and one is in Kampala at 85.05%, is higher than the national average. Also, the distance to elementary school is less than 3 km is 95%, which is much larger than the national average of 85.7%.

As a characteristic of developing countries, the enrollment rate after compulsory education tends to drop sharply, but the nationwide average of secondary school (Secondary) enrollment ratio also falls to 40.51%. Among them, Kampala is 67.16%, much higher than the national average, but the high school (Tertiary) enrollment rate drops sharply to 13.2% (4% in the national average and 6% on the sub-Saharan average).

c. Water Penetration Rate

Only about 20% households are equipped with water supply facilities. Approximately 35% of households use wells as the main source of water.

(3) Environmental Society Systems and Organization Considerations in Uganda.

1) National Environment Management Authority (NEMA）

The responsible agency for EIS in Uganda is the National Environmental Management Authority (NEMA). In the National Environment Law (NEA), the role of NEMA is stipulated as the agency that oversees all activities in the field of monitoring, regulation, coordination, and environment and is responsible for the overall management of the environment. The Environmental Monitoring and Compliance Department oversees the EIS in NEMA.

Judgment on whether it is necessary to carry out an EIS for each project is determined according to the Third Schedule of NEA Cap.153, which stipulates as follows;

a. Projects that will likely be exempted from the Environmental Impact Study(EIS)（equivalent to Environmental Impact Review（EIR) or Environmental Impact Assessment（EIA)).
b. Projects subject to the EIS are defined by field.

Although this project is not a linear road improvement but a point-like junction improvement, it does not conform to the items specifies by NEMA, but the relevant part can be considered as "3. Transportation, including – (a) all major roads". Table 1.31 shows the EIS implementation criteria (Third Schedule).

Table 1.31 The EIS Implementation Criteria (Third Schedule)

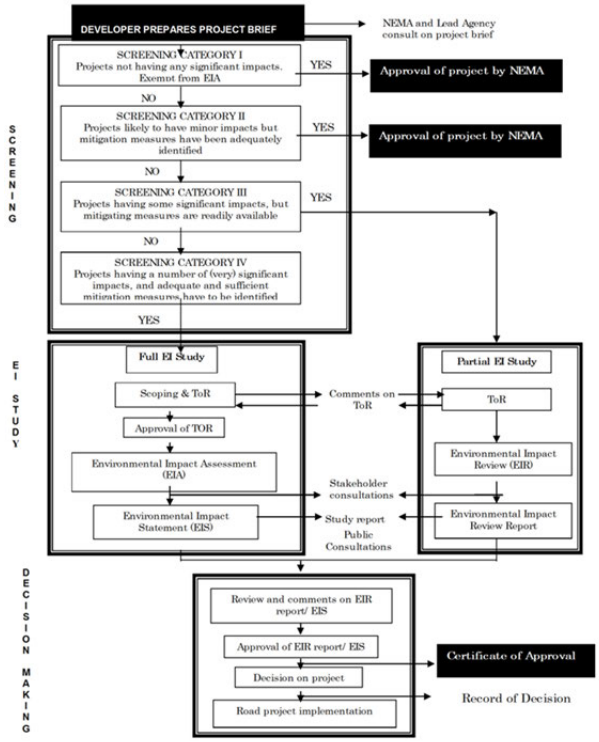
1. General -	9. Processing and manufacturing industries, including -
(a) an activity out of character with its surroundings;	(a) mineral processing, reduction of ores and minerals;
(b) any structure of a scale not in keeping with its surroundings;	(b) smelting and refining of ores and minerals;
(c) Major changes in land use.	(c) foundries;
2. Urban development, including -	(d) brick and earthenware manufacture;
(a) designation of new townships;	(e) cement works and lime processing;
(b) establishment of industrial estates;	(f) glass works;
(c) establishment or expansion of recreational areas;	(g) fertilizer manufacturing or processing;
(d) establishment or expansion of recreational townships in mountain areas, national parks, and game reserves;	(h) explosives plants;
(e) shopping centres and complexes,	(i) oil refineries and petrochemical works;
3. Transportation, including -	(j) tanning and dressing of hides and skins;
(a) all major roads;	(k) abattoirs and meat-processing plants;
(b) all roads in scenic, wooded, or mountainous areas;	(l) chemical works and process plants;
(c) railway lines;	(m) brewing and malting;
(d) airports and airfields;	(n) bulk grain processing plants;
(e) pipelines;	(o) fish processing plants;
(f) water transport.	(p) pulp and paper mills;
4. Dams, rivers, and water resources, including -	(q) food processing plants;
(a) storage dams, barrages, and weirs;	(r) plants for the manufacture or assembly of motor vehicles;
(b) river diversions and water transfers between catchments;	(s) plants for the construction or repair of aircraft or railway equipment;
(c) flood-control schemes;	(t) plants for the manufacturing or processing of rubber;
(d) Drilling for the purpose of utilizing ground water resources, including geothermal energy.	(u) plants for the manufacturing of tanks, reservoirs, and sheet-metal containers;
5. Aerial spraying.	(v) plants for the manufacturing of coal briquettes.
6. Mining, including quarrying and open-cast extraction of-	10. Electrical infrastructure, including -
(a) precious metals;	(a) electricity generation stations;
(b) diamonds;	(b) electrical transmission lines;
(c) metalliferous ores;	(c) electrical substations;
(d) coal;	(d) pumped-storage schemes.
(e) phosphates;	11. Management of hydrocarbons, including the storage of natural gas and combustible or explosive fuels.
(f) limestone and dolomite;	12. Waste disposal, including -
(g) stone and slate;	(a) sites for solid waste disposal;
(h) aggregates, sand, and gravel;	(b) sites for hazardous waste disposal;
(i) clay;	(c) sewage disposal works;
(j) Exploration to produce petroleum in any form.	(d) major atmospheric emissions;
7. Forestry-related activities, including -	(e) Offensive odors.
(a) timber harvesting;	13. Natural conservation areas, including -
(b) clearance of forest areas;	(a) creation of national parks, game reserves and buffer zones;
(c) reforestation and afforestation,	(b) establishment of wilderness areas;
8. Agriculture, including -	(c) formulation or modification of forest management policies;

(a) large-scale agriculture;	(d) formulation or modification of water catchment management policies;
(b) use of new pesticides;	(e) policies for management of ecosystems, especially by use of fire;
(c) introduction of new crops and animals;	(f) commercial exploitation of natural fauna and flora;
(d) Use of fertilizers.	(g) Introduction of alien species of fauna and flora into ecosystems.

Source: Third Schedule, The National Environmental Act（Gov. of Uganda, 1995）

This project is not a linear road improvement but a point improvement, most of which is to install signal equipment at existing intersections. Therefore, it does not fall under the project to implement EI Study shown in Table 1.31.

According to "Guidelines for Environmental Impact Assessment in Uganda: July 1997" and "Environmental Impact Assessment Guidelines for Road Projects: September 2004" guidelines of the country, the process of EI Study / EIA is as follows, .



Source: Environmental Impact Assessment Guidelines for Road Projects: September 2004

Figure 1.35 EIS Workflow

2) Kampala Capital City Authority (KCCA)

The KCCA Environmental Management Unit under the KCCA 's Public Health and Environment Bureau has the role of implementing sustainable infrastructure development, urban planning, social development and improving the environmental quality of Kampala City.

The KCCA Environment Management Unit has the following functions.

1. Environmental monitoring of the proposed project and development projects under construction or after construction and law enforcement
2. Management of industrial waste including home garbage and hazardous substances and consideration of rationalization of management guidance and management method

3. Conservation and management of natural resources (water, wetlands, forests, biodiversity)
4. Formulation and implementation of action plans in environmental management
5. Integration of best practices of environmental management and climate change in Kampala city infrastructure development, gender and community service, spatial planning, education, and other major urban development projects

3) Ministry of Works and Transport (MoWT)

In Uganda, in accordance with the National Environmental Act of 1995, Cap.153, each ministry is required to establish an Environmental Liaison Unit (ELU) and also obliged to formulate EIS guidelines for each ministry.

