5.2.4 TRAVEL SPEEDS ON MAJOR ROADS

(1) Results of Travel Speed Survey

Table 5.2.10 shows the travel speeds by route and direction in the morning and evening peak hours. The congested sections appear around three junctions (Clock Tower, Shoprite, Jinja) and one roundabout (Africana). Notable characteristics between the morning and the evening do not appear from the results of the survey.

Table 5.2.10 Results of Travel Speed Survey

No	Survey Road	Cross Road	Morning (km/h)	Evening (km/h)
1	NateteRoad	SentemaRoad MasakaRoad	22.0	24.9
2	MasakaRoad	NabunnyaRoad	31.1	28.8
3	MasakaRoad	KibuyeRA	31.7	20.6
4	MengoHillRoad	ClockTower	14.6	21.5
5	EntebbeRoad	Shoprite	1.6	7.7
6	EntebbeRoad	KampalaRoad	15.0	24.0
7	KampalaRoad	ParliamentRoad	16.7	9.3
8	KampalaRoad	SaidBarreAvenue	31.2	19.5
9	JinjaRoad	Jinja Junction	21.2	13.3
10	JinjaRoad	Africana RA	8.8	5.5
11	JinjaRoad	Lugogo Bypass	69.8	38.8
12	JinjaRoad	PortBellRoad	34.2	25.7
13	JinjaRoad	NtindaRoad	14.6	22.7
14	JinjaRoad	PortBellRoad	18.9	21.6
15	PortBellRoad	Makerere Univ	32.9	18.3
16	PortBellRoad	Old PortBell	17.9	16.3
17	PortBellRoad	Makerere Univ	12.8	17.9
18	PortBellRoad	JinjaRoad	43.8	32.9
19	JinjaRoad	Lugogo Bypass	25.7	34.2
20	JinjaRoad	Africana RA	46.5	34.9
21	JinjaRoad	Jinja Junction	4.4	2.0
22	KampalaRoad	SaidBarreAvenue	13.3	9.7
23	KampalaRoad	ParliamentRoad	23.4	17.8
24	KampalaRoad	EntebbeRoad	22.2	3.7
25	EntebbeRoad	Shoprite	15.0	6.0
26	EntebbeRoad	ClockTower	7.7	10.2
27	Queen's Way	KibuyeRA	41.0	81.9
28	MasakaRoad	NabunnyaRoad	31.7	19.6
29	MasakaRoad	NateteRoad	28.8	31.1
30	NateteRoad	SentemaRoad	23.6	23.3
		MasakaRoad		
31	NabunnyaRoad	NateteRoad	21.7	26.6
32	BalintumaRoad	HoimaRoad	24.3	31.5
33	Makerere HillRoad	SirApollo KaggawaRoad	18.9	18.9
34	SirApollo KaggawaRoad	Junction with NorthernBypass	33.1	33.1
35	BomboRoad	Bwaise	18.0	8.4
36	BomboRoad	Junction with NorthernBypass	18.0	24.0
37	BomboRoad	GayazaRoad	11.0	27.4

No	Survey Road	Cross Road	Morning (km/h)	Evening (km/h)
		GayazaRoad		
38	Yusufu LuleRoad	MulagoRA	8.6	29.4
39	HajiKasuleRoad	WandegyaJunction	18.8	4.5
40	BomboRoad	GayazaRoad	14.8	15.9
41	BomboRoad	Junction with NorthernBypass	24.0	27.4
42	BomboRoad	Bwaise	10.0	15.0
43	BomboRoad	Junction with NorthernBypass	24.0	18.0
44	SirApollo KaggawaRoad	MakerereHillRoad	27.0	29.4
45	MakerereHillRoad	HoimaRoad	28.4	15.8
46	BalintumaRoad	SentemaRoad	23.6	33.0
47	NabunnyaRoad	MasakaRoad	23.3	23.9
		ClockTower		
48	NsambyaRoad	KibuliRoad	0.08	0.14
49	KibuliRoad	MukuwanoRoad	6.17	13.32
50	MukuwanoRoad	PressHouseRoad	33.75	47.25
51	MukuwanoRoad	AccessRoad	16.20	10.80
52	AccessRoad	JinjaRoad	9.66	10.35
53	YusufuLuleRoad	Nile Avenue	22.20	22.20
54	YusufuLuleRoad	FairwayRA	41.40	27.60
55	YusufuLuleRoad	MuwafuRoad	26.10	26.10
56	YusufuLuleRoad	Mulago RA	34.20	34.20
57	YusufuLuleRoad	Gayaza Junction	22.05	44.10
58	BomboRoad	Wandegya Junction	6.47	15.02
59	BomboRoad	BenKiwanukaStreet	15.60	17.55
60	KampalaRoad	PioneerMall	13.48	19.25
61	KampalaRoad	EntebbeRoad	16.65	7.40
62	KampalaRoad	PioneerMall	0.04	0.08
63	KampalaRoad	BomboRoad	23.10	17.33
64	BomboRoad	Wandegya Junction	32.50	14.30
65	BomboRoad	Gayaza Junction	13.28	11.01
66	YusufuLuleRoad	Mulago RA	5.20	17.15
67	YusufuLuleRoad	MuwafuRoad	25.65	34.20
68	YusufuLuleRoad	FairwayRA	39.15	39.15
69	YusufuLuleRoad	Nile Avenue	27.60	20.70
70	YusufuLuleRoad	JinjaRoad	6.56	5.55
71	AccessRoad	MukuwanoRoad	8.28	2.53
72	MukuwanoRoad	PressHouseRoad	2.43	10.80
73	MukuwanoRoad	KibuliRoad	47.25	3.40
74	KibuliRoad	NsambyaRoad	5.09	2.82
75	NsambyaRoad	ClockTower	11.40	21.38

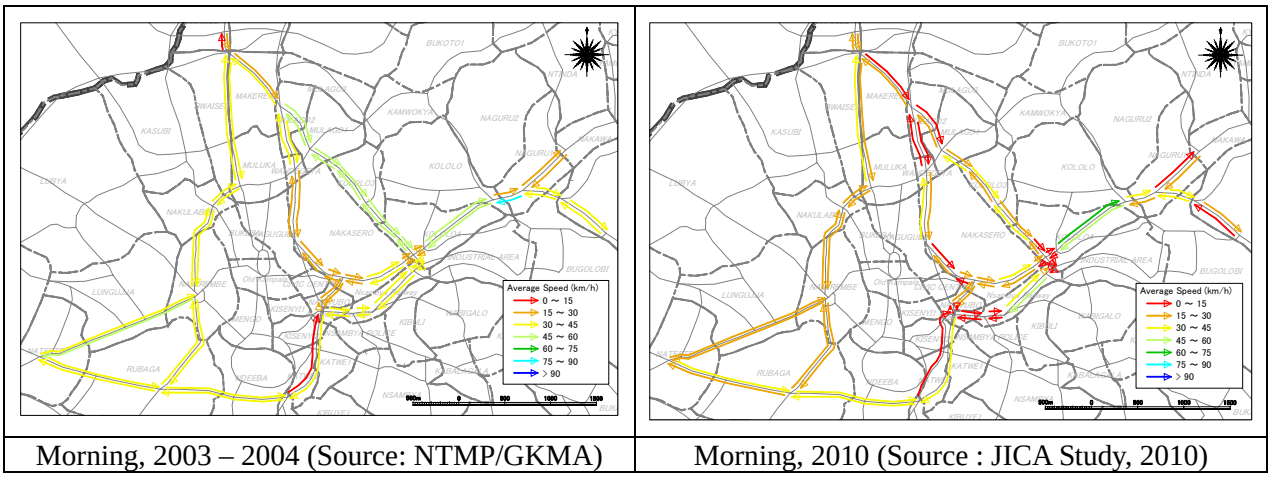
Source : JICA Study, 2010

(2) Comparison with Past Survey (NTMP/GKMA)

The comparison of travel speeds between the current situation and previous records, which was conducted in the study for NTMP/GKMA in 2003 to 2004, is illustrated in Figures 5.2.25 and 5.2.26.

As clearly shown in the figures, the travel speed is diminished in almost all surveyed routes. In addition, the sections with less than 15 km/h travel speed are increasing in the CBD. In the morning, the travel speed of inflow traffic to the CBD is lower than the traffic outflow from the CBD.

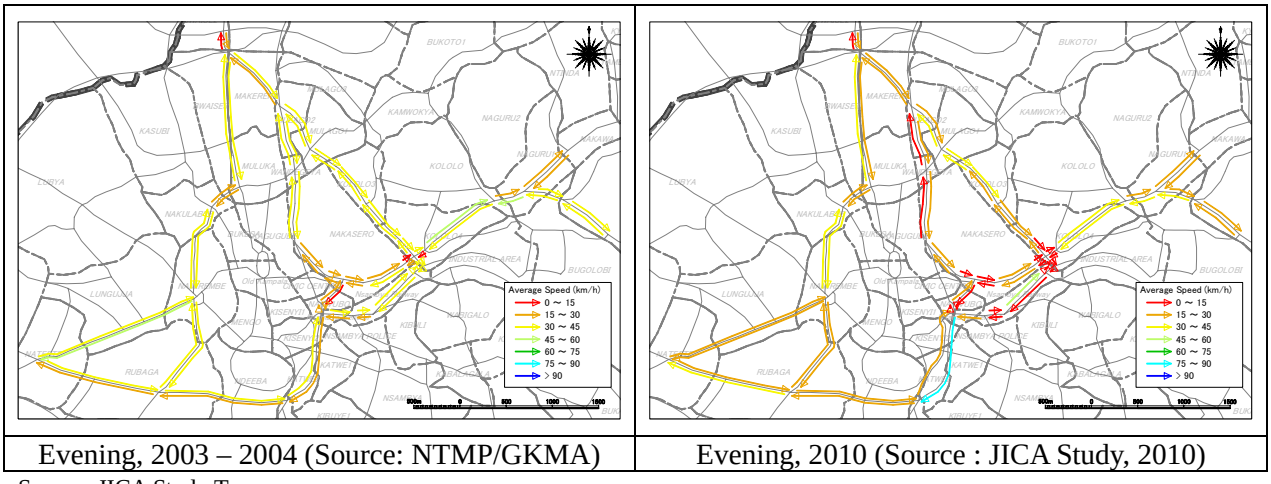
Queen's Way has been operated as one-way since the end of 2004. Consequently, based on the result of evening survey, the travel speed largely surpassed the previous record.



Morning, 2003 – 2004 (Source: NTMP/GKMA)	Morning, 2010 (Source : JICA Study, 2010)

Source: JICA Study Team

Figure 5.2.25 Comparison of Travel Speed (Morning Peak Hour)



Evening, 2003 – 2004 (Source: NTMP/GKMA)	Evening, 2010 (Source : JICA Study, 2010)

Source: JICA Study Team

Figure 5.2.26 Comparison of Travel Speed (Evening Peak Hour)

5.2.5 TAXI (MINIBUS) AND BODA-BODA (BIKE TAXI)

(1) Interview Collection

At five major taxi parks and major boda-boda stages on major road sides in Kampala, the public transport driver and passenger interview survey was conducted to understand the present situation of public transport service.

The total collected number of interviews is 888 for Bike Taxis and 4,151 for minibuses. Most of interviews are collected in the Kampala City Center area. Details of the interview points and number of interviews are as follows:

Table 5.2.11 Number of Collected Interviews

Boda-Boda (Bike Taxi)		Taxi (Mini-Bus)		
Area	Interviews	Point	Interviews	
			Driver	Passenger
Kampala Central	356 (40.1%)	New Taxi Park	236 (26.8%)	1,148 (27.7%)
Kawempe	215 (24.2%)	Old Taxi Park	257 (29.2%)	1,068 (25.7%)
Makindye	60 (6.8%)	Complex Park	98 (11.1%)	827 (19.9%)
Nakawa	137 (15.4%)	Nateete Taxi Park	77 (8.7%)	345 (8.3%)
Rubaga	120 (13.5%)	Nakawa Taxi Park	213 (24.2%)	276 (6.6%)
Total	888	Total	881	4,151

Source: JICA Study Team

(2) O-D distribution

Table 5.2.12 shows the distribution of sampled origin and destination of passengers.

About 82% of the boda-boda passengers have both their origins and destinations in Kampala City. In contrast, only 39% of the minibus passengers have their origins and destinations in Kampala City. Origins and destinations of passengers of minibus are distributed in wider area.

Table 5.2.12 O-D Distribution of Boda-Boda and Minibus Passengers

			Destination									
			Kampala		Wakiso		Mukono		Other		Total	
			Samples	Rate	Samples	Rate	Samples	Rate	Samples	Rate	Samples	Rate
Origin	Kampala	BodaBoda	731	82.3%	67	7.5%	7	0.8%	-	0.0%	805	90.7%
		MiniBus	1,626	39.2%	661	15.9%	105	2.5%	819	19.7%	3,211	77.4%
	Wakiso	BodaBoda	56	6.3%	5	0.6%	1	0.1%	-	0.0%	62	7.0%
		MiniBus	190	4.6%	144	3.5%	6	0.1%	192	4.6%	532	12.8%
	Mukono	BodaBoda	16	1.8%	-	0.0%	-	0.0%	1	0.1%	17	1.9%
		MiniBus	29	0.7%	14	0.3%	2	0.0%	32	0.8%	77	1.9%
	Other	BodaBoda	3	0.3%	-	0.0%	-	0.0%	1	0.1%	4	0.5%
		MiniBus	136	3.3%	62	1.5%	4	0.1%	129	3.1%	331	8.0%
	Total	BodaBoda	806	90.8%	72	8.1%	8	0.9%	2	0.2%	888	100%
		MiniBus	1,981	47.7%	881	21.2%	117	2.8%	1,172	28.2%	4,151	100%

Source: JICA Study Team

(3) Utilization

Figures 5.2.27, 5.2.28 and 5.2.29 are graphs showing the comparison of interview items raised to the passengers.

Trip purpose of Minibus and boda-boda shown in Figure 5.2.27 indicates that boda-boda is used for business related purposes such as Business and Office compared with minibus. And boda-boda is not used for purpose of Go Home. Figure 5.2.28 shows the travel time of boda-boda and minibus. Travel time of boda-boda is far shorter than minibus. 83% of boda-boda trip is within 30 minutes whereas 88% of minibus trip takes more than 30 minutes. It can be said that for the travel purpose with time restrictions like business, office or hospital, the use rate of a boda-boda is higher than that of mini-bus. For the purpose with less time restrictions like returning home, the use rate of mini-bus is overwhelmingly higher than boda-boda. It is noted that boda-boda is used more frequently and reaches destination at less travel time compared to mini-bus. (Figure 5.2.9)

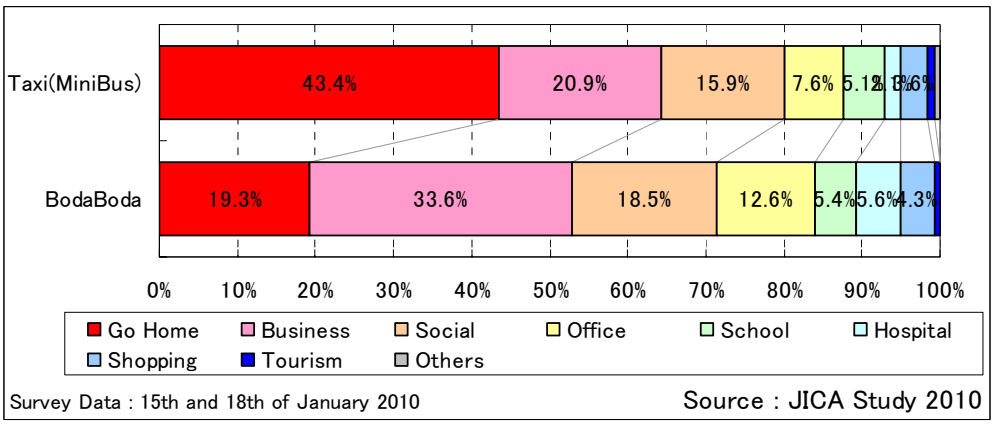


Figure 5.2.27 Comparison of Purpose of Trip

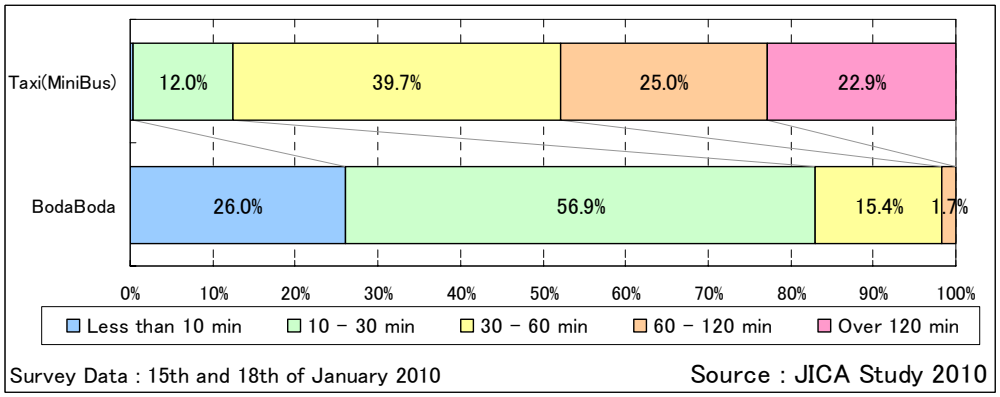


Figure 5.2.28 Comparison of Travel Time

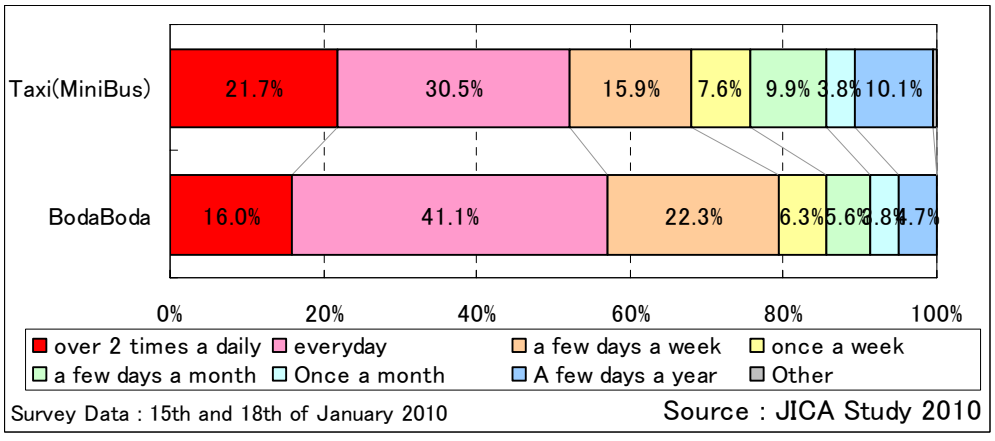


Figure 5.2.29 Comparison of Frequency

(3) Drivers

Approximately 30% of boda-boda drivers own the units that they drive. This share is almost double than that of the minibus. Other drivers belong to the companies of operators. (Figure 5.2.30)

Figure 5.2.31 shows the distribution of fare receipts per day. The average for minibus is UShs 50,000 to 100,000 per day. In contrast, the average for boda-boda is Ushs 20,000 to 30,000 per day due to short travel distance and low capacity. This is one of the reason that boda-boda runs hastily to increase the frequency of operation.

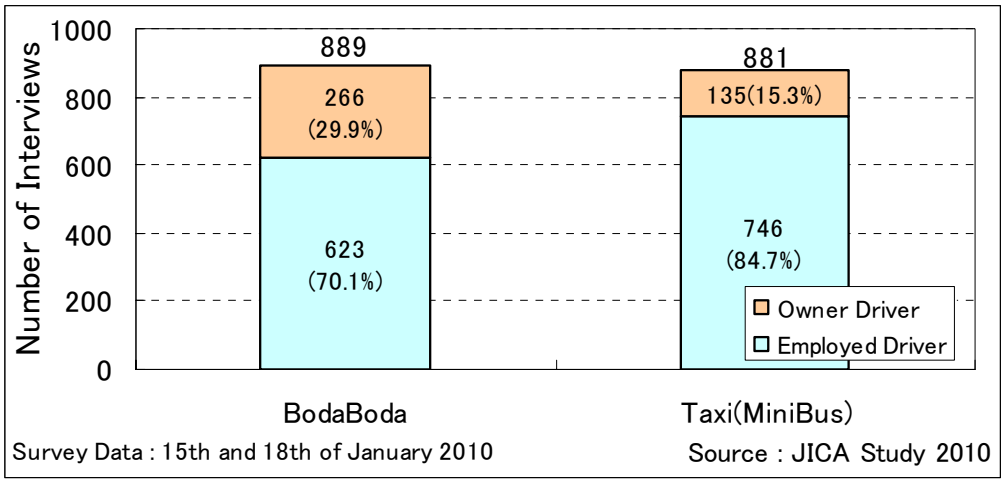


Figure 5.2.30 Comparison of Driver's Occupation

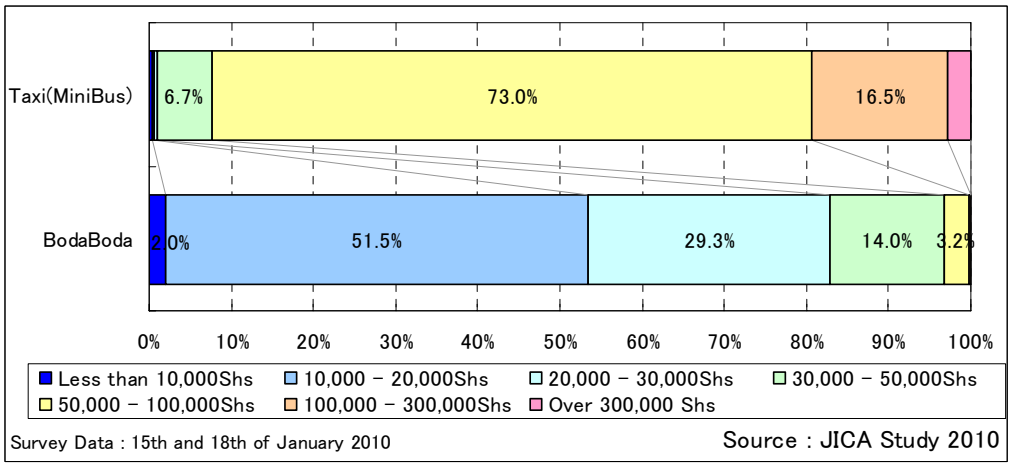


Figure 5.2.31 Comparison of Daily Collection

5.3 TRAFFIC DEMAND FORECAST

5.3.1 BASIC CODITION FOR TRAFFIC DEMAND FORECAST

(1) Transport Plans and Development Scenarios

There are two basic transport plans for GKMA to be considered for the traffic demand forecast in this Study. One is the NTMP/GKMA (May 2009), with some modifications recommended by the Study Team in Section 4.3, and the other is the BRT plan stated in its Pre-FS Final Report (May 2010).

The Study Team has assumed two development scenarios for the future traffic demand forecast in 2018 and 2023 (refer to Annex 6 as to details).

Scenario 1 is a standard development scenario for which investment cost is approximately 17% higher than that in NTMP/GKMA in May 2009, taking limited budget availability into consideration. This investment involves a rather affordable approach through planning the implementation of some programs after 2023. Instead of the dual carriageway with railway viaduct in NKMP/GKMA, the Study Team included Jinja Junction Flyovers and Clock Tower Flyover. The Study Team also included the Kampala – Entebbe Airport Expressway (US$ 350 million for 35 km long).

Scenario 2 is an aggressive development plan for which investment cost is approximately 38% higher than that in NTMP/GKMA in May 2009. All roads and approximately 70% of the BRT development planned in the NKMP/GKMA will be implemented by 2023, including Jinja Junction Flyovers, Clock Tower Flyover and the Kampala – Entebbe Airport Expressway.

Table 5.3.1 Investment Plan in Development Scenario 1

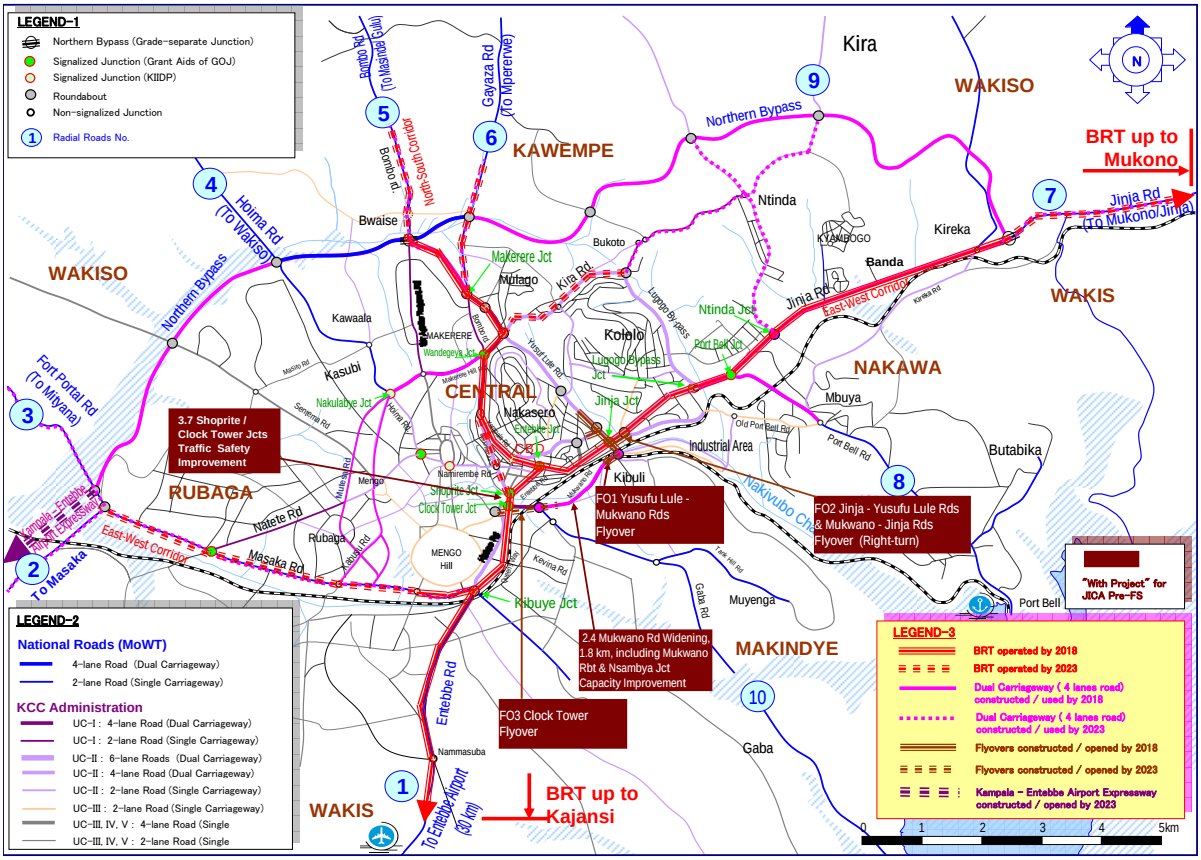
Item	Investment Category	Unit	Scenario 1		Scenario 2		Remarks
			Quantity	Cost (Mill US$)	Quantity	Cost (Mill US$)	
I	Roads						
1	Viaducts /Flyovers	km	4.50	139.08	6.50	154.93	
2	Dual Carriageways	km	40.40	113.65	45.20	127.04	Part of this item was included in BRT
3	Single Carriageway	km	458.40	380.47	573.00	475.59	
4	Bus Rapid Transit (BRT) Network	km	54.80	546.26	78.80	711.39	Length of BRT Roads facility
	(BRT Route Length)	(km)	(64.6)		(88.60)		Length of BRT operation
	Sub-Total			1,179.45		1,468.94	
II	Safety Improvement	sum	1	81.49	1	81.49	
III	Kampala - Entebbe Airport Expressway	km	35.00	350.00	35.00	350.00	
Total (% to the NTMP/GKMA Investment Plan)				1,610.94 116.7%		1,900.43 137.7%	

Source: The Study Team

The Study Team adopted **Scenario 1** since it is a more realistic plan as compared with Scenario 2 since the road network development and BRT introduction require not only budget but also land acquisition and resettlement which needs considerable time. **This Main Report of the Study is therefore based on Scenario 1. For Scenario 2, discussions are presented in Annex 6.**

(2) Assumed Future Road Network in 2023

A future road network in GKMA (refer to Annex 6) was assumed as shown in the following figure for future traffic demand forecast in 2023.

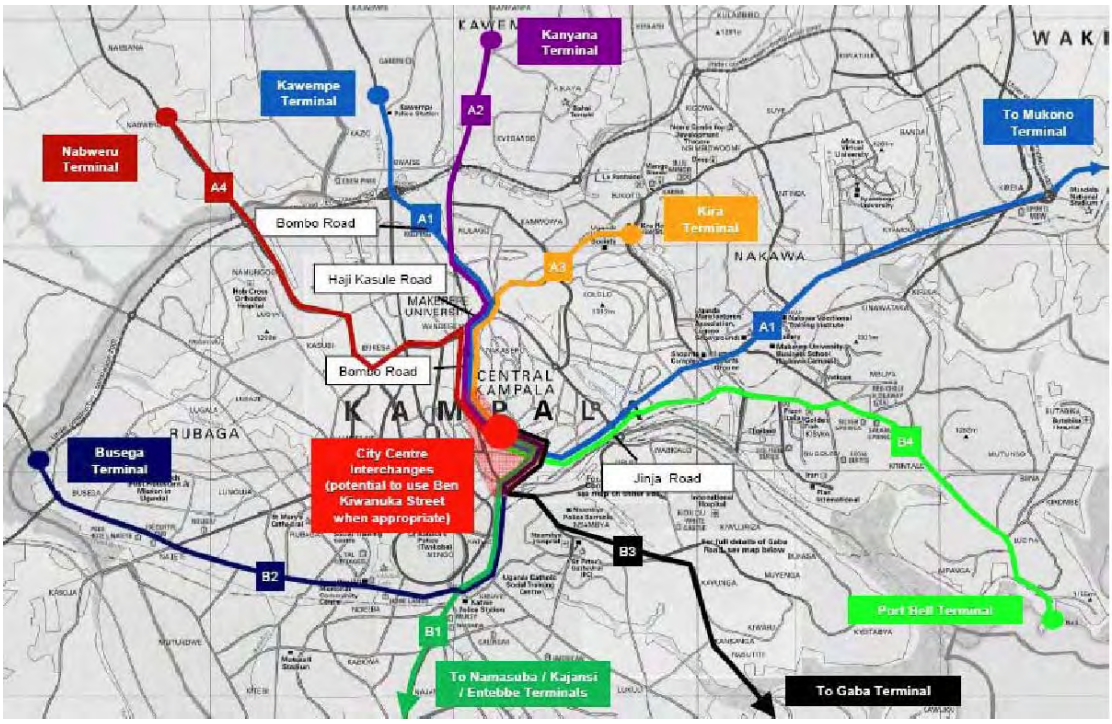


Source: JICA Study Team based on NTMP/GKMA, MoWT, May 2009

Figure 5.3.1 Road Network Development Plan 2023 in NTMP/GKMA

(3) Assumed BRT Development Scenario in 2023

Introduction of the BRT on the major arterial roads is one of the core projects in the NDP. A Pre-FS for the BRT was completed by the WB assistance in May 2010. The Final report of Pre-FS is stating that the introduction of BRT to nine arterial roads will be completed in 2030. (Figure 5.3.2), but implementation schedule of the BRT routes was not clarified in this stage. The total lengths of BRT operation route and segregated lanes are estimated at 118.6 km and 103.5 km, respectively. The introduction of the BRT with this scale will give a significant impact on traffic flow and volume of the future GKMA road network. Therefore for the traffic demand forecast, the Study Team presumed the implementation schedule of BRT as shown in Figure 5.3.3. (Refer to Annex 6 as to details.)



Source: BRT Pre-FS Final Report (May, 2010)

Figure 5.3.2 Operation Routes of BRT in 2030

No	Sub No	BRT Route Name	Facility Length (km)	2010/2011	2011/2012	2012/2013	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019	2019/2020	2020/2021	2021/2022	2022/2023	2023/2030
A1	A1.1	Bombo Rd - Kampala Rd - Jinja Road (Pilot)	14.0					(Jan.2015)									
	A1.2	Kireka/Northern Bypass - Mukono Terminal	13.5														
	A1.3	Northern Bypass - Kawempe Terminal	1.6														
A2		Makerere Rbt - Northern Bypass - Kanyama	2.4														
A3		Kira Rd (Mulago Rbt - Bukoto/Lugogo Bypass	2.5														
A4		Wandegeya Jct - Nabweru Terminal	7.1														
B1	B1.1	Entebbe Rd (Kampala Rd - Kibuye Jct - Kajansi)	13.1														
	B1.2	Entebbe Rd (Kajansi - Airport)	24.0														
B2		Kibuye Jct - Busega Rbt	6.5														
B3		Clock Tower - Nsambya Road - Gaba	9.3														
B4		Africana Rbt - Old Port Bell Rd - Port Bell	8.3														
CBD		City Center Triangle (On Ben Kiwanuka St)	1.2														

Notes: Procurement (9 months) Design Construction
Operation on Dedicated BRT Lanes Operation on existing highways (BRT shared lanes)
Source: Assumed by the Study Team based on BRT Pre-FS Draft Final Report / Presentation, April 2010

Figure 5.3.3 Anticipated BRT Implementation Schedule

5.3.2 METHOD OF TRAFFIC DEMAND FORECAST

(1) Forecast Flow

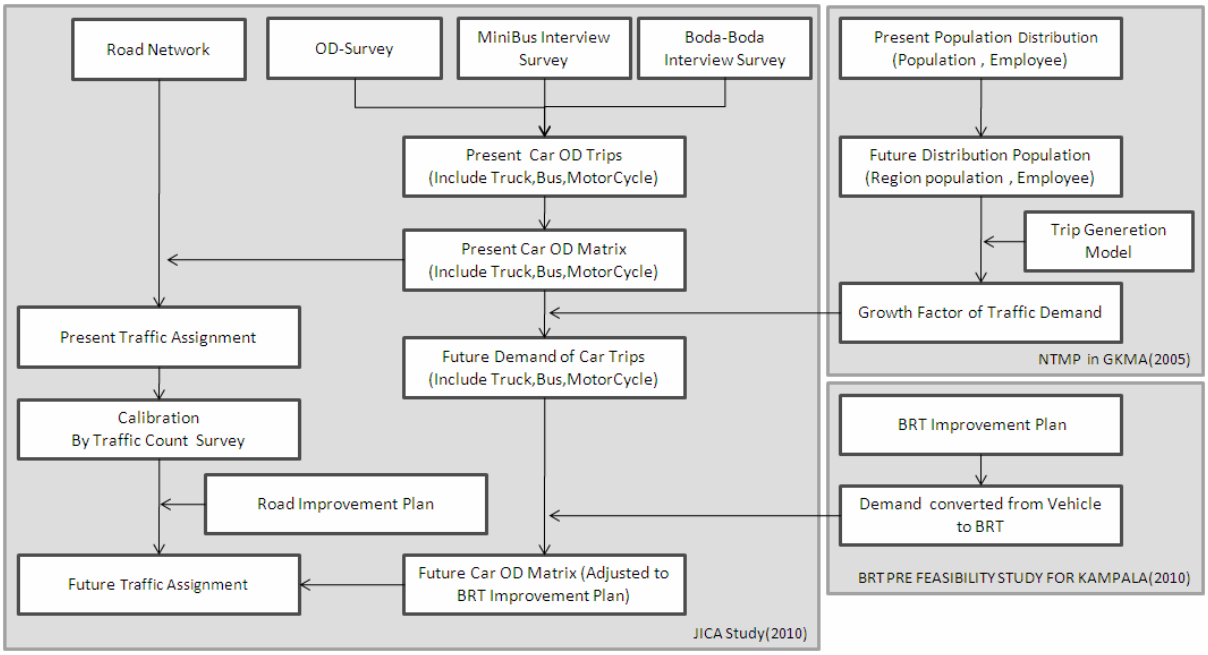
Future traffic demand in GKMA was estimated by NTMP/GKMA, 2005. However, as the traffic demand data used by the NTMP/GKMA consultant was not obtained, the future traffic demand in GKMA was formulated using a combination of data from the traffic surveys carried out by the Study Team and several economic growth projections in Uganda. Forecasting process for future

traffic demand is illustrated in Figure 5.3.4.

O-D matrices for base year (2010) were processed from the interview surveys (O-D survey, minibus and boda-boda interview) and traffic counts by the Study Team and the BRT Pre-FS Team. Traffic growth factor for future traffic demand is estimated based on the future population and economic projections.