In response to this Act, the Ministry of Works, Housing and Communication (MoWHC), the predecessor of the Ministry of Works and Transport, established an ELU within the ministry in 2001. In 2004, the EIS guidelines for Road Sectors were formulated for the purpose of incorporating cross-sectoral social and environmental problems into the road sector projects.

Table 1.32 Environmental Categories for Road Projects

Screening Category	Definition	Type of Road Project or Activities
I	Project normally exempted from EISs	Routine maintenance works such as pavement repairs, cleaning of culverts and drains and roadside vegetation. Periodic maintenance works such as grading and re-gravelling, sealing, surface dressing and road marking and furniture.
II	Projects for which mitigation measures are easily identified	Partial rehabilitation works, such as reconstruction of small sections of existing paved roads. Project involving upgrading from earth to gravel.
III	Projects requiring limited environmental analysis (EIR)	Major rehabilitation/improvement project for existing roads. Project involving pavement strengthening. Project involving upgrading from earth to gravel to bitumen standard.
IV	Project requiring full environmental analysis (EIS)	Construction of new roads. All road rehabilitation projects with new alignment. All road projects requiring relocation of people through acquisition of land for easement, for example the upgrading of urban sections of major roads. All road construction and rehabilitation projects passing through environmentally sensitive areas such as Wetlands Forests National parks/protected area Area prone to desertification Area prone to erosion (mountainous or steep terrain) Areas of unique scenery Area of scientific, historic, or archaeological interest Areas of special cultural, traditional, or religious value Areas of importance to threatened ethnic groups

Source: Environmental Impact Assessment Guidelines for Road Projects: September 2004, MoWHC

(4) Environmental Category

NEMA assumed the project category to be category II. However, NEMA will determine the official category after they analyze the Project Brief. Although the number of target junctions increased, this junction improvement involves no additional land acquisition or relocation of residents.

The conformity of this project to NEMA Third Schedule (projects that require the EIS procedure) and the Environmental Guidelines (2004) and views of JICA Study Team and NEMA in-charge is shown in Table 1.33 below.

Table 1.33 Views of NEMA and the Study Team on the Environmental Category.

Projects	Conformity with NEA (1995) Third Schedule	Conformity with EIS Guidelines for Road 2004 (MoWHC)	View of Study Team/NEMA (Person-in-charge)
Improvement of 30 junctions	3.Transport related Projects (a) All major arterial roads.	Category II (Projects where alleviation measures can easily be specified) -Partial repair (e.g. minor repair of existing pavement) -Upgrading from an earthen road to a graveled road Category III (Project requiring limited environmental analysis (EIR)) -Project for major repair and improvement of existing roads -Strengthening of pavement -Upgrading from an earthen/graveled road to an asphalt road Category IV (Full Environmental Analysis：Projects requiring EIS) -Construction of a new road -Construction of new, including repair of roads -Any road projects that involve relocation of residents and land acquisition (e.g. repair work of a main arterial road in the central urban area) -Any construction or repair works that pass-through nature conservation areas (marshes, forests, national parks, desert, eroded areas of mountains and terraces, scenic areas, historical/cultural areas, areas with traditional/religious value, and areas of ethnic minorities)	(Study Team) The road improvement is in bits (not consecutive), at the particular junctions thus the project has no items falling under the NEA (1995) and the Environmental Guidelines (2004). NEMA decision will be followed. (NEMA) Although there are signalization of junctions associating relocation of monuments, the social and environmental impacts are limited because land acquisition and residents' relocation are not involved, and they do not correspond to projects requiring the EI Study stipulated by Third Schedule. * KCCA has a similar understanding
Construction of the 5-story Traffic Control Center.	1. General (b)Building of which scale does not harmonize with its surroundings.	—	(Study Team) Since the building will have 5 or less stories as others of the same scale at the KCCA premises, as a single project, it will not disturb the surrounding environment. Submission of the Project Brief is thus considered not necessary. * However, this is true only if it is a single project. If it is implemented with the project for junction improvement, it should be included in the Project Brief as one activity and the same explanation as the other project (a note that it should not disturb its surrounding environment) should be added. (NEMA) Since it's within the KCCA premises, it does not require environmental approval on a standalone basis.

Source: JICA Study Team

This project does not modify of the existing urban structure and it does thus not fall under the requirements of the Third Schedule of 1. General and 2. Land use. This project is also not a linear road improvement but a point-like improvement. Regarding conformity of the 3 in Table 1.31, the scope of (a) all major road, the Project does not widen the existing road width and only gives installing signaling equipment that does not affect the environment. It was therefore NEMA, KCCA and the Consultant concluded the Project dose not conform with the 3 in the discussion.

(5) Status of environmental approval for other Uganda's grant aid projects (Reference)

Table 1.34 shows case examples of environmental approval of construction projects of grant aid projects implemented in Uganda in the past.

Table 1.34 EIS Information of Grant aid Construction Projects

Project Name	Relevant Project/Project Scale	Condition of EIS Acquisition
Construction plan basic design survey of Uganda's Rice Research and training center.	Uganda Rice Research and Training Center: 200-700m^2 one-story x 9 buildings, field of approx. 2hactres.	EIS was not carried out since C/P and NEMA did not require because the project location was within the C/P premises and the project building is of one story thus C/P and NEMA did not request for an EIS. EIS was not carried out.
Preliminary survey on rural water supply plan in the L.Kyoga basin, Uganda.	Water supply facilities for 9 locations. Approx. 700m^2 per location.	JICA's environmental category B. Although the project involved no relocation of residents or land acquisition, screening was carried out as the project involved activities of drilling of wells for the purpose of using ground water sources. As a result, Uganda's EIS procedures were followed and the EIS was carried out.

Source: JICA Study Team

(6) Environmental Legal Framework in Uganda

In implementing the environmental survey, the laws, and regulations of "c" country to be referred to are as shown in Table 1.35

Table 1.35 Environmental Legal Framework in Uganda

Legal Framework for Environmental and Social Consideration in Uganda
The national environment management policy, 1994 Uganda forestry policy, 2001 National water policy, 1999 Wetlands policy, 1995 Constitution of the Republic of Uganda, 1995 National Environment Act, Cap 153 Land Act, Cap 227 Road Act, Cap 358 Town and country planning act, Cap 246 National forestry and tree planting Act, 2003 National environment (wetlands, river banks & lakeshores management) regulations, 2000 National environment (standards for discharge of effluent into water or on land) regulations, 1999 National environment (waste management) regulations, 1999 National environment (noise standards and control) regulations, 2003 Uganda Wildlife Act, Cap 200 Draft national air quality standards, 2006 National environment (hilly and mountainous areas management) regulations, 2000 National environment (control of smoking in public places) regulations, 2004 Historical monuments, Act Cap 46 Environmental audit regulations, 2006 Water Resources Regulations 1998
International Safeguard Policy (including JICA)
JICA guidelines for Environmental and Social Considerations, 2010 WB Operational Policy/Bank Procedure4.01: Environmental Assessment, Revised 2011 WB Operational Policy 4.12: Involuntary Resettlement 2011 WB Operational Policy 4.10: Indigenous Peoples 2011

Source: JICA Study Team

(7) Environmental Standard Gap Analysis

The environmental and social considerations for the JICA's Project is required the divergence between the relevant legal system in JICA.

Table 1.36 Gap Analysis on Guidelines

Subject	JICA Guideline	Ugandan Guideline	Gap and/or Correspondence
Principal	Environmental impacts that may be caused by projects must be assessed and examined in the earliest possible planning stage. Alternatives or mitigation measures to avoid or minimize adverse impacts must be examined and incorporated into the project plan. (Appendix1.1, JICA GUIDELINES FOR ENVIRONMENTAL AND SOCIAL CONSIDERATIONS)	4.1.2 Impact Mitigation One of the main objectives of EIS is to predict and prevent unacceptable adverse environmental effects of proposed actions/projects, through recommending the implementation of appropriate project modifications or actions which reduce, avoid, or offset the potential adverse consequences of a project. In order to achieve this, it is necessary that the impact assessment be carried out at the same time as the project design so that any design changes can be recommended early enough.	No Gap
Information Disclosure	•EIA reports (which may be referred to differently in different systems) must be written in the official language or in a language widely used in the country in which the project is to be implemented. When explaining projects to local residents, written materials must be provided in a language and form understandable to them; •EIA reports are required to be made available to the local residents of the country in which the project is to be implemented. The EIA reports are required to be available always for perusal by project stakeholders such as local residents and copying must be permitted; (Appendix2, JICA GUIDELINES FOR ENVIRONMENTAL AND SOCIAL CONSIDERATIONS)	PART 5.0 GUIDELINES AND PROCEDURES FOR PUBLIC PARTICIPATION AND INVOLVEMENT IN THE OVERALL EIA PROCESS. The central policy of the EIA process is the full opportunity for public involvement and participation throughout the entire EIA process. People, including individuals, or groups of local communities who may be directly affected by a proposed project will clearly be a focus for public involvement. Those directly affected can often be easily identified and may include project beneficiaries, those likely to be adversely affected, or other stakeholders with interest or are likely to benefit or to be affected by the proposal in one way or the other 5.3.3 Public consultation after EI Study is done (EIS Review) The Environment Impact Statement (EIS) shall be a public document and may be inspected at any reasonable hour by any person.	Ugandan does not specify language in doing Information Disclosure. 【Action policy】 English is applied in this Project.
Public Consultation	1. Projects must be adequately coordinated so that they are accepted in a manner that is socially appropriate to the country and locality in which they are planned. For projects with a potentially large environmental impact, sufficient consultations with local stakeholders, such as local residents, must be conducted via disclosure of information at an early stage, at which time alternatives for project plans may be examined. The outcome of such consultations must be incorporated into the contents of	1.4 Levels of EIA Projects which clearly will have significant impacts whose mitigation measures cannot readily be prescribed unless a detailed Environmental Impact Study (EI Study) of the project and its possible alternatives is conducted, with a view to determining if an alternative exists which has minimal or less adverse environmental impacts. Conducting an EIStudy requires greater public participation. The Policy therefore, through the use and application of EIA, seeks	No Gap

Subject	JICA Guideline	Ugandan Guideline	Gap and/or Correspondence
	project plans. 2. Appropriate consideration must be given to vulnerable social groups, such as women, children, the elderly, the poor, and ethnic minorities, all members of which are susceptible to environmental and social impacts and may have little access to decision-making processes within society. (Appendix1.5, JICA GUIDELINES FOR ENVIRONMENTAL AND SOCIAL CONSIDERATIONS) •In preparing EIA reports, consultations with stakeholders, such as local residents, must take place after sufficient information has been disclosed. Records of such consultations must be prepared; •Consultations with relevant stakeholders, such as local residents, should take place if necessary throughout the preparation and implementation stages of a project. Holding consultations is highly desirable, especially when the items to be considered in the EIA are being selected, and when the draft report is being prepared (Appendix 2, JICA GUIDELINES FOR ENVIRONMENTAL AND SOCIAL CONSIDERATIONS)	to integrate environmental concerns in all development policies, projects, activities and planning at national, district and local levels, with full public participation. Stakeholder participation in public consultation Key participants should be selected on the basis of the potential negative and positive impacts of the road project. Stakeholders would primarily comprise those people who are affected directly by the road and its activities (including the disadvantaged and poor), responsible agencies for impact management, interested groups with indigenous knowledge on impact management, and private sector entities who might be affected by the road project. The disadvantaged and poor communities should also be involved. Political leaders may be required to provide the political will so as to facilitate public involvement and support resource mobilization for the EIS process. Involvement by other agencies would depend on the nature of the anticipated impacts. Apart from the developers and NEMA, the following agencies/institutions may be called upon to participate: - Office of the Prime Minister; - Ministry of Water, Lands and Environment; - Ministry of Finance, Planning and Economic Department (Department of Planning and Investment); - Population offices in the districts; - National Forest Authority; - District Forest Offices; - Ministry of Gender, Labor and Social Development; - Department of Tourism, Wildlife and Antiquities; - Forest Inspection Division; - Uganda Wildlife Authority; - Wetland Inspection Division; and - other relevant government institutions. A wide variety of environment and development oriented CSOs are found throughout Uganda and most are active at community level. As they generally have	

Subject	JICA Guideline	Ugandan Guideline	Gap and/or Correspondence
		closer ties with local communities or are familiar with the environmental sensitivity of their working areas, it would be advantageous to involve such organizations. Finally, women must be encouraged to participate in the public involvement process.	
Items be studied	1. The impacts to be assessed with regard to environmental and social considerations include impacts on human health and safety, as well as on the natural environment, that are transmitted through air, water, soil, waste, accidents, water usage, climate change, ecosystems, fauna, and flora, including trans-boundary or global scale impacts. These also include social impacts, including migration of population and involuntary resettlement, local economy such as employment and livelihood, utilization of land and local resources, social institutions such as social capital and local decision-making institutions, existing social infrastructures and services, vulnerable social groups such as poor and indigenous peoples, equality of benefits and losses and equality in the development process, gender, children's rights, cultural heritage, local conflicts of interest, infectious diseases such as HIV/AIDS, and working conditions including occupational safety. 2. In addition to the direct and immediate impacts of projects, their derivative, secondary, and cumulative impacts as well as the impacts of projects that are indivisible from the project are also to be examined and assessed to a reasonable extent. It is also desirable that the impacts that can occur at any time throughout the project cycle should be considered throughout the life cycle of the project. (Appendix 1, JICA GUIDELINES FOR ENVIRONMENTAL AND SOCIAL CONSIDERATIONS)	Environmental Impact Assessment Guidelines for Road Projects (MOWT) With respect to the EIS process, the environment is defined as consisting of the following elements. physical elements including geology, topography, soils, climate, air quality, drainage patterns, surface water, groundwater, water quality and soil erosion; biological elements including flora and fauna, habitats, rare and endangered species, protected areas that may exist in the area of influence of the road, trends in flora and fauna; socio-economic elements including demographic characteristics, land uses, agricultural and economic activities, modes of transport, road networks and their usage, origin and destination of goods and passengers transported in the area of influence of the road, administrative structures in the area of influence of the road and employment; and cultural elements such as archaeological, historical, religious, and cultural features, scenic beauty, and wilderness value. An environmental impact is a change in an environmental element that is caused directly or indirectly by an activity related to a road project. Environmental impacts can be in the form of risks created by a project (e.g. increased risk of traffic accidents) and different social groups may be affected in different ways by environmental impacts. Impacts vary in terms of duration; timing; magnitude; spatial coverage; and likelihood of occurrences. All environmental impacts need to be established during the EIS process of a road project.	In Ugandan EIS system, the following points are not included in the impact assessment. waste management, involuntary resettlement, regional resource use, social capital, benefits and benefits, fairness in the development process for poverty, gender, child rights, conflict of interests in the region, HIV / AIDS Infectious disease, labor environment, accident In addition, the following points are not clearly stated about the influence to be investigated and examined. It is desirable to consider the impact of the project's lifecycle. 【Action policy】 Conform to the impact assessment items of the JICA Environmental and Social Consideration Guidelines. □ Consider the impact of project life cycle
Monitoring/Complaint Management	3. Project proponents etc. should make efforts to make the results of the monitoring process available	Developer must arrange self-monitoring, self-record, and report. Information gained	According to Uganda's EIS system, the following points are not specified in complaint

Subject	JICA Guideline	Ugandan Guideline	Gap and/or Correspondence
	to local project stakeholders. 4. When third parties point out, in concrete terms, that environmental and social considerations are not being fully undertaken, forums for discussion and examination of countermeasures are established based on sufficient information disclosure, including stakeholders' participation in relevant projects. Project proponents etc. should make efforts to reach an agreement on procedures to be adopted with a view to resolving problems. (Appendix 1, JICA GUIDELINES FOR ENVIRONMENTAL AND SOCIAL CONSIDERATIONS)	through monitoring is kept and must be able to be inspected. （ 7.0 MONITORING, GUIDELINES FOR ENVIRONMENTAL IMPACT ASSESSMENT IN UGANDA (1997), NEMA） The EIS report is submitted to NEMA for review and comment. NEMA calls on stakeholders and citizens for comments on the EIS report. If the EIS report is approved, EIS's Certificate of Approval will be issued and the project can proceed. If, however the EIS report is not approved, the project will be rejected or the developer will be asked to revise the project or develop other mitigation measures to avoid adverse environmental impacts.	management If there are concrete indications from third parties that environmental and social considerations are not sufficient, a place for stakeholders involved in the project to participate and discuss to consider measures is necessary The Developer shall have to set aside and try to agree on procedures to solve the problem. 【Action policy】 Following the JICA guidelines, KCCA will hold stakeholder meetings and information disclosure so that procedures for problem solving will be agreed.