Besides, as introduction of the BRT system is planned in 2015, converting trips from current transportation mode to the BRT was considered in the traffic demand forecast.

User Equilibrium Assignment Model is adopted to distribute trips of the O-D table on the road network since it is the most common modeling for traffic demand forecast. The Model is based on the principle that the traffic volume is distributed to the routes of equivalent travel time which is calculated through Q-V (Quantity-Velocity) model. The software named JICA-STRADA is used for actual traffic assignment.



Source: JICA Study Team

Figure 5.3.4 Traffic Demand Forecast Flow

(2) Zone and Networks

Traffic zone for the demand forecast is same as the zone defined for traffic survey. The basic road network in the study area was built based on the map provided by the MoWT. The entire road network was divided into links and data related to the link such as length, maximum velocity, capacity and volume-delay function were coded. These parameters were set based on the result of traffic survey and KCC road-inventory data.

Table 5.3.2 Basic Capacity and Free-speed of Links for Assignment

RoadClass	Pavement	Capacity (pcu/day) number of Lane(both direction)			Free Speed (km/h) number of Lane(both direction)		
		2	4	6	2	4	6
I	paved	16,000	48,000	72,000	50	50	50
II	paved	12,000	48,000	–	40	40	–
III~	paved	12,000	48,000	–	30	40	–
	dirt	8,000	–	–	30	–	–

Source: JICA Study Team

As traffic demand on the network is represented in terms of passenger car unit (PCU), conversion factor from each vehicle type to passenger car was set in consideration of the factors by the NTMP and Geometric Design Manual of Uganda. The following table shows the PCU factor employed in this study.

Table 5.3.3 PCU Equivalent

JICA STUDY 2010		GKMA-NTMP*		Geometric Design Manual**		
Vehicle Classification	**PCU Equivalent**	Vehicle Classification	PCU Equivalent	Level	Rolling	Mountainous
Passenger / 4-Wheel Drive vehicle	**1**	Saloon Cars	1	1	1	1.5
Small Size Cargo Vehicle	**1**	Pick-ups, 4WD	1	1	1.5	1.5
Mini Bus (Taxi)	**1.15**	Minibus	1.15	1	1	1.5
Large Size Bus	**2.4**	Bus	2.4	2	4	6
Medium Goods Vehicle(MGV)	**2.5**	Truck, Single-unit, 2-axle	2.5	2.5	5	10
		Truck, Single-unit, 3-axle	2.75			
Heavy Goods Vehicle(HGV)	**3.5**	Truck-trailer combination, 4-axle	2.8	3.5	8	20
		Truck-trailer combination, 5-axle	3.5			
		Truck-trailer combination, >5 axles	4			
Motorcycle	**0.4**	Motorcycle	0.4	1	1	1.5

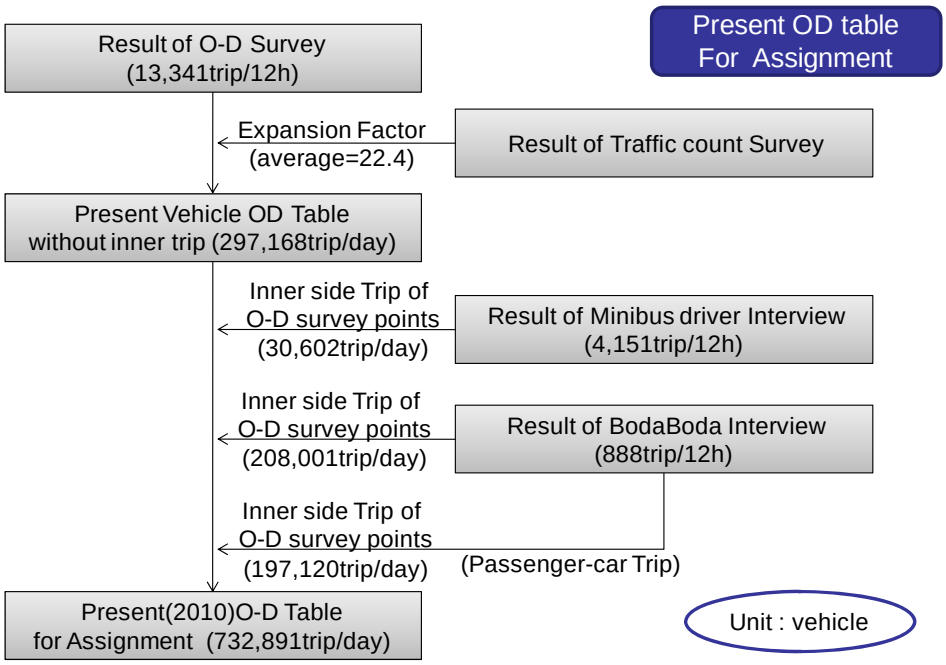
*IR4 Appendices(App B7 - Table B-7-2)
**Road DesignManual(Vol.1),MWHC 2005

5.3.3 PRESENT TRAFFIC FLOW PATTEN

(1) Present O-D Calibration

The present O-D matrices in 2010 were processed from O-D survey conducted by the Study Team. As the next step, it is necessary to adjust estimated O-D matrices to observed traffic volume at each survey site. Moreover, seasonal factor should be also considered. As a result of the analysis of adjustment factor, average expansion factor was derived as 22.4, while the seasonal factors were 1.1 for passenger cars and 1.08 for motorcycles. These results were derived from the traveler interview survey (February 2010, BRT Pre-FS Interim Report).

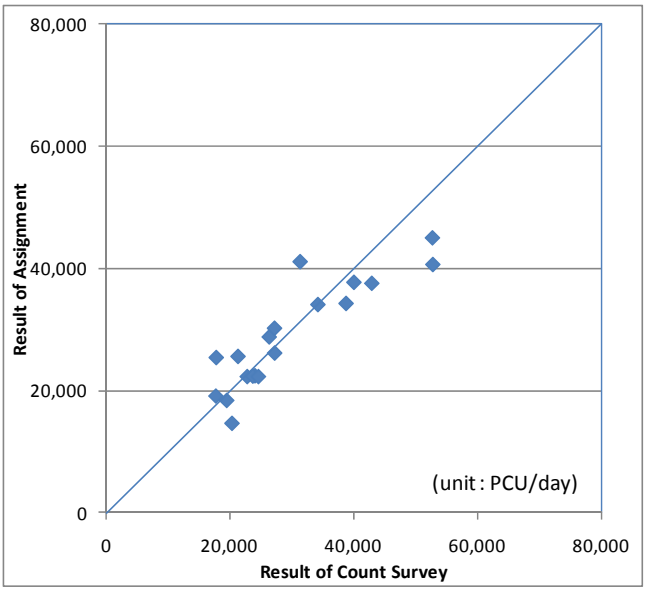
In addition, trips to and from the inner city obtained from the results of minibus (taxi) drivers interview survey and boda-boda interview survey were added to the present O-D table. As a result, a total trip in the study area is estimated as approximately 733,000 trips per day.



Source: JICA Study Team

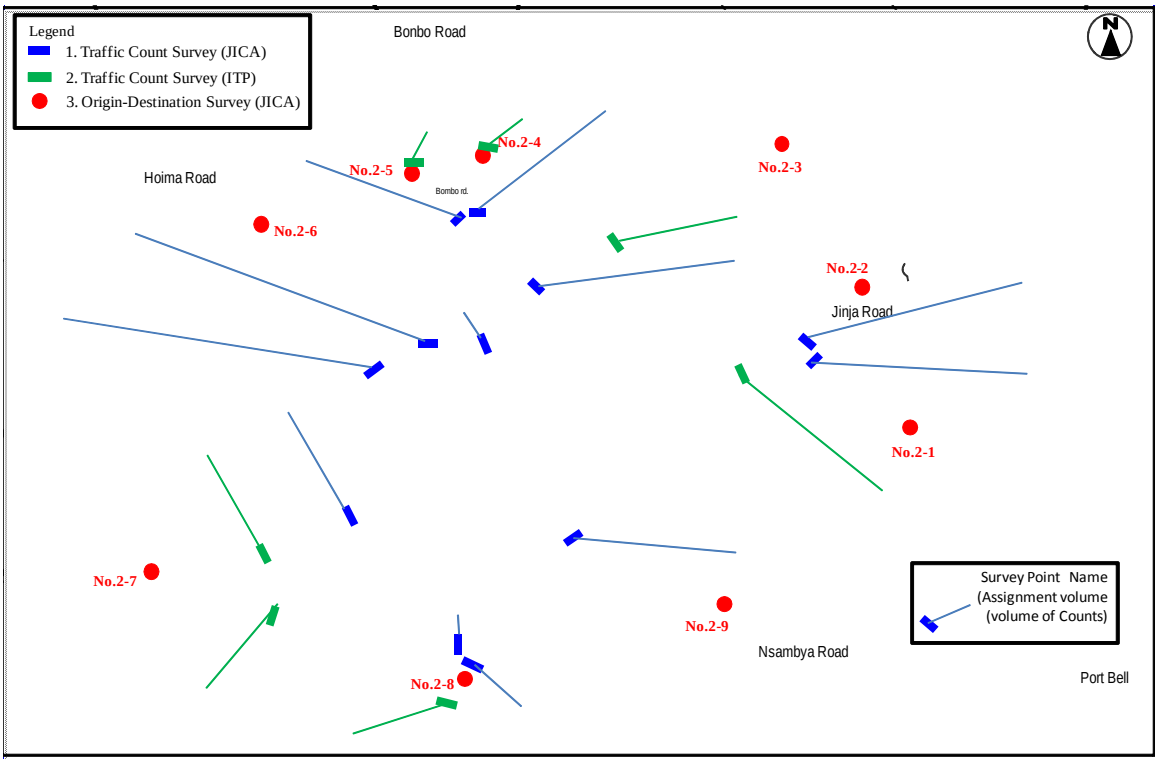
Figure 5.3.5 Estimation flow of Present O-D Distribution

Reproducibility of the present traffic flow on the road network was evaluated using a correlation coefficient. Its value was 0.89 (see table below) indicating high reproducibility.



Source: JICA Study Team

Figure 5.3.6 Graph of Correlation Coefficient at each Survey Site



Source: JICA Study Team

Figure 5.3.7 Traffic Volume Comparison between Assignment model and Site Survey

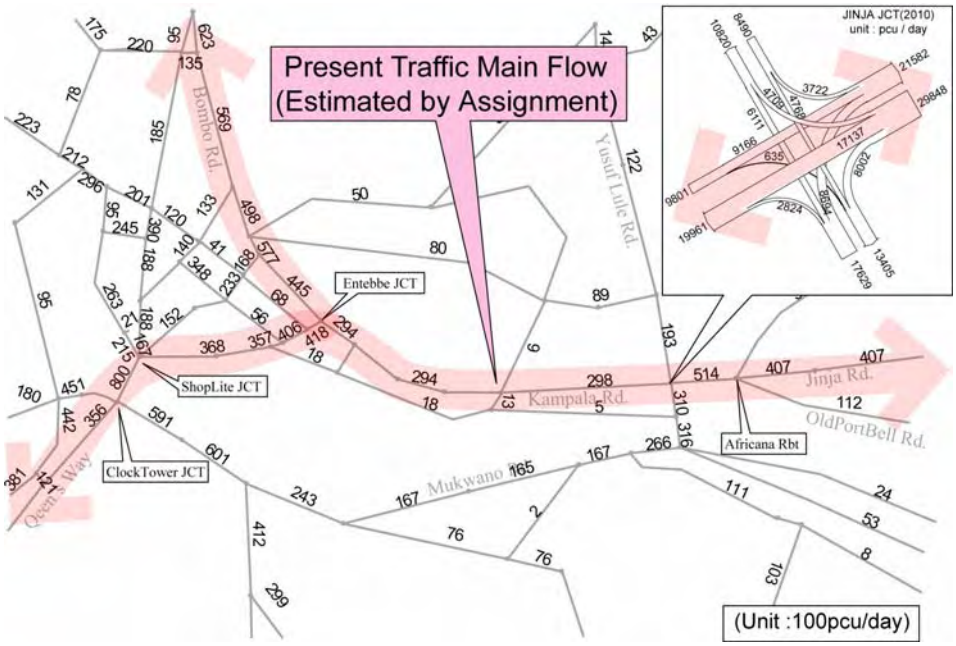
(2) Present Traffic Flow Pattern at City Center Area

The following figure illustrates the present traffic volume reproduced by assignment model. Its result shows that Jinja, Kampala, Entebbe and Bombo roads have high demands.

Source: JICA Study Team

Figure 5.3.8 Result of Present Traffic Volume estimated by Assignment Model

Detailed traffic flow at the city center is illustrated in Figure 5.3.9. This figure also shows that Jinja, Kampala, Entebbe and Bombo road are functioning as the trunk roads which carry large proportion of traffic flow in the city center area.



Source: JICA Study Team

Figure 5.3.9 Result of Present Traffic Assignment in Kampala City Center Area

5.3.4 EXAMINATION OF FUTURE TRAFFIC DEMAND

(1) Demand Forecast Scenario

The target year of the Study is decided as 2018 and 2023, in coordination with the NTMP/GKMA. Traffic demand forecast is prepared for 2013, 2018 and 2023. Future traffic demand is forecasted in the following six cases including 2010.

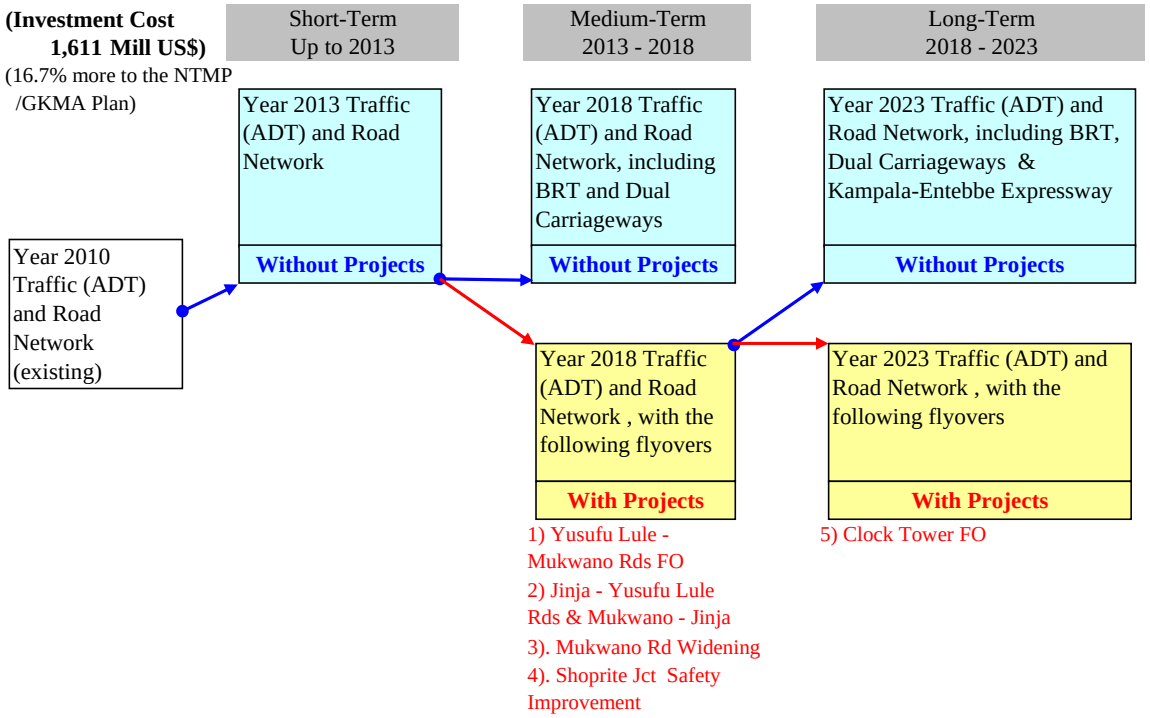
Table 5.3.4 Cases of Traffic Demand Forecast

Scenario	Year	Pre-FS Projects
Case1	2010	without
Case2	2013	without
Case3	2018	**with**
Case4		without
Case5	2023	**with**
Case6		without

Source: JICA Study Team

In the above table, "***With Project Case***" means implementation of ***the Pre-FS projects*** (Jinja Jct Flyovers, Mukwano Road Widening and Shoprite and Clock Tower Jcts Road safety Improvement) by 2018 and construction of Clock Tower Flyover by 2023. "***Without Project Case***" means ***the Pre-FS Projects*** are not implemented. The Study Team presumed implementation schedule for BRT project as shown in Figure 5.3.3. The conditions regarding BRT are based on the presumption.

The following figure illustrates the relation between "With Project Case" and "Without Project Case" in this Study.



Source: JICA Study Team

Figure 5.3.10 With and Without Project Cases for Traffic Demand Forecast

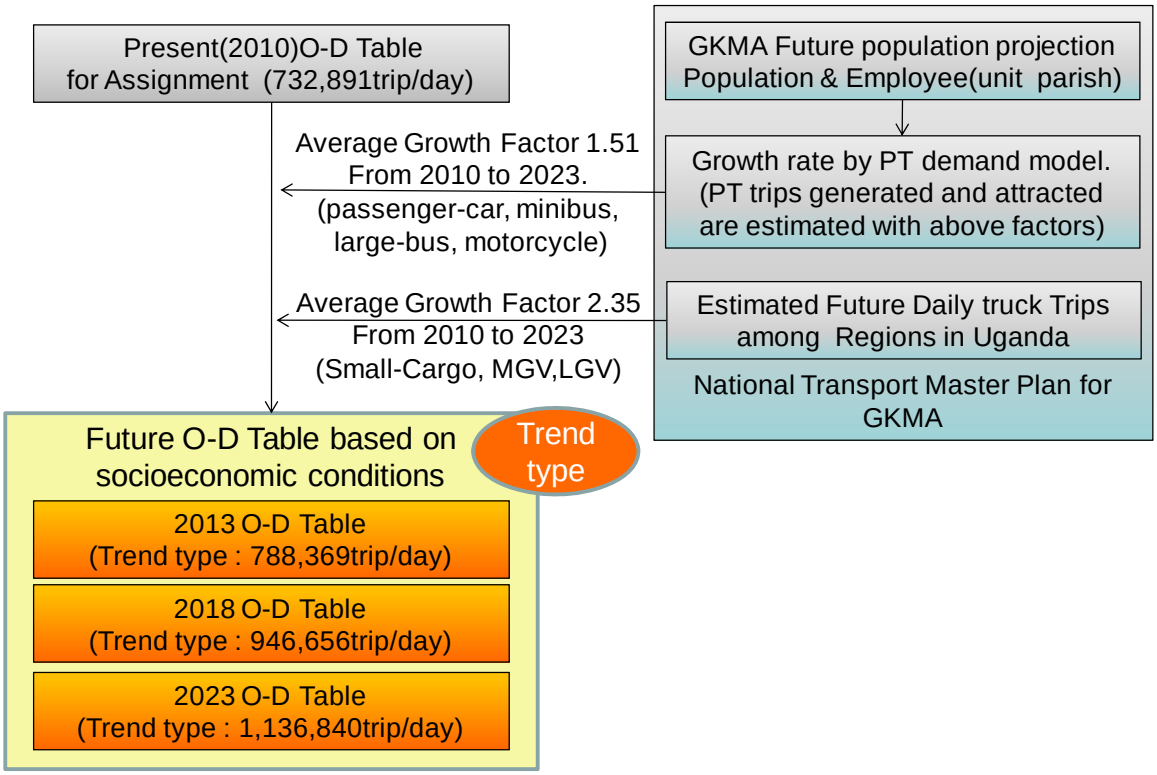
(2) Future O-D Estimation based on Socioeconomic Condition

As socioeconomic activities are the sources of traffic movement, generally population, workforce or economic indices are adopted as the key factors for the traffic growth forecast.

In this study, forecast of future traffic generation was divided into passenger transport (Passenger car, Minibus, Large size bus, Motorcycle) and cargo transport (Small size cargo, Medium goods vehicle, Heavy goods vehicle). Passenger transport generation within the GKMA area was estimated by the equation model formulated by the NTMP/GKMA IR-4. Applying future population and workforce by zone to the equation model, future traffic generation by zone were estimated. Passenger demand outside the GKMA was estimated using the growth factor for passenger travel in the NTMP/GKMA. The traffic growth rate for passenger inside the GKMA from 2010 to 2023 shows 1.52 through the insertion of population growth rate of 1.66 and workforce growth rate of 2.00. Traffic demand growth rate outside the GKMA was estimated as 2.02 - 2.38.

Cargo transport generation was forecasted based on the growth rate in each district employed in NTMP/GKMA. As a result, growth rate of cargo transport from 2010 to 2023 shows 2.17 – 2.50.

The total number of trips in 2023 was estimated to be approximately 1.1 million per day.

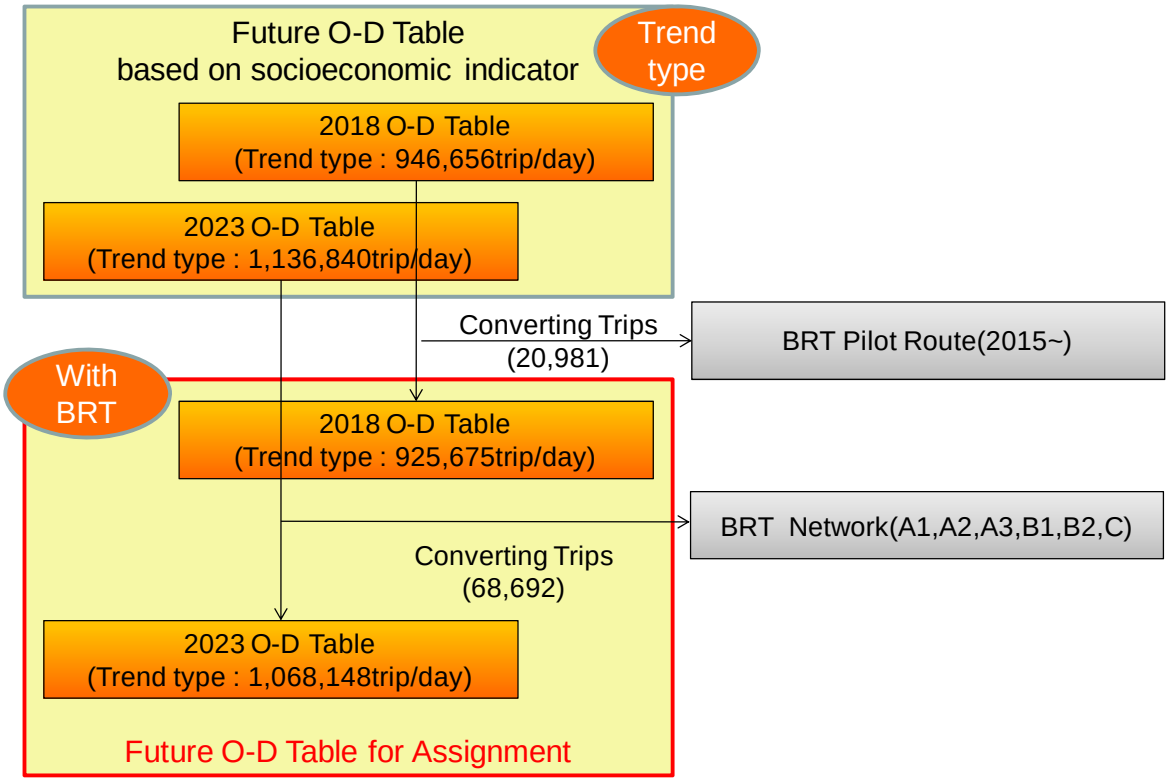


Source: JICA Study Team

Figure 5.3.11 Flow of Future Trip Number Estimation

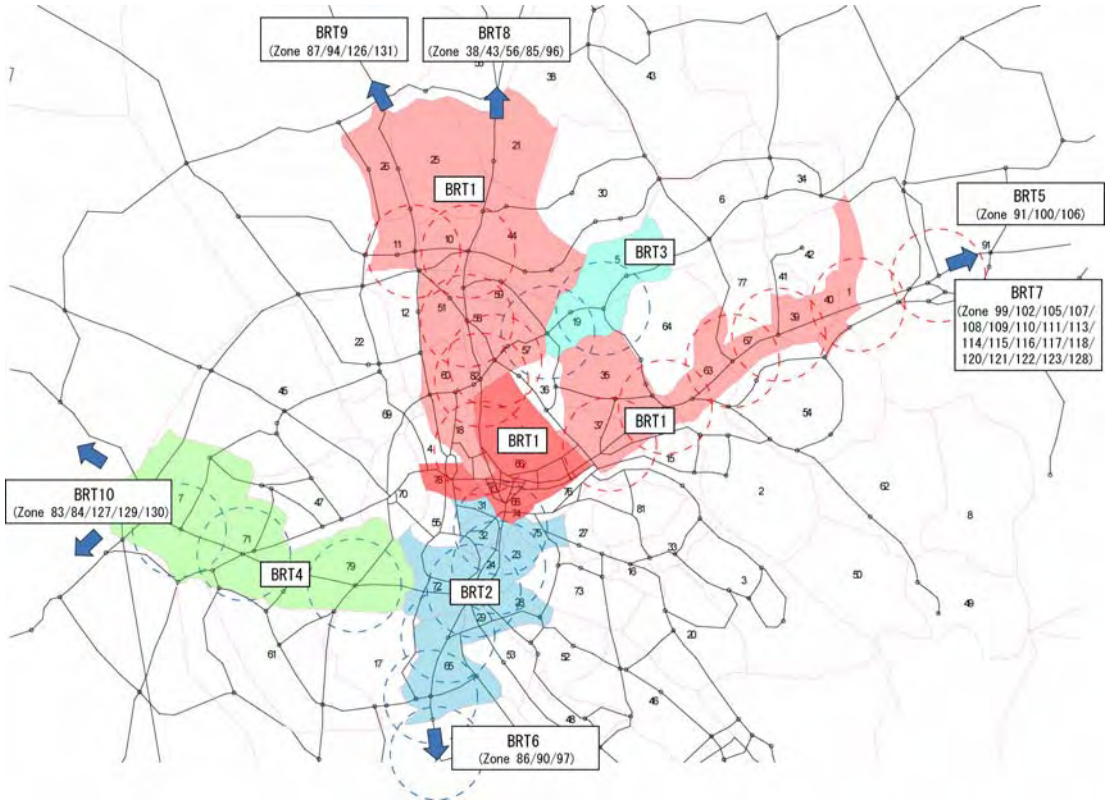
(3) Future Public Transport Service by the BRT System

The passengers of mini-buses and large-buses will shift to the BRT substantially after the introduction of BRT in 2015. This modal change to the BRT is considered in the future traffic demand. The assumption established by the Study Team is that the passenger trips generated within 1 km radius from the BRT route will shift to the BRT. As a result, approximately 91,000 trips were assumed to shift from mini-buses and large-buses to the BRT in 2023.



Source: JICA Study Team

Figure 5.3.12 Estimation Flow of Future Trip Number Corresponding to the BRT



Source: JICA Study Team

Figure 5.3.13 Areas of Modal shift from Buses to the BRT

(4) Outline of Future O-D Distribution Pattern

Figure 5.3.14 is a graph comparing the trip distributions of all purposes in 2010 and 2023. These distribution patterns were derived from the O-D table calculated for traffic assignment model. The major trip flows are limited within Kampala City in 2010. Distribution pattern in 2023 is basically the same pattern as that in 2010. Only the share of external trips (through trips) will slightly expand because future population and employment outside Kampala City will increase more.

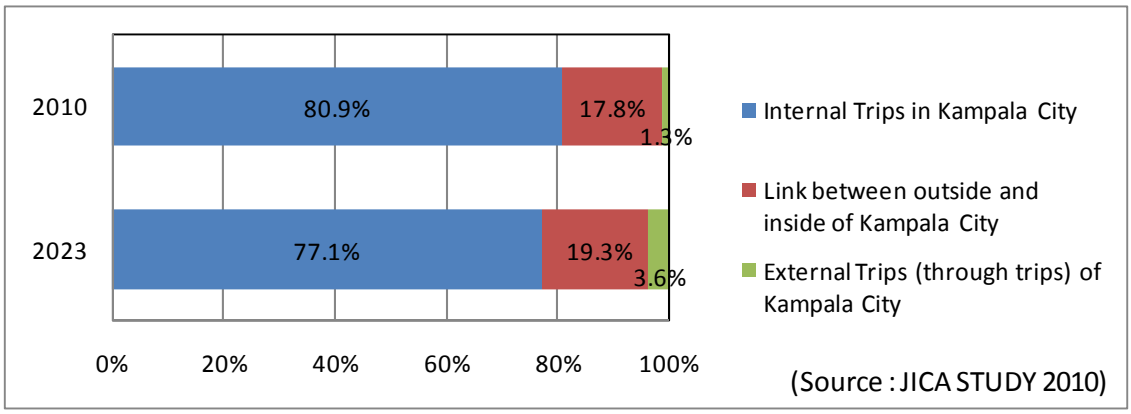
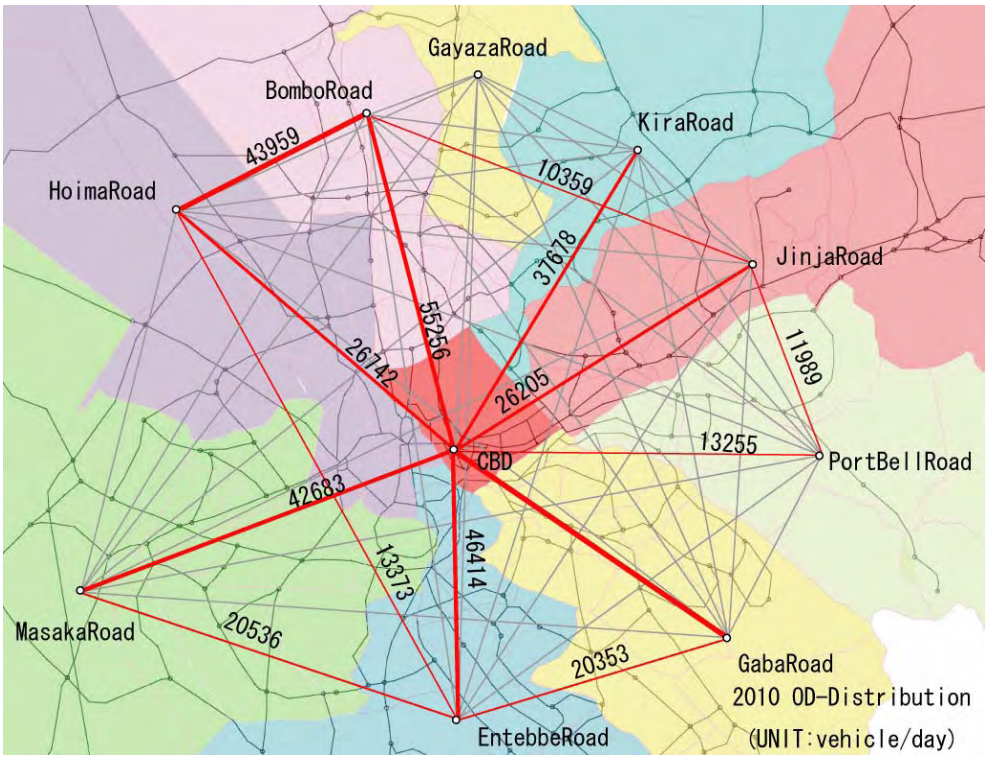


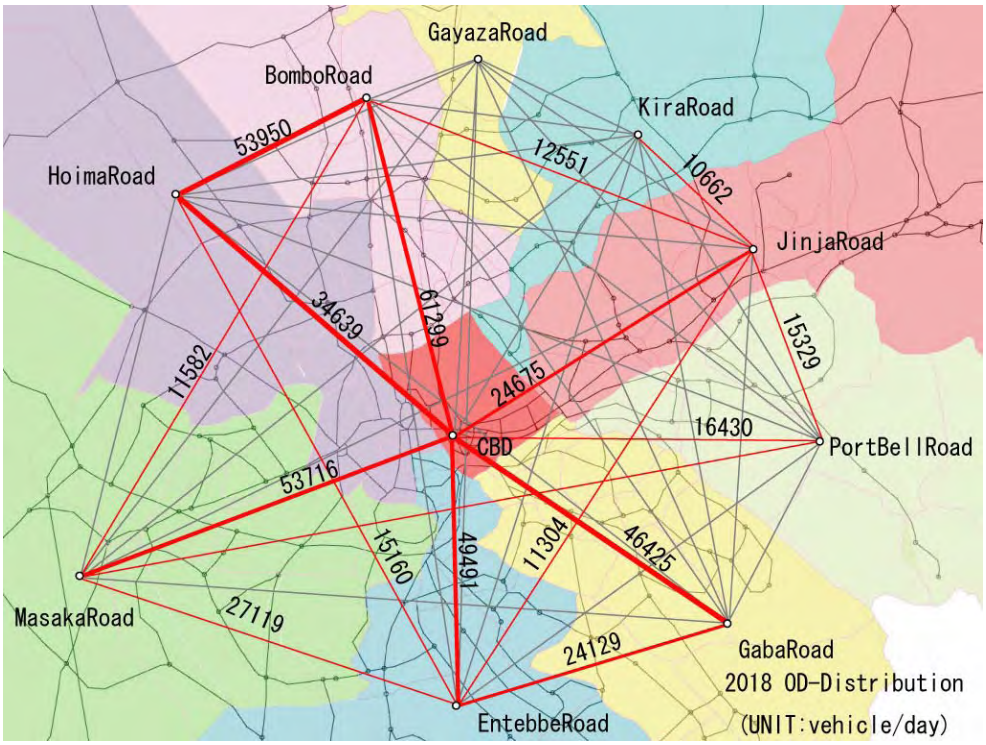
Figure 5.3.14 Trip Distribution in 2010 and 2023

Figures 5.3.14 to 16 illustrate the future trip distributions in 2010, 2018 and 2023, respectively, on zone map. All figures basically show the same trend. The only point to be noticed is that vehicle trips in catchments area of the BRT operation will decrease in time with the introduction of the BRT.



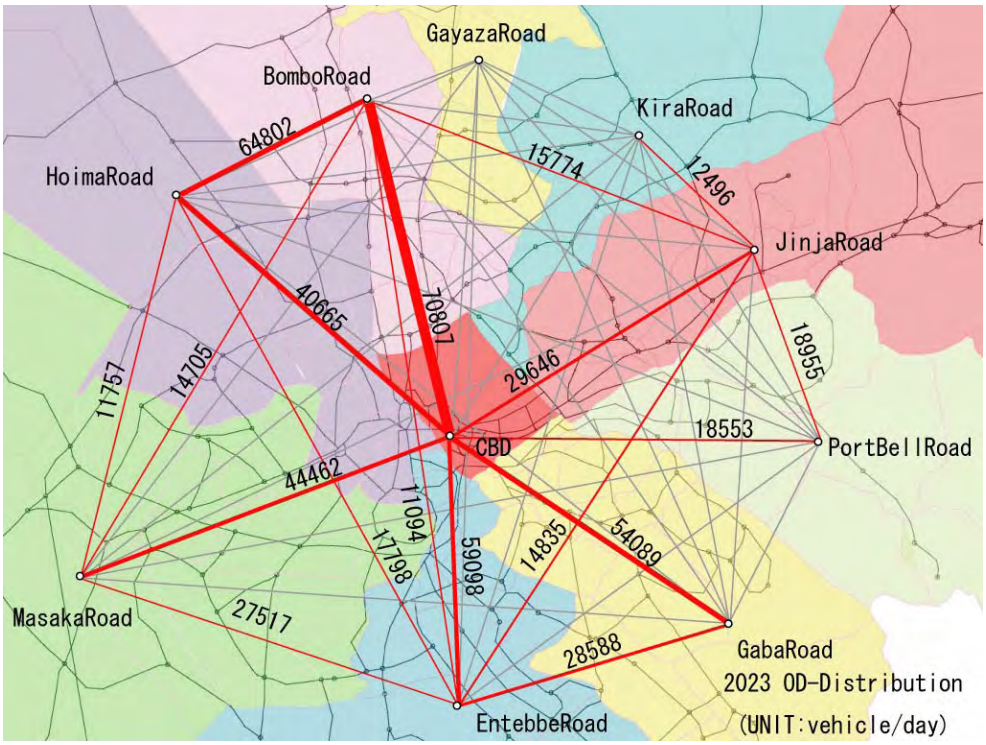
Source: JICA Study Team

Figure 5.3.15 Estimated O-D Distribution (2010)



Source: JICA Study Team

Figure 5.3.16 Estimated O-D Distribution (2018)