Source: JICA Study Team

(8) Project alternatives

The project alternatives suggested in this report have focused on deciding the most preferred option among conceivable alternatives as follows:

- Option 1: Without Project
- Option 2: Converting Unsignalized Junctions to Roundabouts
- Option 3: Option 2 plus Converting Signalized Junctions to Overpass Bridges
- Option 4: Option 3 plus Converting Roundabouts to Overpass Bridges
- Option 5: Converting Roundabout and Unsignalized Junction to Signalized Junction and Building Traffic Control Centre

Junction types and their numbers of junctions according to the types are shown in Table 1.37

Table 1.37 Junction Types and Their Numbers on Option 1 to 5

	Option 1 (Without Project)	Option 2	Option 3	Option 4	Option 5
Unsignalized junctions	22	0	0	0	0
Roundabouts	5	27	27	0	0
Signalized junctions	3	3	0	0	30
Overpass Bridge	0	0	3	30	0

Source: JICA Study Team

Preliminary analysis to the alternatives was conducted and select the preferred options according to criteria below

- Social environment;
- Natural environment;
- Living environment (specifically, air quality);
- Traffic safety (specifically, collision risk between vehicles and between vehicle and pedestrian);
- Road and traffic function;
- Logistic
- Construction cost; and
- O&M cost

The result of preliminary analysis is described in Table 1.38.

Table 1.38 Result of Preliminary Analysis of Alternatives

Option / Criteria	Option1 (Without Project)	Option2	Option3	Option4	Option5
Total	Not preferred △	Not preferred △	Not preferred △	Not preferred △	Preferred ◎
Social environment	No change ○	Land acquisition for roundabouts △	Land acquisition for road widening △	Land acquisition for road widening △	No land acquisitions No resettlement ◎
Natural environment	No change ◎	Tree cutting and excavation ○	Tree cutting and excavation ○	Tree cutting and excavation ○	Tree cutting and excavation ○
Living environment (specifically, air quality)	Worse emission than Option 3-5 △	Worse emission than Option 3-5 △	Less improvement of air quality ○	Improvement of air quality ◎	Improvement of air quality ◎
Traffic safety	Few walkway & High collision risk △	Few walkway & High collision risk △	Few walkway & High collision risk △	Few walkway & High collision risk △	Walkway installation & Low collision risk ◎
Road and traffic function	Not smooth traffic flow △	Not smooth traffic flow △	Not smooth traffic flow △	Smoother traffic flow than Option 5 ◎	Smooth traffic flow ○
Logistic	Inefficient transportation △	Inefficient transportation △	Efficient transportation ○	More efficient transportation than Option 5 ◎	Efficient transportation ○
Construction cost	No cost ◎	Lower cost ○	Higher cost △	Higher cost △	Lower cost ○
O&M cost	Higher cost △	Low cost ◎	Moderate Cost ○	Moderate Cos ○	Moderato Cost ○

◎: Preferred / ○: Less preferred / △: Not preferred

Source: JICA Study Team

(9) Scoping

Based on the environmental checklist in the environmental guidelines, scoping for items that may be affected in terms of the environment in project implementation was examined in three stages, before construction, during construction, and use. The results are shown in Table 1.39.

Table 1.39 Scoping Result

Category			Scoping Evaluation		Consideration to Evaluation
			Before& During Project	After Project	
Pollution Management	1	Air Pollution	B-	B+	**During Project：** Temporary impact of dust and vehicle exhaust gas (NOx, SOx, PM, etc.) due to the operation of heavy equipment for construction and earth work can be considered by this project implementation. **After Project：** As this project improves the traveling speed of the vehicle, it is predicted that the positive impact on vehicle exhaust gas (NOx, SOx, PM, etc.) will be expected over the current situation.
	2	Water Pollution		D	**During Project：** Water pollution of rivers nearby is not expected by implementation of this project. Since this project only improves partial junction and installation of traffic lights, it gives that the effect on water pollution and sediment that could be negligible. **After Project：** Water quality of rainwater drainage is not affected, so no water pollution occurs.

	3	Waste	B-	D	**During Project:** Demolition of existing structures · Logging Green areas temporarily generate waste such as asphalt waste materials, waste concrete , pruned branches, and logging trees. **After Project:** The generation of waste is not assumed after the Project.
	4	Soil Contamination	B-	D	**During Project:** There is a possibility of soil contamination due to leakage of construction oil etc. **After Project:** There is no possibility of soil contamination after the Project
	5	Noise Vibration	B-	B+	**During Project:** Temporary noise and vibration caused by the operation of construction equipment is assumed to be influenced. **After Project:** It is expected to eliminate congestion at the junction that results in reduction of noise and vibration.
	6	Consolidation	D	D	**During Project:／After Project:** The ground is stiff enough not to cause land subsidence such as large-scale consolidation and groundwater drying.
	7	Stench	D	D	**During Project:／After Project:** Do not use materials, machinery, etc. that cause odors in construction work and maintenance work.
	8	Sedimentation	D	D	**During Project:** Water pollution of rivers nearby the sites is not expected by implementation of this project. **After Project:** Since there is no influence on the water quality of rainwater drainage, there is no influence on sedimentation.
Natural Environment	9	Conservation Area	D	D	**During Project:／After Project:** There are no national parks, protected areas, etc. in the project site and its surroundings.
	10	Ecosystem	D	D	**During Project:／After Project:** There are no scarce animals and plants in the project site, so the impact on the ecosystem is not assumed.
	11	Water Disaster	D	D	**During Project:／After Project:** Works that would adversely affect river beds and flow conditions of neighboring rivers are not assumed.
	12	Topography/ Geology	D	D	**During Project:／After Project:** The feature of project is junction improvement by signalization, therefore large-scale earth work are not included, so influence on topography and geology is not assumed.
Social environment	13	Land Acquisition/Resettlement	D	D	During Project:／After Project: In this project, no land acquisition and resettlement of residents are envisaged as the project improve junction only within ROW.
	14	Poverty	B+	B+	**During Project:** It is assumed that employment opportunities for the low income layer are created as casual workers **After Project:** As the junctions are improved and the traffic flow becomes more efficient, positive impacts are anticipated for the low income layer, such as social services to schools and medical facilities, by improving access.
	15	Ethnic Group	D	D	**During Project:／After Project:** Because it is a project in the area where development has progressed, no special consideration should be given to ethnic minorities and indigenous peoples.
	16	Livelihood	B+	B+	**During Project:** The project does not do large-scale construction work that stops existing sales activities. It is also assumed that employment opportunities for the low-income layer are created as casual workers. **After Project:** This project is expected to contribute to the revitalization of the regional economy, such as shortening traveling time due to elimination of traffic congestion.
	17	Land use	D	B+	**During Project:** The feature of project is junction improvement by signalization, therefore impacts on land use and local resource use is not assumed. **After Project:** Improvement of transportation situation by easing traffic congestion is expected to contribute to effective utilization of regional resources and improvement of social services.
	18	Water Resource	D	D	**During Project:／After Project:** Although the waterway is located near Nasser Road Rd. however, the project is intended to drain from factories and households, so no impact on water use is assumed.
	19	Existing social infrastructure and social services	B-	B+	**During Project:** Temporary traffic congestion is expected by improvement of the project. **After Project:** As this project improves the traveling speed of the vehicle that contribute improvement of social services by government and private sector
	20	Social organizations such as social capital and regional decision-making organizations	D	D	**During Project:／After Project:** As the feature of project is junction improvement by signalization the impact on social capital and regional decision-making organizations etc. is not assumed.

	21	Uneven distribution of damage and benefits	D	D	**During Project:／After Project:：** As the feature of project is junction improvement by signalization, no uneven distribution of damage and benefits is expected
	22	Conflict in community	D	D	**During Project:／After Project:：** As the feature of project is junction improvement by signalization, no conflict is expected in community
	23	Cultural Heritage	A-	D	**During Project:：** Roundabout is included in the junction to be improved by this project. At the middle of the roundabout, there are monuments and trees of high age, so these relocation and removal works are expected.
	24	Landscape	D	B-	**After Project:：** Loss of roundabout and landscape loss due to logging of green road zones are conceivable.
	25	Gender	D	D	**During Project:／After Project:：** As the feature of project is junction improvement by signalization, no negative impact on gender is expected
	26	Child's Rights	D	D	**During Project:／After Project:：** As the feature of project is junction improvement by signalization, no negative impact on children's right is expected
	27	HIV/AIDS	D	D	**During Project:／After Project:：** It is a construction in an urban area, the possibility of immigrants flowing in as a construction worker is low, there is no establishment of a construction camp, so a negative influence is not assumed.
	28	Working Environment （Construction Safety）	B-	D	**During Project:：** It is necessary to pay attention to the working environment of construction workers. **After Project:：** Works that are expected to have a negative impact on workers are not planned after the project.
Others	29	Accident	B-	B+	**During Project:：** Accidents are assumed during the project. **After Project:：** It is assumed that the traffic accident case will be reduced by installing signal junctions and traffic control centers.
	30	Transboundary impact and climate change	D	D	The feature of project is junction improvement by signalization, no negative impact on trans-border and climate change is expected

A+/-：Significant effects are expected (if positive influence + / if negative influence -)
B+/-：A certain degree of influence are expected ((if it is a positive influence + / if it is a negative influence -)
C：It is difficult to identify how much impact is expected.
D： No influence or negligible

The above scoping results also include general matters. If the proposed junctions are scattered not in one place but in Kampala city as in this case, it is preferable to perform scoping for each proposed junction. Based on the above scoping results, the Study Team selected six items such as air pollution, waste, soil contamination, noise / vibration, cultural heritage, and landscape that may be affected.

Table 1.40 Re-Scoping Result

		Air pollution		Waste		Soil Contamination		Noise Vibration		Culture Heritage		Landscape
No.	Junction /Roundabout	During Project	After Project	During Project	After Project	During Project.	After Project	During Project.	After Project	During Project	After Project	After Project
1	Spear Motors	B-	B+	D	D	B-	D	B-	D	D	D	B-
2	Jinja Rd/Katalima Rd	B-	B+	D	D	D B-	D	B-	D	D	D	D
3	Nakawa	B-	B+	D	D	D B-	D	B-	D	D	D	B-
4	Archer Road	B-	B+	D	D	D B-	D	B-	D	D	D	B-
5	Station	B-	B+	D	D	D B-	D	B-	D	D	D	B-
6	Entebbe	B-	B+	D	D	D B-	D	B-	D	D	D	D
7	Square	B-	B+	D	D	D B-	D	B-	D	D	D	D
7-1	Square-1	B-	B+	D	D	D B-	D	B-	D	D	D	D
8	Nasser Road	B-	B+	D	D	D B-	D	B-	D	D	D	B-
10	UMEME Headquarter	B-	B+	D	D	D B-	D	B-	D	D	D	D
12	Rwenziori Court	B-	B+	D	D	D B-	D	B-	D	D	D	A-
14	Kintu Rd/Sezibwa Rd	B-	B+	D	D	D B-	D	B-	D	D	D	D
15	Grand Imperial	B-	B+	D	D	D B-	D	B-	D	A-	D	A-

		Air pollution		Waste		Soil Contamination		Noise Vibration		Culture Heritage		Landscape
17	Equatorial/Kyaggwe Rd	B-	B+	D	D	D B-	D	B-	D	D	D	D
18	Kyaggwe Rd/Lumumba Ave	B-	B+	D	D	D B-	D	B-	D	D	D	D
19	Nakasero Rd/ Kyaggwe Rd	B-	B+	D	D	D B-	D	B-	D	D	D	D
20	Nigerian Embassy/Nakasero Rd	B-	B+	D	D	D B-	D	B-	D	D	D	D
21	Queen's Ln/Bombo Rd	B-	B+	D	D	D B-	D	B-	D	D	D	D
22	Kubiri Roundabout	B-	B+	D	D	D B-	D	B-	D	D	D	A-
23	Mortuary Roundabout	B-	B+	D	D	D B-	D	B-	D	D	D	A-
24	Mulago Roundabout	B-	B+	D	D	D B-	D	B-	D	D	D	A-
25	Kampala Road - Dastur Street	B-	B+	D	D	D B-	D	B-	D	D	D	D
26	Kampala Road - Square 2	B-	B+	D	D	D B-	D	B-	D	D	D	D
26-1	Kampala Road - Square 2-1	B-	B+	D	D	D B-	D	B-	D	D	D	D
27	Kyagwe Road - Buganda Road	B-	B+	D	D	D B-	D	B-	D	D	D	D
37	Wandegeya	B-	B+	D	D	D B-	D	B-	D	D	D	B-
79	Kampala Road Speke Road	B-	B+	D	D	D B-	D	B-	D	D	D	D
115	Kira Road/Acacia Ave	B-	B+	D	D	D B-	D	B-	D	D	D	D
188	Kampala Road King Goerge Way	B-	B+	D	D	D B-	D	B-	D	D	D	D
121	Kayunga Road Tufnell Drive	B-	B+	D	D	D B-	D	B-	D	D	D	D
	ITS Centre at KCCA	B-	B+	D	D	B-	D	B-	D	D	D	B

A+/-：Significant effects are expected (if positive influence + / if negative influence -)
B+/-：A certain degree of influence are expected ((if it is a positive influence + / if it is a negative influence -)
C：It is difficult to identify how much impact is expected.
D： No influence or negligible

Source: JICA Study Team

(10) Environmental and Social Consideration Survey Result (Including Forecast Results)

Survey results are shown in Table 1.41

Table 1.41 Survey Result

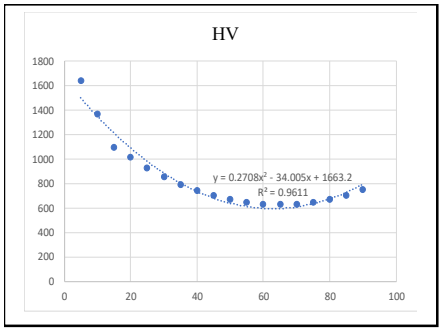
Item	Survey/Forecast Result
Air pollution	**During Project**: The use of heavy machinery etc. during the project is limited and there is no simultaneous use of many heavy machinery. Consideration is also required that loading and unloading of raw materials and other equipment and materials does not interfere with normal traffic. Emission of air pollutants is limited, but the occurrence of dust from construction vehicles and bare ground is expected. **After Project:** No significant change in air quality is expected after signalization, but the occurrence of exhaust gas at low travel speed being seen at the current roundabout is predicted to decrease (about 13%[4])