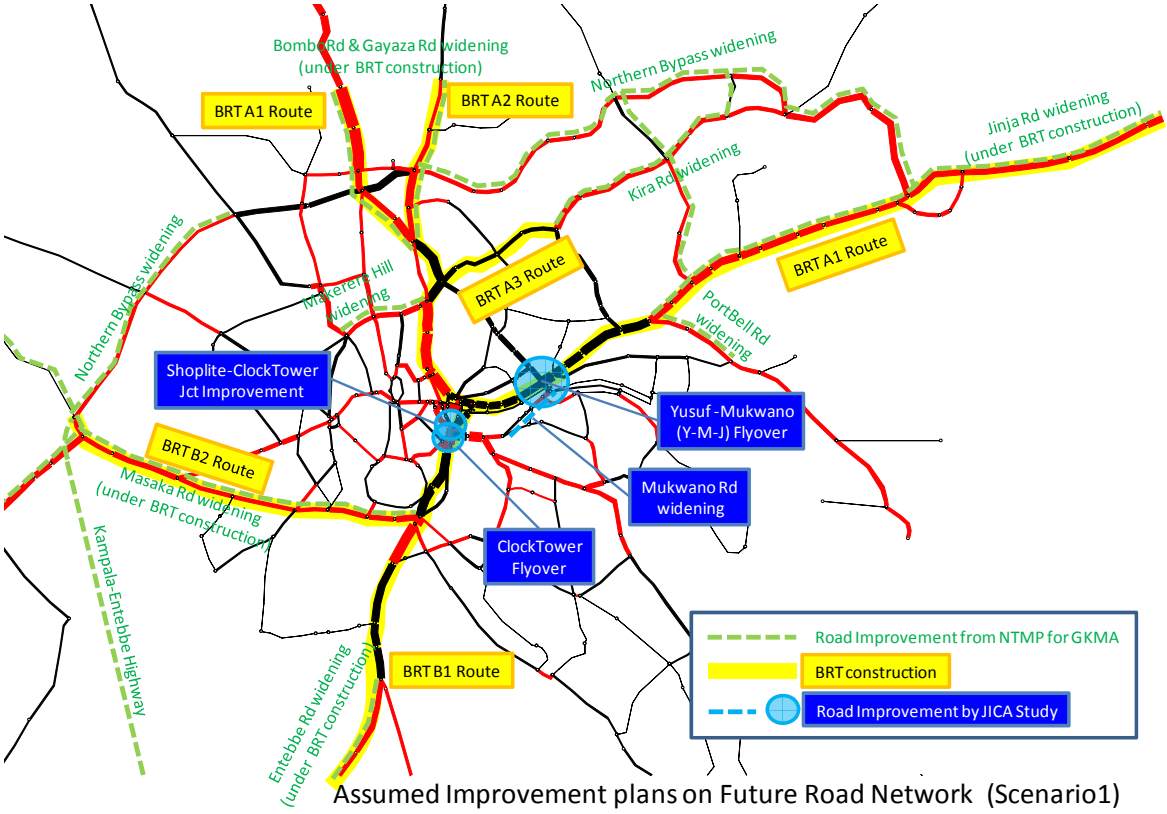


Source: JICA Study Team

Figure 5.3.17 Estimated O-D Distribution (2023)

(5) Future Road Network

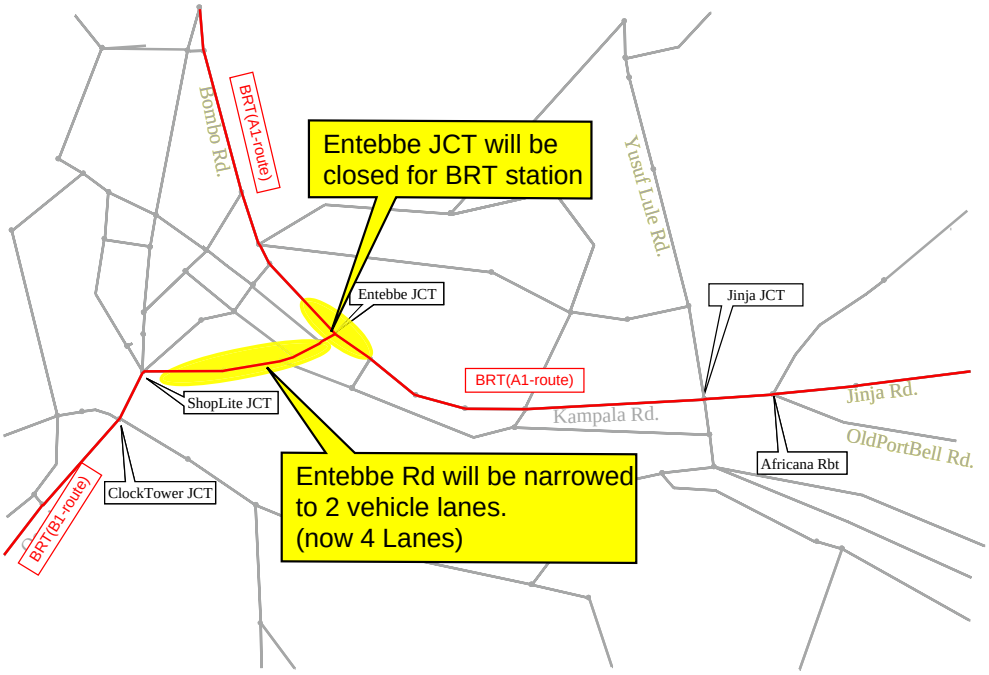
Future road networks in 2018 and 2023 were set out based on the final report of NTMP/GKMA. Moreover, its modification in consideration of some road improvement projects is proposed in this Study and in the introduction of the BRT.



Source: JICA Study Team

Figure 5.3.18 Proposed Road Network Improvement and BRT Projects

Major impacts to the future road network by the introduction of the BRT will be the decrease in number of lanes for some trunk roads which were proposed due to the BRT route and passage restriction at Kampala/Entebbe Jct to the general traffic.

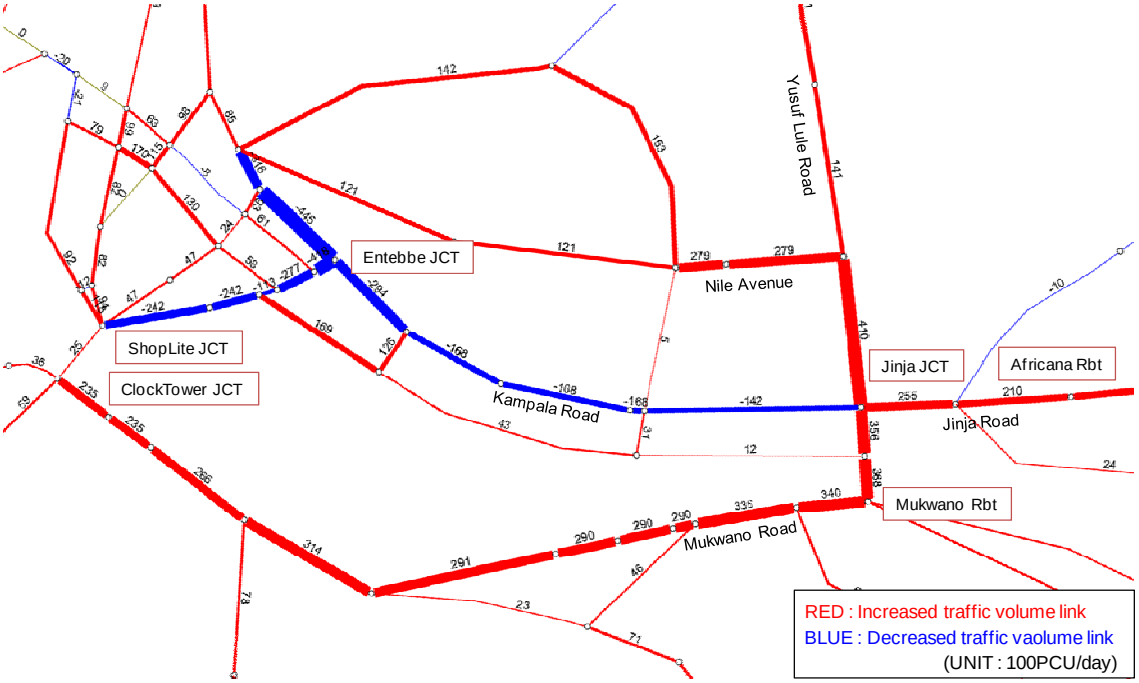


Source: JICA Study Team

Figure 5.3.19 Road Network Capacity Change with the BRT Operation

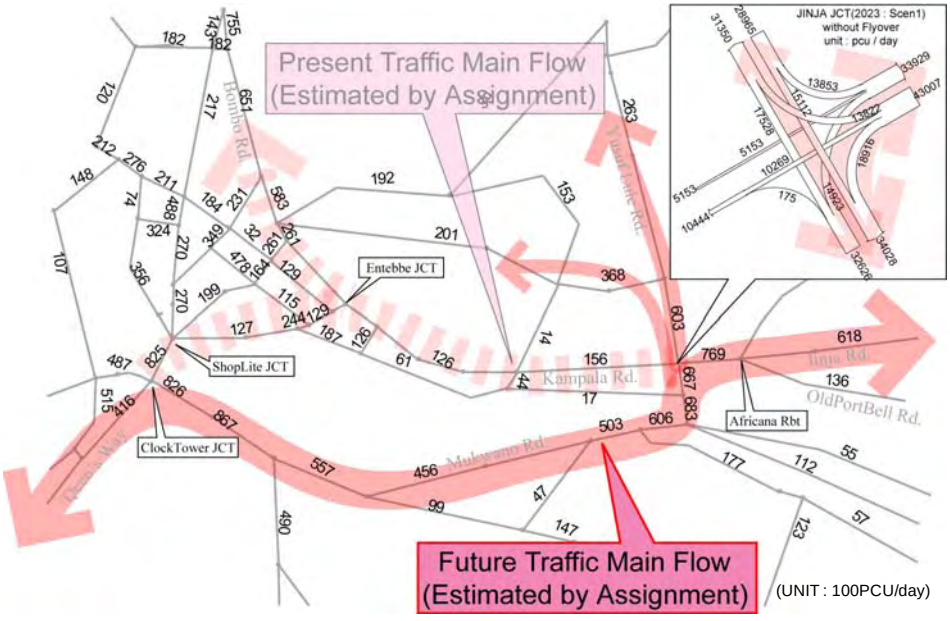
(6) Future Traffic Flow

Figure 5.3.19 shows the decrease or increase of traffic volume from 2010 to 2023 at the city center. It indicates a large shift of traffic flow. Jinja, Kampala and Entebbe Roads have high demand in 2010. However, traffic volume of 14,000-17,000 pcu/day will decrease on Jinja and Kampala roads in 2023. In contrast, traffic volume of 29,000-34,000 pcu/day will drastically increase on Mukwano road and Nile Avenue. The main traffic flow will shift from Jinja-Kampala roads direction (east-west) to Yusufu Lule - Mukwano Rds direction (north-south) as shown in Figure 5.3.20.



Source: JICA Study Team

Figure 5.3.20 Decrease or Increase of Traffic Volume (Difference between 2010 and 2023)



Source: JICA Study Team

Figure 5.3.21 Main Traffic Flow Change after Introduction of the BRT

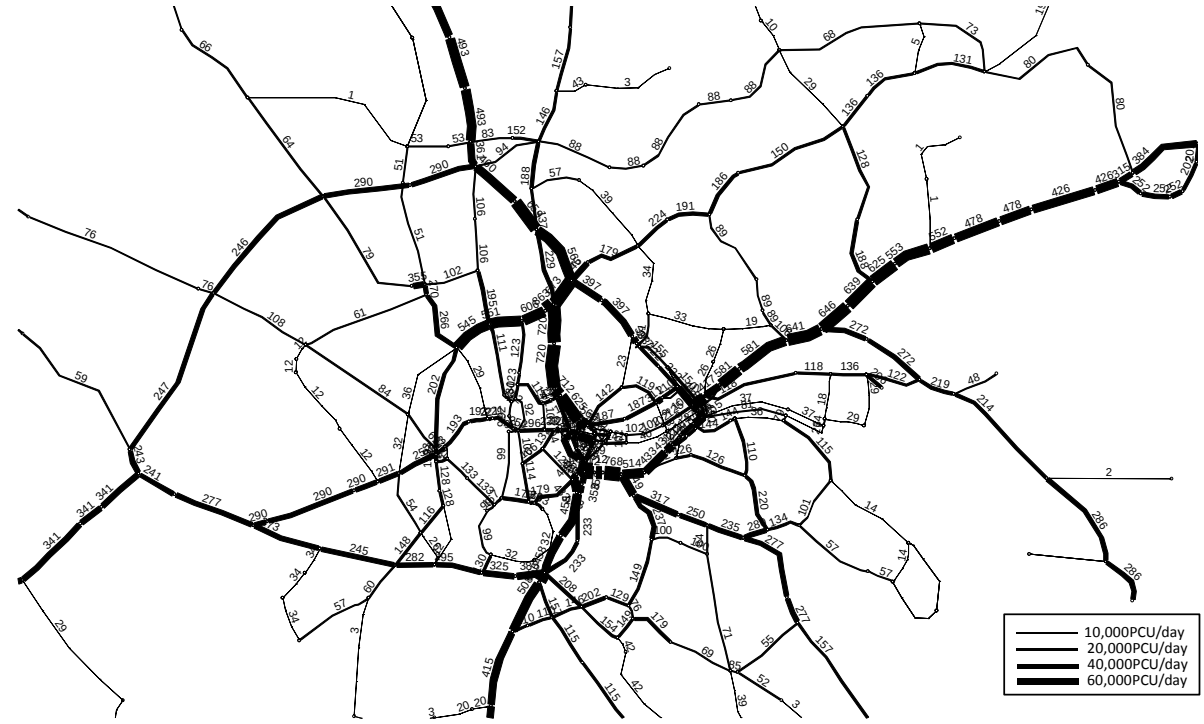
The following figures show the results of traffic assignments in 2013, 2018 and 2023. The road network in the forecast consists of proposed road improvement project and the BRT project. The future traffic volume in the alternative case is shown in Chapter 7. Link parameters such as road capacity are compiled in Annex 2.

Source: JICA Study Team

Figure 5.3.22 Result of Future Traffic Assignment in Kampala (2013)

Source: JICA Study Team

Figure 5.3.23 Result of Future Traffic Assignment at City Center (2013)



Source: JICA Study Team

Figure 5.3.24 Result of Future Traffic Assignment in Kampala (2018)

Source: JICA Study Team

Figure 5.3.25 Result of Future Traffic Assignment at City Center (2018)

Source: JICA Study Team

Figure 5.3.26 Result of Future Traffic Assignment in Kampala (2023)

Source: JICA Study Team

Figure 5.3.27 Result of Future Traffic Assignment at City Center (2023)

The following tables show the future traffic flow at the Jinja-Africana intersection and Clock Tower-Shoprite intersection presented in the form of O-D matrix.

Table 5.3.5 Traffic Flow at Jinja-Africana Intersection (2018)

Out / In	Jinja Road	Old Port Bell Road	Sixth Street	Seventh Street	Eighth Street	Mukwano Bypass Road	Station Road	Kampala Road	Nile Avenue	Yusf Lule Road	Wampewo Road	total
Jinja Road	0	43	0	90	1861	12412	0	4078	10618	3065	0	32,167
Old Port Bell Road	9	0	0	0	0	1565	0	4009	212	2084	348	8,227
Sixth Street	57	0	0	0	0	344	199	1	97	813	14	1,525
Seventh Street	528	0	0	0	0	390	269	89	2685	1579	151	5,691
Eighth Street	847	0	0	0	0	1318	444	55	3539	2532	213	8,948
Mukwano Bypass Road	9974	592	395	483	118	0	3	0	1243	7150	743	20,701
Station Road	0	0	0	0	0	0	0	0	0	0	0	0
Kampala Road	2473	1123	0	0	0	0	0	0	0	0	31	3,627
Nile Avenue	8057	844	8	424	1657	70	0	0	0	0	665	11,725
Yusf Lule Road	3602	1013	1758	1081	2475	9741	0	0	719	0	0	20,389
Wampewo Road	0	35	0	11	126	178	0	57	16	0	0	423
total	25,547	3,650	2,161	2,089	6,237	26,018	915	8,289	19,129	17,223	2,165	113,423

(Including traffic passing through the Fly-Over)
Unit : PCU/Day

Source: JICA Study Team

Table 5.3.6 Traffic Flow at Jinja-Africana Intersection (2023)

Out / In	Jinja Road	Old Port Bell Road	Sixth Street	Seventh Street	Eighth Street	Mukwano Bypass Road	Station Road	Kampala Road	Nile Avenue	Yusf Lule Road	Wampewo Road	total
Jinja Road	0	92	0	807	1637	14781	0	5328	11533	1888	0	36,066
Old Port Bell Road	5	0	0	0	0	3484	0	3826	248	1573	98	9,234
Sixth Street	74	0	0	0	0	593	12	0	257	826	15	1,777
Seventh Street	630	0	0	0	0	2020	250	0	2740	1464	218	7,322
Eighth Street	1167	0	0	0	0	837	1076	0	3911	3024	397	10,412
Mukwano Bypass Road	11968	778	1448	996	1478	0	5	0	2192	4692	678	24,235
Station Road	0	0	0	0	0	0	0	0	0	0	0	0
Kampala Road	3754	1635	0	0	0	0	0	0	0	0	56	5,445
Nile Avenue	9192	624	15	972	2075	1282	0	0	0	198	371	14,729
Yusf Lule Road	2289	1284	1802	1377	1799	7466	0	0	1918	0	0	17,935
Wampewo Road	0	40	0	56	90	218	0	64	25	0	0	493
total	29,079	4,453	3,265	4,208	7,079	30,681	1,343	9,218	22,824	13,665	1,833	127,648

(Including traffic passing through the Fly-Over)
Unit : PCU/Day

Source: JICA Study Team

Table 5.3.7 Traffic Flow at Clock Tower-Shoprite Intersection (2018)

Out / In	Nakibubo Place	Ben Kiwanuka Street	Sikh Road	Entebbe Road(N)	Nsambya Road	Qweensway	Katwe Road	Mengo Hill Road	4th Road off Mengo Hill/Katwe R/A	total
Nakibubo Place	0	0	0	0	0	0	0	0	0	0
Ben Kiwanuka Street	0	0	0	1,089	8,813	9,903	0	0	0	19,805
Sikh Road	0	0	0	0	0	0	0	0	0	0
Entebbe Road(N)	1,591	0	0	0	5,181	3,547	0	0	0	10,319
Nsambya Road	12,481	0	8,318	25	0	20,140	0	0	0	40,964
Qweensway	0	0	0	0	0	0	0	0	0	0
Katwe Road	12,817	0	7,234	1,052	10,871	0	0	8,505	7,281	47,760
Mengo Hill Road	2,295	0	1,854	571	4,026	608	0	0	0	9,354
4th Road off Mengo Hill/Katwe R/A	1,385	0	146	14	1,989	1,365	0	56	0	4,955
total	30,569	0	17,552	2,751	30,880	35,563	0	8,561	7,281	133,157

(Excluding traffic passing through the Fly-Over : ClockTower Fly-Over will not be constructed.)
Unit : PCU/Day

Source: JICA Study Team

Table 5.3.8 Traffic Flow at Clock Tower-Africana Intersection (2023)

In \ Out	Nakibubo Place	Ben Kiwanuka Street	Sikh Road	Entebbe Road(N)	Nsambya Road	Qweensway	Katwe Road	Mengo Hill Road	4th Road off Mengo Hill/Katwe R/A	total
Nakibubo Place	0	0	0	0	0	0	0	0	0	0
Ben Kiwanuka Street	0	0	0	1,710	10,554	14,219	0	0	0	26,483
Sikh Road	0	0	0	0	0	0	0	0	0	0
Entebbe Road(N)	1,880	0	0	0	4,265	4,391	0	0	0	10,536
Nsambya Road	15,758	0	9,088	0	0	23,203	0	0	0	48,049
Qweensway	0	0	0	0	0	0	0	0	0	0
Katwe Road	15,358	0	9,226	172	13,257	0	0	8,011	5,890	51,914
Mengo Hill Road	2,123	0	1,715	653	4,820	23	0	0	0	9,334
4th Road off Mengo Hill/Katwe R/A	2,407	0	206	40	2,942	113	0	0	0	5,708
total	37,526	0	20,235	2,575	35,838	41,949	0	8,011	5,890	152,024

(Including traffic passing through the Fly-Over)

Unit : PCU/Day

Source: JICA Study Team

5.4 SUPPLEMENTAL TRAFFIC SURVEY

5.4.1 OBJECTIVES OF SUPPLEMENTAL TRAFFIC SURVEY

A supplemental traffic survey was carried out to identify the problems at nine major junctions, including six intersections signalized through the ODA of the GOJ.