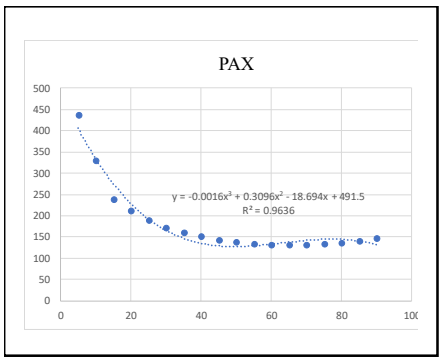
[4] Calculation of Co2 reduction effect
By optimizing the traffic flow by MODERATO control, it is expected that the travel speed will be improved. Estimation is prepared based on the Co2 generation amount for each of the following travel speeds. Also, the projection is given to the junction No. 2 to 8.

	because the travel average speed is improved. Therefore, a slight improvement is expected in the situation of air quality.
Waste	**During Project**：There is a possibility of leakage of construction materials harmful to the soil such as machine oils and fats, asphalt emulsion etc. during construction. **After Project**： Properly handle the waste at the maintenance of the road
Noise and Vibration	**During Project**： The sources of noise and vibration during construction are transportation of vehicles at the time of loading and unloading equipment, embanking, leveling, paving, and the like, but both are not large-scale and the influence on noise and vibration is minor. **After Project**： Current environment around junctions is a situation where the vehicle is always queuing, but after the project although there is a negative influence due to the increase in the traffic volume, the noise due to the low traveling speed at the current roundabout will decrees.
Poverty	
Livelihood	**During Project**： There is a possibility giving negative financial impact on local markets due to increasing chances of in-access by construction activities. **After Project**：There is a possibility that new business and development around the project area by elimination of traffic congestion will be generated. It may bring job opportunity.

Figure Co2 Emissions/Speed &Vehicle Type

Speed (km/h)	Co2(g-Co2/km*Veh)	
	Passenger	Heavy
5	437	1646
10	329	1372
15	237	1099
20	210	1014
25	188	929
30	171	856
35	159	794
40	150	742
45	142	700
50	137	668
55	133	645
60	131	632
65	130	629
70	131	634
75	133	649
80	136	674
85	140	707
90	146	750





Source：http://www.nilim.go.jp/lab/bcg/siryou/tnn/tnn0671pdf/ks067112.pdf

Table Co2 Emissions by Traffic Controls

	Traffic	Co2			L(km)	Co2 (g)			Moderato/ Non
		Non	Fix	Moderato					
		10.95	13.59	14.9		Non	Fix	Moderato	
Pax	167,930	321.8	291	276.4	2	39,449	35,624	33,884	14%
HV	8,710	1323.3	1,251	1216.6	2	8,414	7,955	7,736	8%
Total						47,863	43,579	41,619	13%

Source：JICA Study Team

	During Project／After Project：There is no sunshine inhibition and radio interference.
Land use	**After Project**：There is a possibility that new business and development around the project area by elimination of traffic congestion will be generated.
Services of Existing Utilities	**During Project**：In addition to traffic congestion by the project, the services of utilities including electric, communication, water and sewerage may temporary be suspended due to the relocation work associated to the Project. **After Project**：
Cultural Heritage	**During Project**： As monuments in the roundabout are regional heritage, in case of relocation it is necessary to obtain consent of Uganda Museum.
Landscape	**During Project**：Since the roundabout is a landmark covered by greens etc. it is not preferable from the view of the landscape to remove the roundabouts by Project
Working Environment	**During Project**：There is concern that the uncertain condition setting about the working environment at the construction site may not secure the adequacy of safety and health of the work environment.
Accident	**During Project**：Accident risk of construction vehicles and general vehicles is expected to become higher. In Africa, the Traffic Safety Facilities are not properly arranged in many cases, there is concern about ensuring traffic safety such as contact between construction vehicles and general cars and pedestrians. **After Project**： Signalization and improvement of walkway improves pedestrian safety that makes accident risk low.

Source: JICA Study Team

(11) Environmental Evaluation Results

Environmental evaluation result was tabulated in Table 1.42

Table 1.42 Environmental Evaluation Results

Category	No.	Item	Evaluation at Scoping		Evaluation after Environmental Survey		Considerations
			Before Project During Project	After Project	Before Project During Project	After Project	
Pollution Management	1	Air Pollution	B-	B+/B-	B-	B+	**During Project**： The use of heavy machinery etc. during the project is limited and there is no simultaneous use of many heavy machinery. The risk of air pollutants is also considered to be low. However, generation of dust from construction machineries and exposed ground during/after earth works expected, so it is necessary to take these countermeasures. **After Project**： The air quality at the junction is expected to be improved by elimination of traffic congestion, therefore the risk of pollution is low. It is judged that the risk of local air pollution is suppressed when compared with the present situation.
	2	Water Quality	B-	D	N/A	N/A	**During Project**： Water pollution of rivers is not expected by this project. **After Project**： As the Project does not give any impact on quality of storm water, water pollution is not expected.
	3	Waste	B-	D	B-	N/A	**During Project／After Project**： Since it is properly handled by waste management, the influence on the environment is limited as also can be known from construction activities at KIIDP.
	4	Soil Contamination	B-	D	B-	N/A	**During Project**： By careful handling of oils and fats, the impact on the environment is considered to be extremely low. As for soil contamination prevention measures, it is necessary to manage construction materials such as oils and fats for machinery, asphalt emulsion which are harmful in the field without mixing with other

							filling materials and base materials, and also to workers having specific knowledge It is necessary to properly manage such as limiting handling. Construction waste material mainly are generated at RA improvement works. RA is located in the hilly part of CBD, and there is no assumption of the presence of hazardous substances including waste in the ground from land use (commercial, business district).
	5	Noise /Vibration	B-	B+	B-	B+	**During Project:** The occurrence of noise and vibration during construction is temporary, and the influence on noise and vibration is minor. **After Project:** Improvement of the traffic flow make noise and vibration smaller.
	6	Consolidation	D	D	N/A	N/A	**During Project／After Project：** The ground is stiff enough not to cause land subsidence such as large-scale consolidation and groundwater drying.
	7	Stench	D	D	N/A	N/A	**During Project／After Project：** Do not use materials, machinery, etc. that cause odors in construction work and maintenance work.
	8	Sedimentation	D	D	N/A	N/A	**During Project:：** Water pollution of rivers nearby the sites is not expected by implementation of this project. **After Project:：** Since there is no influence on the water quality of rainwater drainage, there is no influence on sedimentation.
Natural Environment	9	Conservation Area	D	D	N/A	N/A	**During Project:／After Project:：** There are no national parks, protected areas, etc. in the project site and its surroundings.
	10	Eco-system	D	D	N/A	N/A	**During Project:／After Project:：** There are no scarce animals and plants in the project site, so the impact on the ecosystem is not assumed.
	11	Water Disaster	D	D	N/A	N/A	**During Project:／After Project:：** Works that would adversely affect river beds and flow conditions of neighboring rivers are not assumed.
	12	Topography/Geology	D	D	N/A	N/A	**During Project:／After Project:：** The feature of project is junction improvement by signalization, therefore large-scale earth work are not included, so influence on topography and geology is not assumed.
Social Environment	13	Land Acquisition /Resettlement	D	D	N/A	N/A	**During Project:／After Project:**： In this project, no land acquisition and resettlement of residents are envisaged as the project improve junction only within ROW.
	14	Poverty	B+	B+	B+	B+	**During Project：** Do not do large-scale construction work that stops existing commercial activities. It is also assumed that employment opportunities for the low-income layer are created as causal workers. **After Project**： This project is expected to contribute to the revitalization of the regional economy by improvement of traveling time due to elimination of traffic congestion.
	15	Ethnic Group	D	D	N/A	N/A	**During Project:／After Project:：** Because it is a project in the area where development has progressed, no special consideration should be given to ethnic minorities and indigenous peoples.
	16	Employment/Livelihood	B+	B+	B+	B+/B-	**During Project**：Do not do large-scale construction work that stops existing commercial activities. It is also assumed that employment opportunities for the low-income layer are created as causal workers. As for regional economic activities, it should consider the mitigation for the shops that likely be affected are provided by temporary access to maintain commercial activities during the Project. **After Project:** This project is expected to contribute to the revitalization of the regional economy, such as improvement of traveling time by elimination of traffic congestion. In addition, it is possible to mitigate the influence on living condition, especially movement, of residents, students, and others around the project site by notifying in advance. As for livelihood, since this project is an improvement project without road widening, it is

							considered that the impact on social life is not large. However, it is necessary to conduct environmental management so as not to create chaotic development.
	17	Land use	D	B+	N/A	B+	After Project：This project is expected to contribute to the revitalization of the regional economy, such as improvement of traveling time by elimination of traffic congestion.
	18	Water Resource	D	D	N/A	N/A	**During Project: ／ After Project: ：** Although the waterway is located near Nasser Road Rd. however, the project is intended to drain from factories and households, so no impact on water use is assumed.
	19	Existing social infrastructure and social services	B-	B+	B-	B+	**During Project: ：** Temporary traffic congestion is expected by improvement of the project. **After Project:：** As this project improves the traveling speed of the vehicle that contribute improvement of social services by government and private sector
	20	Social organizations such as social capital and regional decision-makin g organizations	D	D	N/A	N/A	**During Project:／After Project: ：** As the feature of project is junction improvement by signalization the impact on social capital and regional decision-making organizations etc. is not assumed.
	21	Uneven distribution of damage and benefits	D	D	N/A	N/A	**During Project:／After Project: ：** As the feature of project is junction improvement by signalization, no uneven distribution of damage and benefits is expected
	22	Conflict in community	D	D	N/A	N/A	**During Project:／After Project: ：** As the feature of project is junction improvement by signalization, no conflict is expected in community
	23	Cultural Heritage	A-	D	B-	N/A	**During Project ／ After Project ：** Relocation of monuments is considered to be undesirable from the viewpoint of community environment, but since there are plans to arrange the relocation place in the vicinity, the impact is small.
	24	Landscape	D	B-	N/A	B-	**After Project**：After the project, the signalization gives significant impact on the landscape. It is necessary to take measures to restore the landscape, such as tree planting along walkway.
	25	Gender	D	D	N/A	N/A	**During Project:／After Project: ：** As the feature of project is junction improvement by signalization, no negative impact on gender is expected
	26	Child's Rights	D	D	N/A	N/A	**During Project:／After Project: ：** As the feature of project is junction improvement by signalization, no negative impact on children's right is expected
	27	HIV/AIDS	D	D	N/A	N/A	**During Project:／After Project:：** It is a construction in an urban area, the possibility of immigrants flowing in as a construction worker is low, there is no establishment of a construction camp, so a negative influence is not assumed.
	28	Working Environment (Construction Safety)	B-	D	B-	N/A	**During Project:** In order to ensure the safety and health of the working environment, it is necessary to carefully examine the related law system and world standards.
Others	29	Accident	B-	B+	B-	B+	**During Project: ：** Accidents are assumed during the project. **After Project: ：** It is assumed that the traffic accident case will be reduced by installing signal junctions and traffic control centers.
	30	Transboundary impact and climate change	D	D	N/A	N/A	The feature of project is junction improvement by signalization, no negative impact on trans-border and climate change is expected

Source: JICA Study Team

(12) Mitigation Measures

Table 1.43 shows the mitigation measures.

Table 1.43 Mitigation Measures

No.	Item	Mitigation Measures	Responsible Agency	Supervising Agency	Cost [UGX]
【Before Project】					
1	Employment/Livelihood/Reginal Economy	Information sharing for Project and consensus building with stakeholders	KCCA	KCCA/Consultant	—
24	Cultural Heritage	Discussion and Consensus building with Uganda Museum Information sharing for Project and consensus building with stakeholders	KCCA	KCCA	—
【During Project】					
1	Air Pollution	Strict management of idling of construction machineries Avoiding simultaneous use of multiple heavy machinery Water spraying during earth work	KCCA	Contractor	
2	Water Quality	During construction, take measures against turbid water outflows such as temporary drainage canals and small dams	KCCA	Contractor	
3	Waste	Strict management of waste (Collect waste and disposed at the designated area.) Waste concrete pieces and asphalt waste generated by construction will be processed according to the contractor's waste management plan with reference to The Local Governments (Kampala City Council) (Solid Waste Management) Ordinance set by Kampala City. KCCA holds a disposal area in the city Ddundu. The area is 135 acres. Waste generated in the Project is planned to be disposed of in this treatment plant.	KCCA	Contractor	
4	Soil Contamination	Properly process the oil / asphalt and dispose them to the designated area.	KCCA	Contractor	
5	Noise Vibration	Strict management of idling of construction machineries Avoiding simultaneous use of multiple heavy machinery	KCCA	Contractor	
19	Existing Social Infrastructure	Installation of temporary access etc. to reduce of traffic congestion during Project	KCCA	Contractor	
23	Cultural Heritage	Based on the results of consultation with Uganda Museum, cultural heritage facilities shall be properly preserved and relocated.	KCCA	KCCA	

28	Working Environment	Based on Uganda Employment Law and other related laws, contractors will create environment	KCCA	KCCA Contractor	
29	Accident	Permanent installation of walkways. Installation of Road Traffic Signs to Pedestrian Crossing Keep in mind the carrying-in and out of construction vehicles and equipment. Traffic management regulations for construction vehicles. Road safety measures were implemented based on KCCA, advice of related organizations.	KCCA		
【After Project】					
24	Landscape	Appropriate green management	KCCA	KCCA	

Source: JICA Study Team

(13) Environmental Management Plan/Monitoring Plan

a. Environmental Management Plan

Table 1.44 Environmental Management Plan

Item	Description	Responsible Agency	Executing Agency
【Before Project】			
16.Employment/Livelihood	Implementation of stakeholder meeting (explanation of construction outline).	KCCA	
23. Cultural Heritage	Consultation with Uganda Museum on preservation method of heritages		
【During Project】			
1. Air Pollution	Avoiding simultaneous use of multiple heavy machinery	KCCA	Contractor
2. Water Quality	Execution of water management and monitoring	KCCA	Contractor
3. Waste	Waste concrete pieces and asphalt waste generated by construction will be processed according to the contractor's waste management plan with reference to The Local Governments (Kampala City Council) (Solid Waste Management) Ordinance set by KCCA The amount of earthwork is limited, and the cut earth is diverted for backfilling. Design residual amount is 1170 m 3 Design Asphalt waste material 3,600 m 3, Waste Concrete Piece 70 m 3	KCCA	Contractor
4. Soil Contamination	Careful handling of oily and bituminous material	KCCA	Contractor
5. Noise/Vibration	Avoiding simultaneous use of multiple heavy machinery	KCCA	Contractor
19. Existing Social Infrastructures	Execution of Traffic Management to mitigate congestion during the Project	KCCA	Contractor
23. Cultural Heritages	Advance Tree plantation to compensate logging	KCCA	KCCA
28. Working Environment	Application of EHS（to refer EHS guideline）	KCCA	Contractor
29. Accident	Provision of space for pedestrian traffic and temporary signal during the Project	KCCA	Contractor
29. Accident	Pay attention to carry-in and out of construction vehicles and equipment. Setting dispatch management regulations	KCCA	Contractor

Item	Description	Responsible Agency	Executing Agency
【After Project】			
1. Air pollution	Plan and implement air quality monitoring measurement. Based on the results, when air pollution is delegated or concern arises, propose traffic regulation to improve air quality.	KCCA	KCCA
3. Waste	Proper process of according to the waste management document.	KCCA	KCCA
4. Soil Contamination	Proper process of bituminous waste material during maintenance	KCCA	KCCA
5. Noise Vibration	Execution of periodical miniating	KCCA	KCCA
24. Landscape	Execution of monitoring on related heritage	KCCA	KCCA