5.4.2 OUTLINE AND SCHEDULE OF SUPPLEMENTAL TRAFFIC SURVEY

(1) Outline of Supplemental Traffic Survey

The outline of the traffic survey is summarized in the following table:

Survey	Objectives	Method	Coverage
Traffic Count Survey	To obtain traffic condition on major junction	Vehicular Traffic Count	9 locations (12 hr)

Source: JICA Study Team

(2) Schedule of Supplemental Traffic Survey

The schedule of the supplemental traffic survey is as follows:

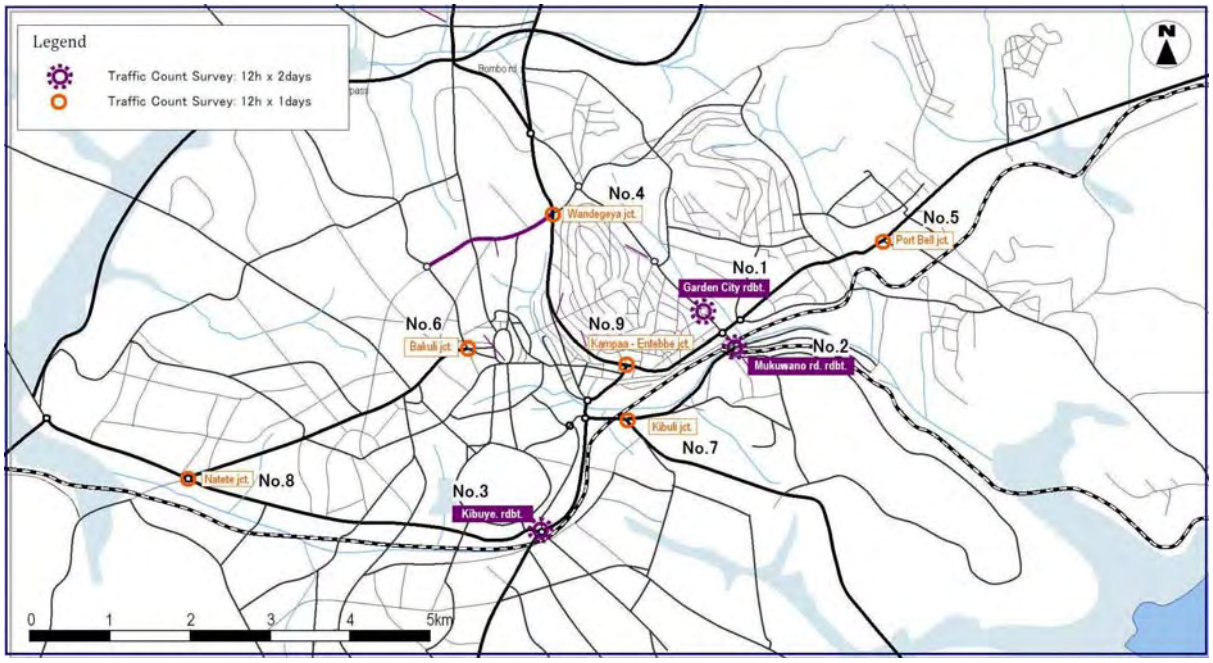
Activity	June, 2010
Preparation of Survey	
Training and Trial	
Traffic Count Survey (12 hr)	
Data Entry and Reporting	

Source: JICA Study Team

Figure 5.4.1 Schedule of Supplemental Traffic Survey

(3) Location of Supplemental Traffic Survey

The location of the supplemental traffic surveys is shown below:



Source: JICA Study Team

Figure 5.4.2 Location of Supplemental Traffic Survey

(4) Description of Supplemental Traffic Survey

This survey aims to count the number of vehicles to determine traffic volume at major junctions. The contents of the traffic count survey are as follows.

Table 5.4.1 Details of Supplemental Traffic Survey

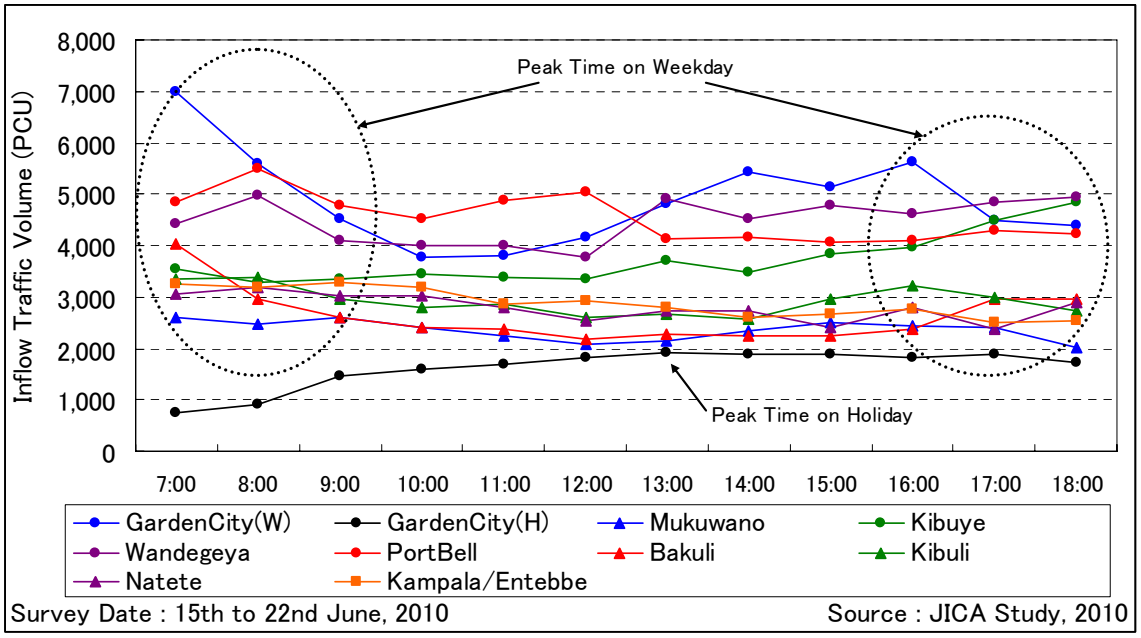
Survey Date	- No.1 Garden City Rbt : 15th and 20th June 2010 - No.2 Mukwano Rd Rbt : 15th and 16th June 2010 - No.3 Kibuye Rbt : 18th and 21st June 2010 - No.4 Wandegeya Junction & No.6 Bakuli Junction : 17th June 2010 - No.5 Port Bell Junction : 15th June 2010 - No.7 Kibuli Junction : 21st June 2010 - No.8 Natete Junction & No.9 Kampala Rd - Entebbe Rd Junction : 22nd June 2010
Survey Hour	- 12 hours from 7:00 a.m. to 7:00 p.m.
Vehicle Type	- Seven (7) categories as shown in Table 5.1.3.
Survey Method	- To count the number of vehicles by direction and by vehicle type continuously for 12 hrs. - To record the number of vehicles on the survey sheet every thirty (30) minutes.

Source: JICA Study Team

5.4.3 RESULT OF SUPPLEMENTAL TRAFFIC SURVEY

(1) Hourly Variation

Figure 5.4.3 shows the hourly profile of observed traffic volume at survey points where 12-hr counts were undertaken. From the results obtained at Garden City roundabout, pattern of the peak hour of weekday and holiday was completely different. The peak hour on holiday was 13:00 hrs while that on weekday was 7:00 to 9:00 hrs and 15:00 to 17:00 hrs.

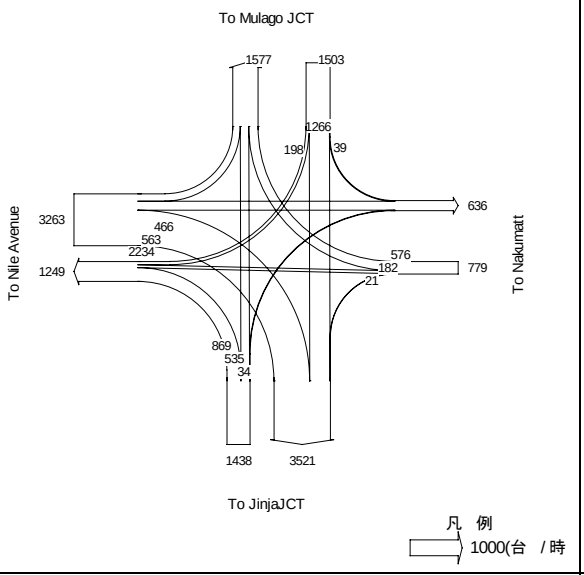


Source: JICA Study Team

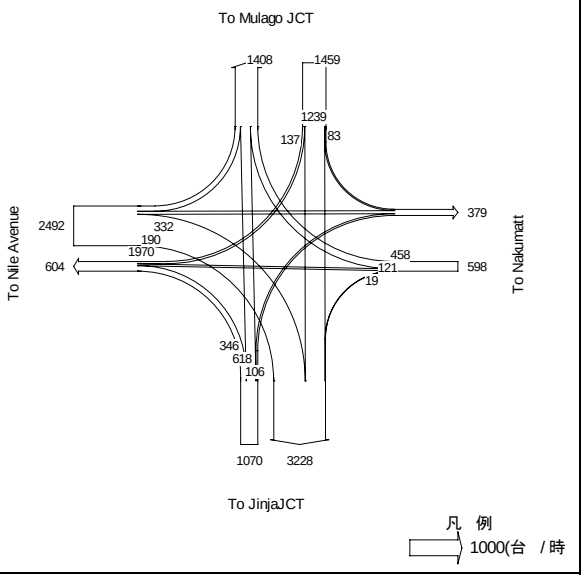
Figure 5.4.3 Hourly Traffic Variation at Major Nine Junctions

(2) Traffic Flows at Peak Time

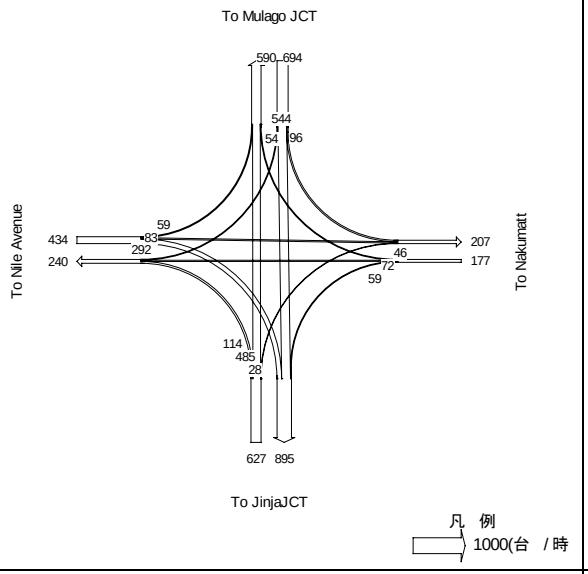
The traffic flows at each roundabout and junction at peak hours are shown below. The detailed survey data were compiled in Annex 2.



Weekday Morning Peak (7:00 – 8:00)



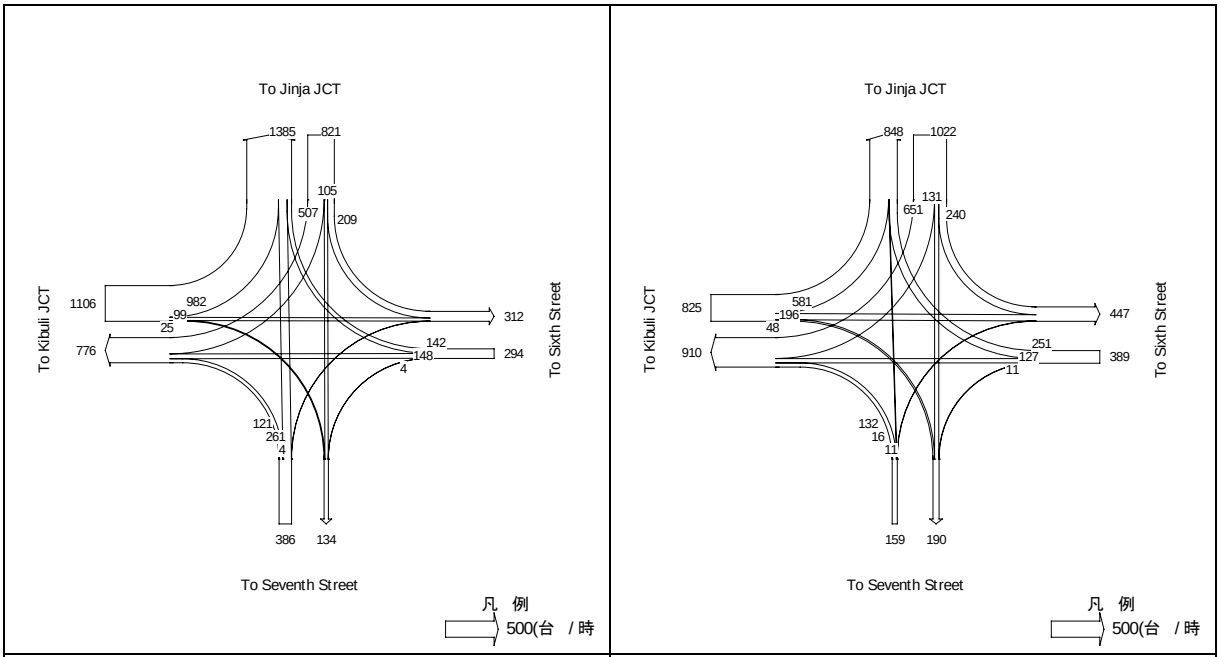
Weekday Evening Peak (16:00 – 17:00)



Holiday Peak (13:00 – 14:00)

Source: JICA Study Team

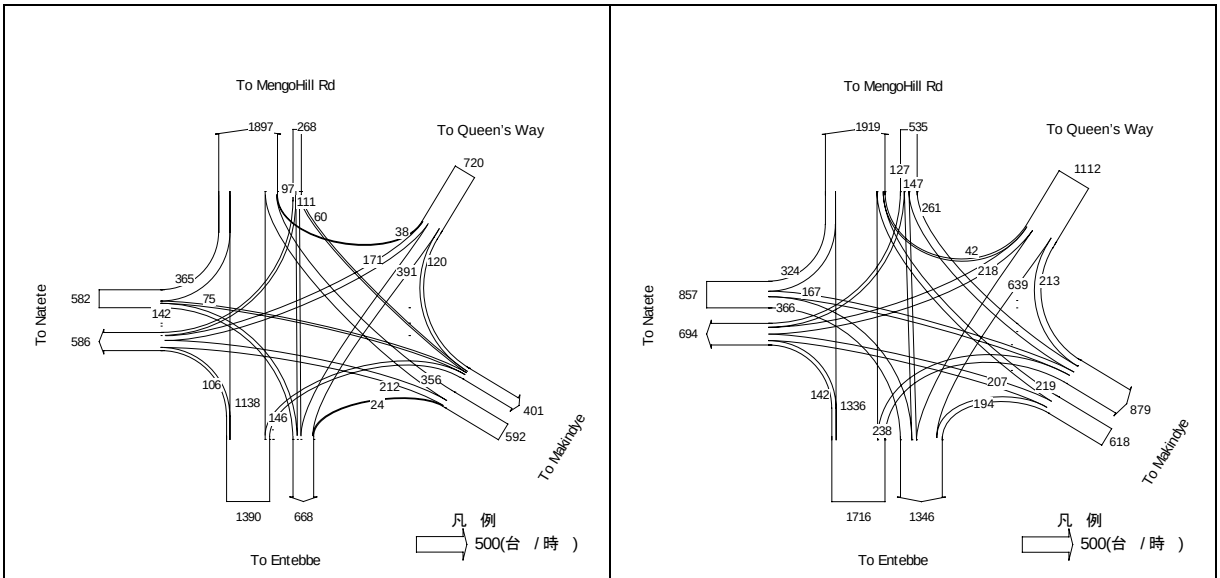
Figure 5.4.4(1) Traffic Flows at Peak Hour: Garden City Roundabout (No.1)



Weekday Morning Peak (7:00 – 8:00)	Weekday Evening Peak (15:00 – 16:00)

Source: JICA Study Team

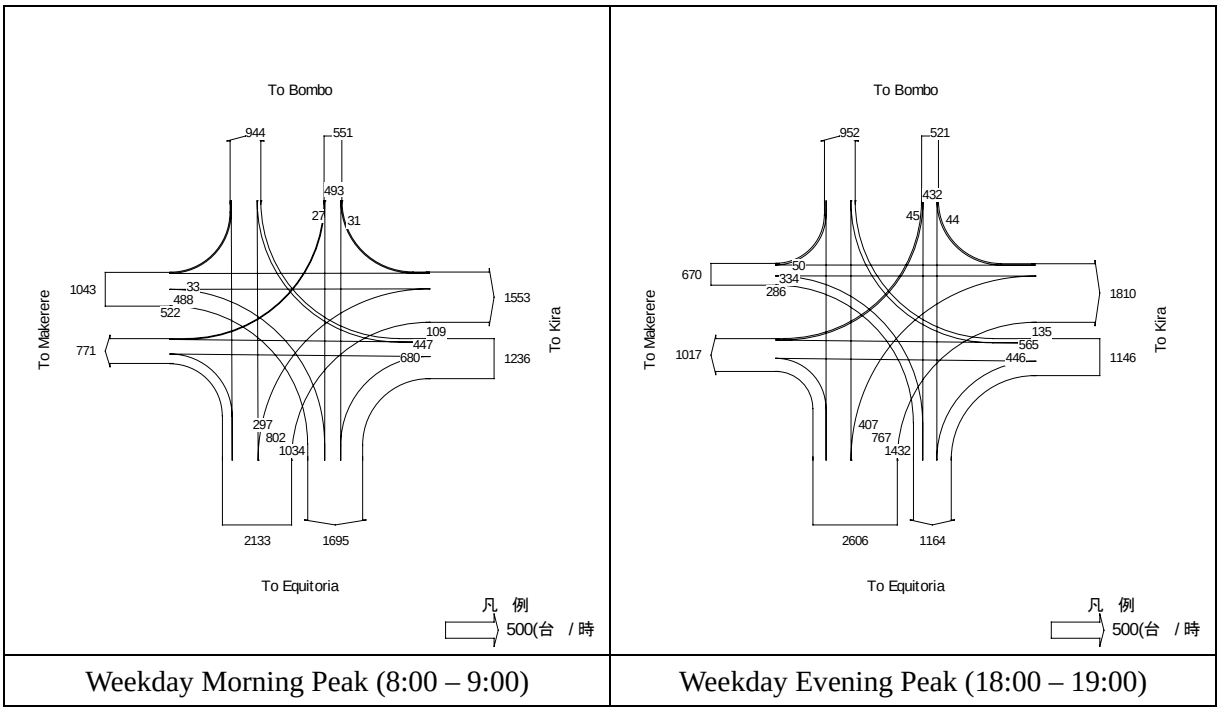
Figure 5.4.4(2) Traffic Flows at Peak Hour: Mukwano Roundabout (No.2)



Weekday Morning Peak (7:00 – 8:00)	Weekday Evening Peak (18:00 – 19:00)

Source: JICA Study Team

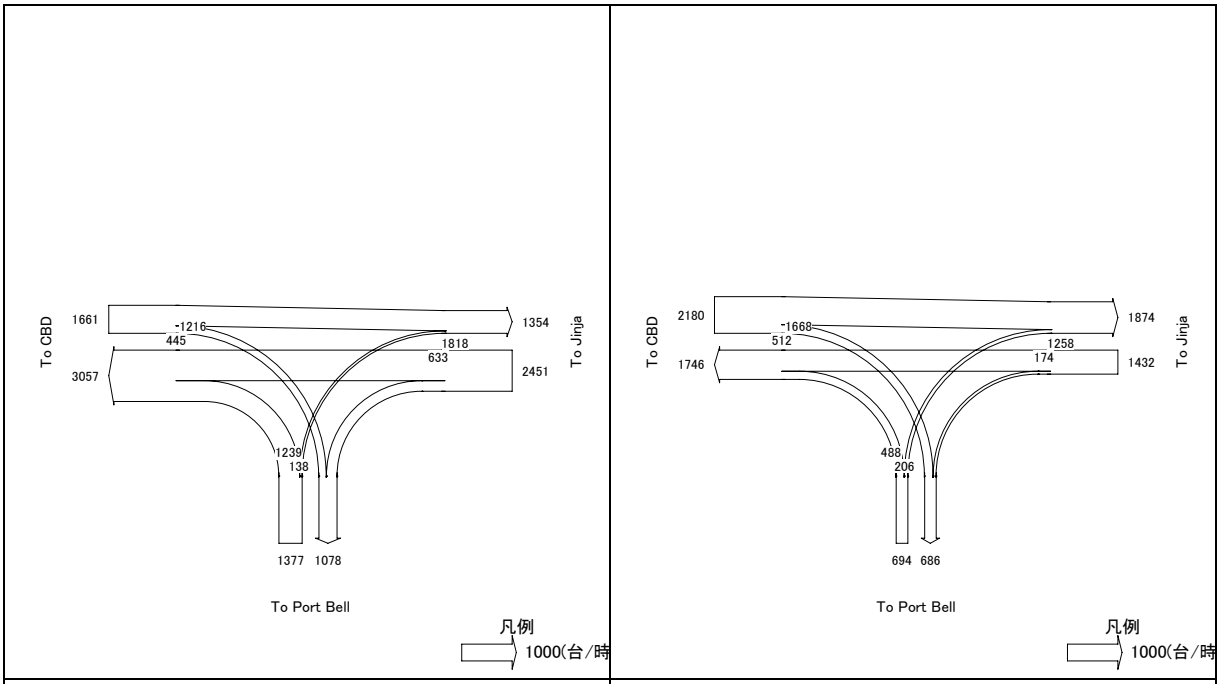
Figure 5.4.4(3) Traffic Flows at Peak Hour: Kibuye Roundabout (No.3)



Weekday Morning Peak (8:00 – 9:00)	Weekday Evening Peak (18:00 – 19:00)

Source: JICA Study Team

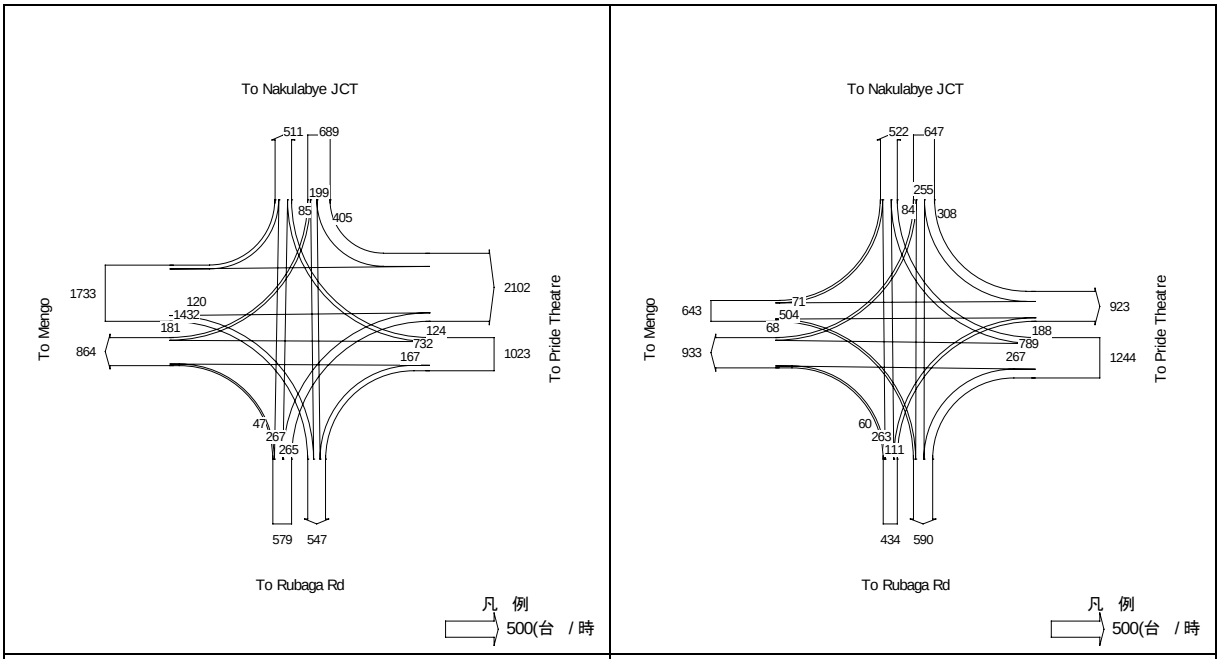
Figure 5.4.4(4) Traffic Flows at Peak Hour: Wandegeya Junction (No.4)



Weekday Morning Peak (8:00 – 9:00)	Weekday Evening Peak (18:00 – 19:00)

Source: JICA Study Team

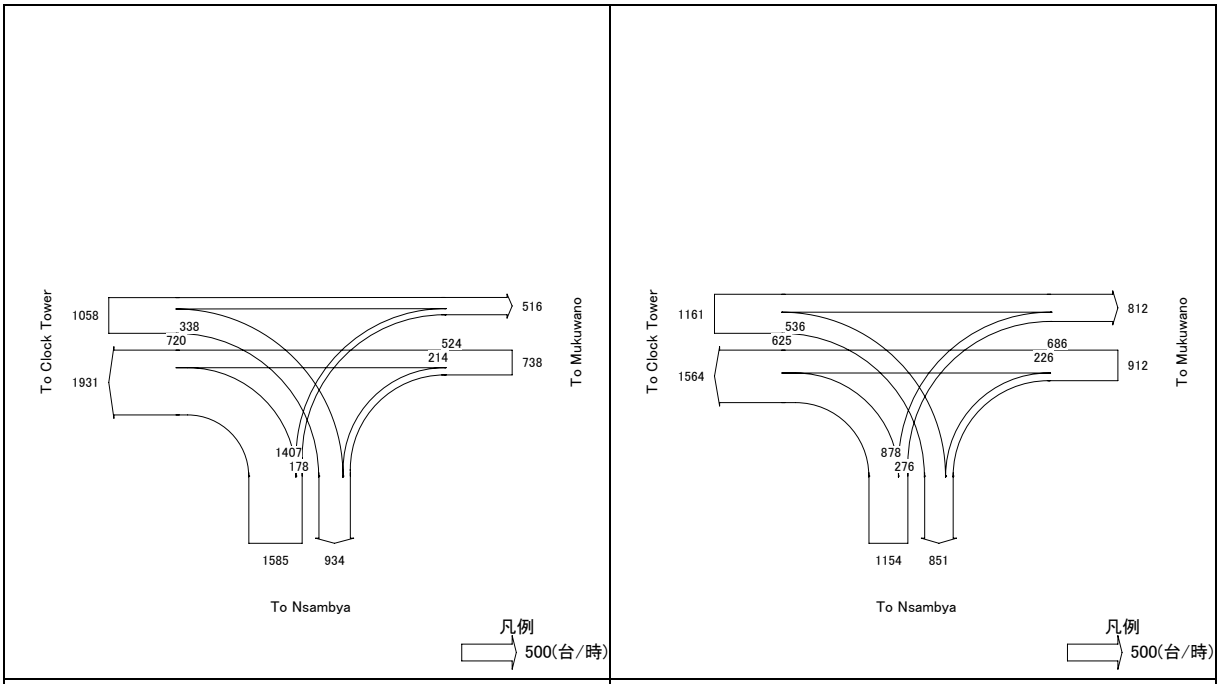
Figure 5.4.4(5) Traffic Flows at Peak Hour: Port Bell Junction (No.5)



Weekday Morning Peak (7:00 – 8:00)	Weekday Evening Peak (17:00 – 18:00)

Source: JICA Study Team

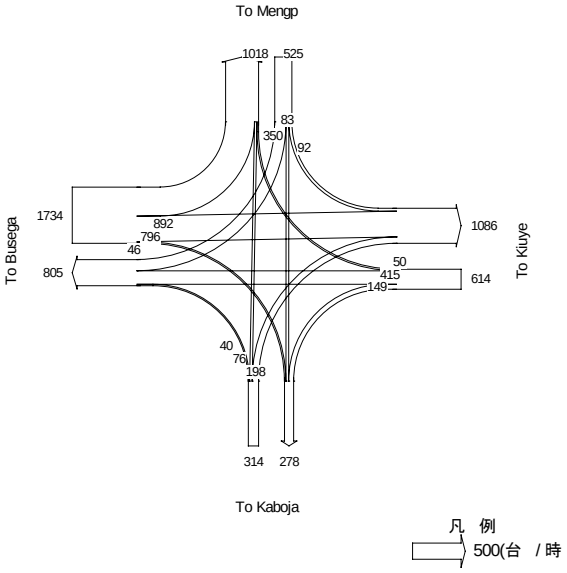
Figure 5.4.4(6) Traffic Flows at Peak Hour: Bakuli Junction (No.6)



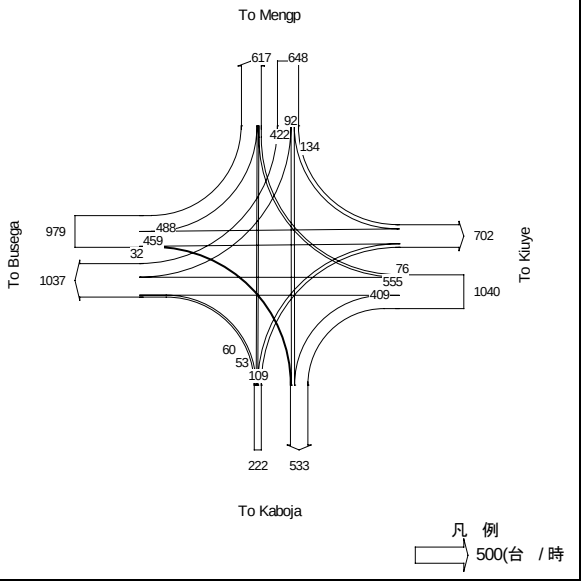
Weekday Morning Peak (8:00 – 9:00)	Weekday Evening Peak (16:00 – 17:00)

Source: JICA Study Team

Figure 5.4.4(7) Traffic Flows at Peak Hours: Kibuli Junction (No.7)



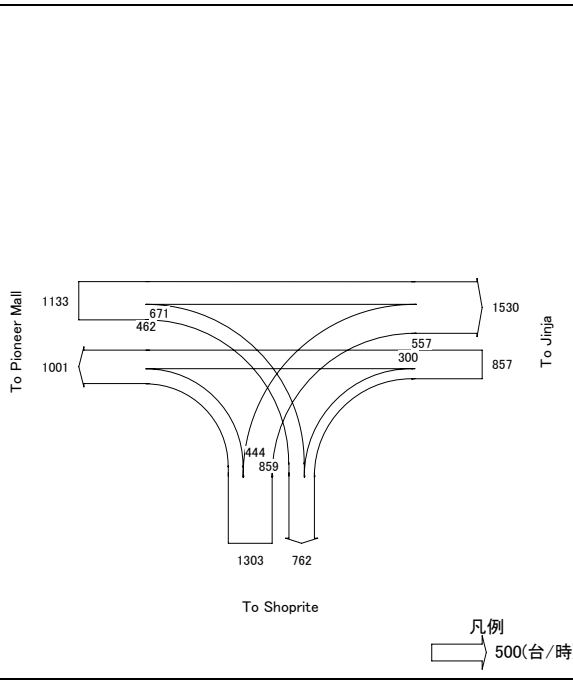
Weekday Morning Peak (8:00 – 9:00)



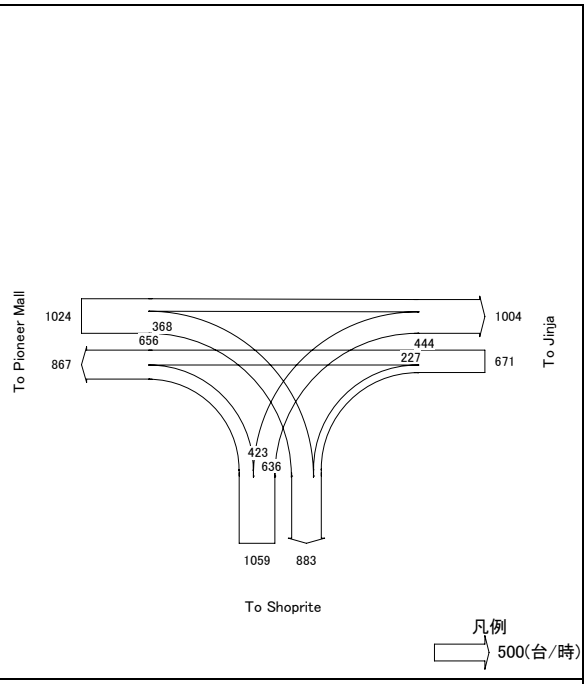
Weekday Evening Peak (18:00 – 19:00)

Source: JICA Study Team

Figure 5.4.4(8) Traffic Flows at Peak Time: Natete Junction (No.8)



Weekday Morning Peak (9:00 – 10:00)



Weekday Evening Peak (16:00 – 17:00)

Source: JICA Study Team

Figure 5.4.4(9) Traffic Flows at Peak Time: Kampala Rd / Entebbe Rd Junction (No.9)

5.5 PEDESTRIAN TRAFFIC SURVEY

5.5.1 SURVEY LOCATION AND METHODS

The Study Team conducted pedestrian and boda-boda traffic count survey between Shoprite and Clock Tower Junctions (on Entebbe Road) to identify the volume of the latest non-motorized

traffic (NMT) around these junctions. The survey was conducted on 4th August for each peak three hours in the morning and evening, i.e., 6.00 – 9.00 a.m. and 4.00 – 7.00 p.m.

The pedestrian count was conducted at Nakivubo Channel and approach road (Mengo Hill Road) of Clock Tower junction (Figure 5.5.1). Most of these pedestrians would be the users of the pedestrian bridges planned on Shoprite and Clock Tower junctions, which is intended to promote road safety by segregating the pedestrians and vehicles.

5.5.2 SURVEY RESULTS

The average morning peak hour pedestrian traffic passing along Nakivubo Channel is 2,180 persons/hr, from Clock Tower to Shoprite direction (inflow to the city center). The average evening peak hour pedestrian traffic is 2,600 persons/hr from Shoprite to Clock Tower direction (outflow from the city center).

The total three-hour pedestrian traffic is 9,670 persons in the morning and that for the evening three hours is 10,745 persons, passing on Entebbe Road on Nakivubo Channel. The pedestrian traffic has increased to 3.5 times as compared with the data from 2001 KUTIP survey (Table 5.5.1).

The Study Team has estimated that approximately 48,000 persons pass on this point daily and over 10 million pass per year. According to the observation, approximately 70% are from Katwe and Nsambya areas, where many poor people stay and travel to the city center to work in the morning, and then return to their homes in the evening.