Source: JICA Study Team

b. Environmental Monitoring Plan

Table 1.45 Environmental Monitoring Plan

・ Pollution management

1. Air Pollution

Items	Value (Average)	Value (Maximum)	Standard Value	Standard	References	Survey Method
SO_2			0.15 ppm	NEMA	150µg/m3 IFC	During/After Project Survey point:4 Survey Time: 4 /year Metrological Data
NO_2			0.10 ppm		150µg/m3 IFC	
CO			9.0 ppm			
O_3			0.1 ppm		150µg/m3 IFC (8 Hour Mean)	
Particulate Matter			PM10: 50 µg/m^3 PM2.5: 25 µg/m^3	WHO		
Dust			-			Observation

2. Water Quality

Items	Value (Average)	Value (Maximum)	Standard Value		Survey Method
pH			Surveyed value before Project		During/After Project Survey point:2 Survey Time: 2 /year
EC			Ditto		
Oil film			Ditto		
BOD／COD			Ditto		
T-P			Ditto		
T-N			Ditto		
SS			Ditto		
Oil			Ditto		
Bacteria			Ditto		
Heavy Metals Cd Cr Cu Pb			Ditto		

Hg Ni Zn					
Water Temperature			Ditto		

3. Waster	
Items	Survey Method
Visual inspection of waste during construction: · Confirmation of waste: construction waste, harmful substances, living waste. When in service: Visual inspection of waste: · Confirmation of waste disposal destination: 1 time / week.	·1 time per month

4. Soil					
Items	Value (Average)	Value (Maximum)	Standard Value	International Standard	Survey Method
Heavy Metal： Cd Cr Cu Pb Hg Ni Zn			(mg/L)	IFC(2007) unless no local standard	During/After Project Survey point:2 Survey Time: 2 /year
Oil				Ditto	

Noise Vibration						
Item	Value (Average)	Value (Maximum)	Standard Value	Applicable Standard	Ref. Standard Value	Method
Equivalent noise level (Leq)[dBA]			Day: 70 dB (A) Night 60 dB(A)	National Environment (Noise Standard and Control) Regulations, 2003	Day:70dB(A) IFC Night:70dB(A) IFC	Noise Vibration Measurements during and after Project ·Nos of point：2 ·Item：Noise Vibration 3times per day Frequency ：4times per year
Vibration			-	No applicable Standard in UG		

Source: JICA Study Team

▪ Social Environment

19.Existing Social Infrastructure

Monitoring Item	Method /Report
1) Condition Survey of Social Infrastructures including utility relocation status	

23 Cultural Heritage

Monitoring Item	Method /Report
1) Recognition of relocation and preservation condition/status	

28. Working Environment

Monitoring Item	Method/Report
1) Working Environment：EHS status survey	・Frequency：EHS Survey：1time per week

29 Accident

Monitoring Item	Method/Report
1) Traffic Condition：Queue Length Survey during Project 2) Accident Data Collection：Data Collection during Project	Frequency：Queue Length Survey during Project; 1time per month

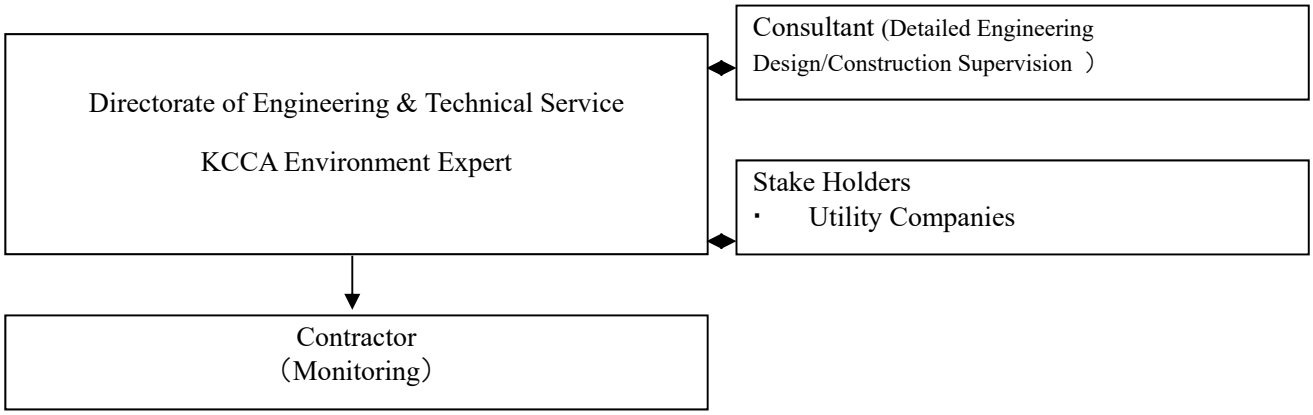
24. Landscape

Monitoring Item	Method/Report
1) Monitoring on Transplanted trees	1time per year

(14) Implementation Team

Upon the implementing of monitoring, a team is organized as shown in Figure 1.36.

The team carries out the monitoring mainly by the environmental expert of KCCA. The team also promptly responds to problems occurring at the site and cooperate closely with stakeholders. In addition, KCCA 's environmental expert checks the monitoring results and reports it to the JICA Uganda office. Japanese consultants provide advice and guidance as necessary.



Source: JICA Study Team

Figure 1.36 Monitoring Implementation Team

(15) Stake Holder Meeting（SHM）

The stakeholder meeting (SHM) was announced on November 15, by KCCA and was held on November 22, 2017.

The meeting intended to involve the utilities companies likely to be affected by the Project in addition to the District of interest with consideration that utility relocations were always issues in the urban project that KCCA has experienced in KIIDP project.

In the meeting, the JICA Study Team explained outline of the project including the timing of implementation and possible relocations of the utility.

Table 1.46 Meeting Attendances

KCCA	Director of Building(Male), Project Engineer（Female）
District	Principal Engineer, other 2, Nakawa District (Male)
Private Sector	UMEME(Electricity),NWSC(Water),NITTA-U(Government organization of ICT),CSQUARED(optical fiber), MTN(Telecom), Uganda Telcom(Telecom),AIRTEL(Telecom), UETCL(Electricity Transmission) total 16 person （Male: 15, Female :1）

Source: JICA Study Team

（Outline of discussion in SHM）

Greeting from the meeting: Director of Building, KCCA expressed appreciation to the participants and explained the purpose of this stakeholder meeting.

Purpose of the meeting:
Aggregate and discuss stakeholders' opinions on the stakeholders about the implementation of the project and the impact of its construction work.

Explanation of the project outline:
JICA consultant gave an explanation about obstructing property upon the implementation according to his view. When implementing the project, it is not necessary to relocate residents or acquire land, interpreting that the social impact is limited according to the consultant. The consultant also mentioned that there is no “A” evaluation in scoping.

Q & A: Questions and answers on projects and impacts (summary).

- ✧ Q1: Does project relocate existing infrastructure?
- ✧ A1: will relocate infrastructures that conflict to construct the project facilities without inconvenience
- ✧ Q2: Is there a resettlement of residents?
- ✧ A2: There is no land acquisition or resettlement by the project.
- ✧ Q3: Do you leave the roundabout at the junction?
- ✧ A3: Do not leave a roundabout.
- ✧ Q4: Many projects are planned, and examples of removing infrastructure shortly after maintenance can be seen. Is comprehensive planning necessary?
- ✧ A4: KCCA is planning to formulate the Urban Development Plan in addition to implementing the Multi Modal Master Plan. If the project is implemented in accordance with such a global plan, development can be rationally performed.
- ✧ Q5: Does JICA pay the relocation costs of existing infrastructure?
- ✧ A5: JICA will not bear it. It was necessary for the business operator to bear the example of KIIDP 2.
- ✧ JICA Study Team needs to coordinate relocation plans with each utility company on the project site.
- ✧ Closing remarks: KCCA gave thanks to the conference participants and a closing remark.

Source: JICA Study Team

Photograph 1.9 Stake Holder Meeting

The project plans to conduct another consultation including explanations about construction work (construction plan) by the contractors before the construction starts.

Consultation targets shall include representatives of local district, public transport operator (Matatsu operator) and traffic police.