Source: JICA Study Team

Figure 5.5.1 Survey Points of Pedestrians and Bicycle Taxi Traffic

Table 5.5.1 Pedestrian Traffic Count Survey Results on Entebbe Road

Date: **4th August 2010** **(Wednesday)**
Time: **6.00 - 9.00 am and 4.00 - 7.00 pm**

Direction	Station	Classification	Morning Peak Hours (6.00 - 9.00)							Evening Peak Hours (16.00-19.00)							Estimated for 24 Hrs
			6.00-6.30	6.30-7.00	7.00-7.30	7.30-8.00	8.00-8.30	8.30-9.00	Total	4.00-4.30	4.30-5.00	5.00-5.30	5.30-6.00	6.00-6.30	6.30-7.00	Total	
Clock T. to Shoprite (South to North)	P1 (West)	Man	153	326	390	289	497	366	2,021	133	105	140	111	245	141	875	
		Woman	50	137	228	279	175	126	995	61	70	87	89	64	77	448	
	P2 (East)	Man	289	418	335	297	330	342	2,011	198	238	158	235	145	160	1,134	
		Woman	208	259	197	411	240	201	1,516	56	58	72	93	108	101	488	
	Sub-Total		700	1,140	1,150	1,276	1,242	1,035	6,543	448	471	457	528	562	479	2,945	22,000
Shoprite to Clock T. (North to South)	P1 (West)	Man	81	130	212	116	326	267	1,132	248	386	346	302	464	710	2,456	
		Woman	16	40	37	50	59	58	260	83	135	117	151	160	263	909	
	P2 (East)	Man	153	253	266	43	329	293	1,337	271	395	541	655	725	715	3,302	
		Woman	38	67	36	80	94	80	395	85	187	160	285	200	216	1,133	
	Sub-Total		288	490	551	289	808	698	3,124	687	1,103	1,164	1,393	1,549	1,904	7,800	25,000
	Total		988	1,630	1,701	1,565	2,050	1,733	9,667	1,135	1,574	1,621	1,921	2,111	2,383	10,745	48,000

Note:
Comparison of Pedestrian Survey with KUTIP in 2001
Direction: From Shoprite to Clock Tower

Unit: No. of Pedestrian

Ave. Pedestrian Traffic	KUTIP (2001)	JICA (2010)	Increase
Morning Peak Hour	464	1,041	225%
Evening Peak Hour	597	2,600	436%
Total	1,060	3,641	344%

Source: JICA Survey on 4th August 2010

The Study Team observed that pedestrians are not given appropriate signal period to cross on these very busy junctions. The existing walkway widths are also not sufficient and are not well maintained.

The Study Team also identified that a large number of boda-bodas are passing on this point to transport passengers from the outside to the city center in the morning, and to the opposite direction in the evening. Since boda-bodas are weaving their way more frequently than cars and motor cycles, they are more subject to very high accident risks.

Overview of Entebbe Road on Nakivubo Channel

Mixed Traffic (Car, Boda Boda & Pedestrian) on Shoprite Jct

Overview of Queen's Way from Clock Tower

Commuters from Katwe and Nsambya Areas

Source: JICA Study Team

Figure 5.5.2 Photographs of Shoprite and Clock Tower Junctions

CHAPTER 6 LONG LIST AND SHORT LIST OF PROJECTS FOR PRE-FEASIBILITY STUDY

6.1 PREPARATION OF LONG LIST AND SHORT LIST OF PROJECTS FOR PRE-FEASIBILITY STUDY

6.1.1 OBJECTIVE AND FLOW OF LONG LIST AND SHORT LIST OF PROJECTS SELECTED FOR PRE-FEASIBILITY STUDY

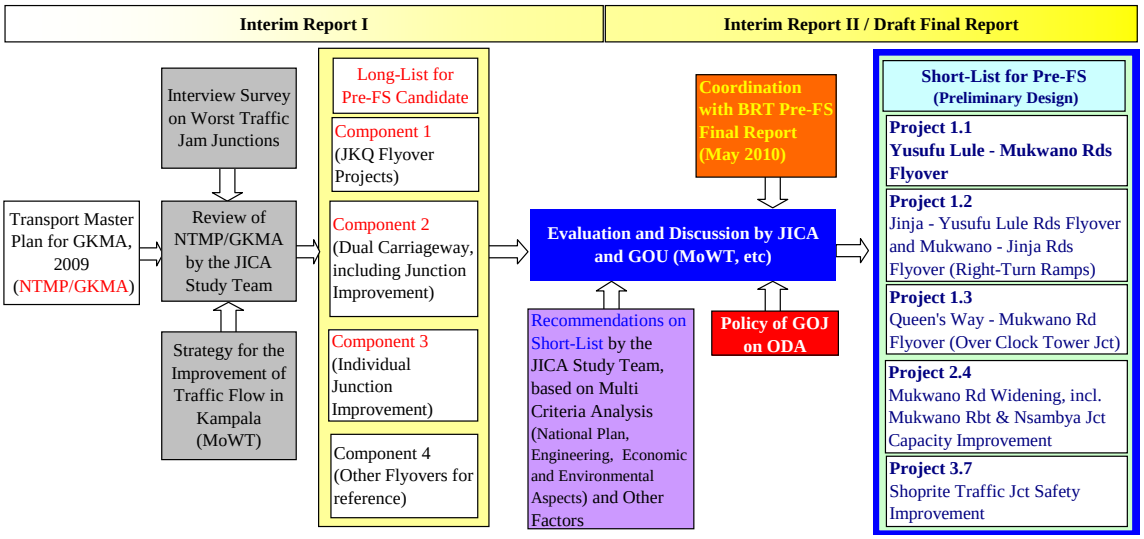
The objective of the long listing is to identify the candidate projects which might be subjected to official development assistance of the GOJ for the road network improvement. It is intended to address serious traffic congestion in GKMA to support the NTMP/GKMA as well as the NDP.

Meanwhile, the objective of the short listing is to select priority projects for Pre-FS and preliminary design, to evaluate them on technical, economical and other aspects.

The Study Team considered the transport master plans reviewed in Chapter 4, the traffic survey in Chapter 5 and the following, for the long listing of candidate projects:

- Interview results related to junctions with worst traffic jam
- Priority junction improvement list, dual carriageway programs and dual carriageway with railway viaduct in NTMP/GKMA
- KUTIP, KCC, June 2003 and Assistance of the World Bank for KIIDP
- Strategy for the Improvement of Traffic Flow in Kampala, MoWT, December 2009
- Other plans and studies

The following Figure 6.1.1 shows the flow of selection for long and short list of projects for the Pre-FS.



Source: JICA Study Team

Figure 6.1.1 Flow of Selection of Long and Short List Projects for Pre-FS

The Study Team conducted traffic survey, site surveys and a series of discussions with key

stakeholders (MoWT, UNRA and KCC) and JICA for the selection of long list of projects. The Study Team classified this long list by category (component) and implementation period for evaluation.

6.1.2 EVALUTION OF LONG-LIST PROJECTS AND SELECTION OF SHORT-LIST PROJECTS FOR PREFEASIBILITY STUDY

The Study Team recommended five short listed projects, flyovers for preliminary design and other four projects for the basic design level Pre-FS, based on multi criteria analysis and other considerations in March 2010.

Besides, a Pre-FS for BRT has been conducted in parallel with the JICA Study since November 2009, to address the serious traffic congestion in GKMA. The Draft Final Report[1] of BRT Pre-FS was submitted in April 2010 and accepted by MoWT accordingly. As the BRT project is one of the priority projects in NDP and NTMP/GKMA, an introduction of BRT is a given condition for JICA Pre-FS. It is required to plan the JICA Pre-FS projects well in coordination with the BRT plan.

However, it has become clear that the short-listed projects are either directly or indirectly affected by the BRT introduction since all five short-listed projects are located on the planned BRT routes, particularly the three projects on the BRT pilot project route. The Study Team conducted a traffic simulation of traffic flows in the CBD area and identified that the traffic main flow at Jinja Jct will change from Jinja Rd – Kampala Roads (east-west direction) to Yusufu Lule – Mukwano Rds (north – south direction), as Kampala / Entebbe Rds Jct is closed for the general traffic. The flyover requirement changed from the east-west direction to the north – south direction.

Besides, the BRT Pre-FS did not provide sufficient information required for the basic design of JICA Pre-FS projects for their coordination with the BRT plan. It was further noted that the basic concepts in the BRT Pre-FS may change during the BRT FS and detailed design stage, which will commence in the early 2011, as a result of the technical and financial reviews or through public consultations.

Thus, it is not appropriate to conduct the basic design level Pre-FS for the short-listed projects until a concrete plan of BRT is established in the FS and detailed design of BRT Pilot Project. It has been decided to conduct the Pre-FS with preliminary design for three final short-listed projects namely, Flyover Projects, Mukwano Road Widening and Shoprite / Clock Tower Traffic Safety Improvement. These would rather support introduction of BRT by addressing the new traffic flow bottlenecks caused by the implementation of BRT, in accordance with the original scope of work signed by both governments on 1st March 2007. Jinja Road Widening and Lugogo Bypass Junction Improvement recommended were omitted since these were already considered in the FS and detailed design of BRT Pilot Project.

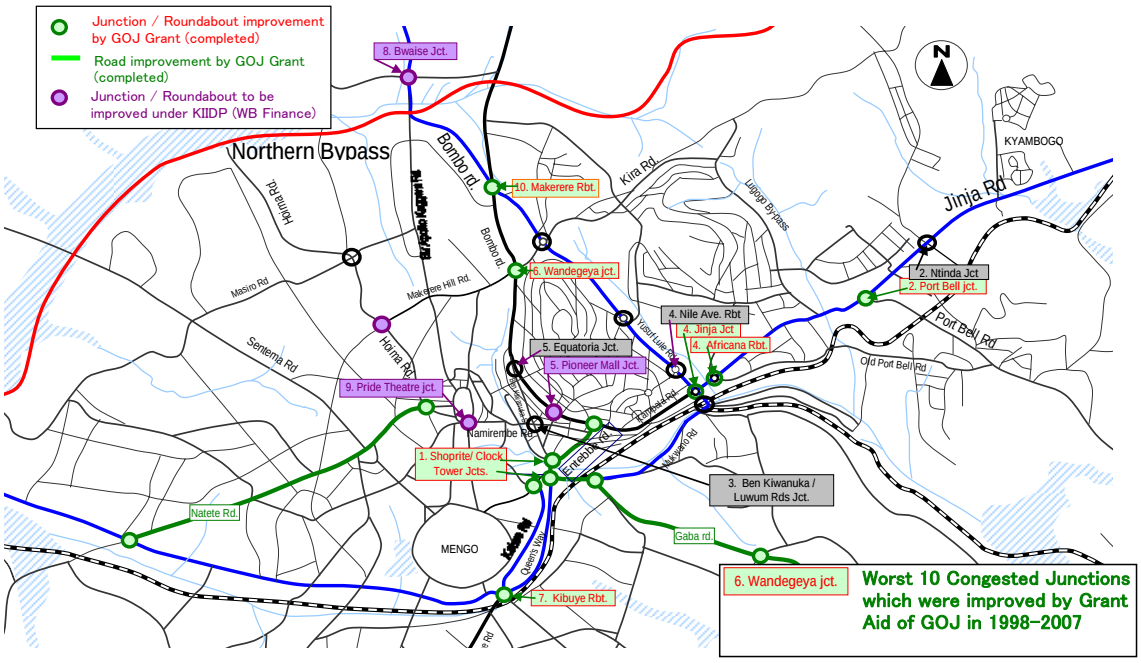
6.2 LONG LISTING OF CANDIDATE PROJECTS

6.2.1 INTERVIEW RESULTS ON WORST TRAFFIC JAM JUNCTIONS

The Study Team conducted interviews on the worst traffic jam junctions at the Steering Committee meeting on November 20, 2009 and Stakeholder meetings on December 8, 2009, with 57 replies collected. Over 90% replied that the traffic jam at Shoprite / Clock Tower / Entebbe Jcts is the most serious (Section 3.2.2(2) as to details). About 50% replied that the traffic jams at Ntinda Jct, Jinja Jct and Africana Rbt, Equatoria Jct and Ben Kiwanuka Jct are very serious. The Study Team and MoWT considered these opinions and were then reflected to the long and short listing of pre-FS projects.

[1] Final Report of BRT Pre-Feasibility Study was submitted to MoWT in May 2010.

Of the worst ten junctions, six were improved through the grant aid of GOJ in 1998-2007 as shown in Figure 6.2.1. This means that conventional method of standalone junction improvement, either by signalization or roundabout, could not cope with the recent rapid traffic growth for the major junctions near/around the city center without substantial capacity increase or an introduction of area-controlled signalization system. **As the traffic at all these junctions has far exceeded the traffic capacity, flyover construction and/or road and junction widening are required to improve the current severe traffic congestion.**



Source: JICA Study Team

Figure 6.2.1 Worst Ten (10) Congested Junctions and GOJ Grant Aid Assistance

The WB has financed the improvement of four junctions, of which three are among the list of worst ten junctions, under KIIDP as shown in Figure 6.2.1. However, as the improvement mostly involves signalization, its effectiveness would be limited to the short-term.

6.2.2 PRIORITY JUNCTIONS IN NTMP/GKMA

The Study Team reviewed the priority junctions (classified as high priority, medium priority and special flyover projects) in NTMP/GKMA, and selected those that could be considered in the Pre-FS long list as shown in Table 6.2.1.

The junctions located in the suburbs of Kampala City were not selected as their traffic congestion is less serious compared with those located in or near the city center.

Table 6.2.1 Planned Junction Improvement in NTMP/GKMA and Recommendation of the Study Team for Pre-FS Long List

List of Junction Improvement (Signalization or Roundabout Improvement)

Jct No	Road Name	Limits	Priority in MP	Administrative Status	Selection for Long List of the Study / Remarks
1	Entebbe Road	Wamala - Kiulwe Point - Bweya Rd	Medium	N	No
2	Entebbe Road	Kajansi-Kawotto-Bweya Rd	Medium	N	No
3	Entebbe Road	Wankulukuku Rd	Medium	N	No
4	Entebbe Road	Mutungo-kigo Rd	Medium	N	No
5	Entebbe Road	Nakirima Rd	Medium	N	No
6	Entebbe Road	Zana Rbt	Medium	N	No
7	Entebbe Road	Nankinga- Kikajjo Rd	High	N	No
8	Wankulukuku Rd	Murundwe-Muzito Rd	Medium	N	No
9	Masaka Rd	Kyengera – Natete Rd	Medium	N	JICA-2002*
10	Masaka Rd	Mugema Rd	Medium	N	No
11	Masaka Rd	Nalukolongo Rd	Medium	N	No
12	Masaka Rd	Weraga - KalindaRd	Medium	N	No
13	Hoima Rd	Wakiso Town	High	N	No
14	Hoima Rd	Kimera-Masiro-Kawala Rd	Medium	N	Yes (3.1 Kasubi Jct)
15	Hoima Rd	Makerere Hill-Balintuma-Mutesa Rds	High	N	KIIDP (Nakulabye Jct)
16	Bombo Rd	Kawmpe –Tula-Lugoba Rds	Medium	N	No
17	Bombo Rd	Bwaise Nabweru Rd	Medium	N	KIIDP (Bwaise Jct)
18	Kira Rd	Acacia/Babiha Av-Kayunga Rd	High	KCC	Yes (3.2)
19	Kira Rd	Lugogo Bypass	Medium	KCC	No
20	Kira Rd	Ntinda Rd	Medium	KCC	Yes (3.3)
21	Gaba Rd	Nsambya Rd	Medium	N	No
22	Gaba Rd	Tank Hill Rd	Medium	N	JICA-2002
23	Port Bell Rd	Old Port Bell Rd	Medium	N	Yes (3.4)
24	Jinja Rd	Yusufu Lule Road	Medium	KCC	Yes (1.1&1.2), (JICA-2005)
25	Jinja Rd	Lugogo Bypass	Medium	KCC	Yes (3.5)
26	Jinja Rd	Ntinda Rd	Medium	N	Yes (2.1)
27	Jinja Rd	Kireka Jct	Medium	N	Yes (2.1a)
28	Jinja Rd	Seeta Goma-Namilyango	Medium	N	No
29	Jinja Rd	Mukono- Kayunga Hwy	Medium	N	No
30	Jinja Rd	Mukono Bukasa- Kisoga Rd	High	N	No

Flyovers, Viaduct and Pedestrian Underpass

F1	Queen's way	Kevina-Mutebi	Special	KCC	Yes (4.1)
F2	Masaka Rd	Kabusu-Wankulukuku Rds	Special	N	No
F3	Natete Rd	Sentema –Balintuma –Canon –Apollo K	Special	KCC	No
F4	Gayaza Rd	KalarweRbt. Bombo-Yusufu Lule Rds	Special	N	Yes (2.2), JICA-1998 (Makerere Rbt)
F5	Yusufu Lule Rd	Mulago Rbts Kira-Haji Kasule Rds	Special	KCC	Yes (4.2)
F6	Yusufu Lule Rd	Fairway Rbt.Ssezibwa-Kafu Babiha	Special	KCC	Yes (4.3)
F7	Yusufu Lule Rd	Nile Ave	Special	KCC	Yes (1.2)
PD-1	Queen's Way	Kayemba Road Pedestrian Underpass	Medium	KCC	No
V-1	Queen's Way	(Viaduct from Jinja Rd to Kibuye Rbt)	-	KCC	**Special consideration (refer to Annex 8)**

Notes: The projects recommended for the long list
The projects to be implemented under KIIDP (World Bank Finance)
JICA-1998, 2002, 2005: Junction improved under Grant Aid of GOJ

Source: The Study Team based on NTMP/GKMA

6.2.3 STRATEGY FOR THE IMPROVEMENT OF TRAFFIC FLOW IN KAMPALA

The Study Team reviewed and considered "Strategy for the Improvement of Traffic Flow in Kampala, MoWT, December 2009" for the selection of long list of projects as in Table 6.2.2. Of the long-listed 21 projects by the Study Team, 14 comply with the strategic junctions of MoWT.

Table 6.2.2 Urgent Programs/Projects in MoWT Traffic Flow Strategy

MoWT No	Location	JICA Long List No & Remarks
1.	Mukwano Roundabout	2.4
2.	Entebbe Road Corridor/ Shoprite Ben Kiwanuka Junction	3.7
3.	Nakumatt Roundabout	1.2
4.	Kibuye Roundabout	4.4
5.	Nsambya Rd–Gaba Rd Jct	2.4
6.	Fairway Hotel Roundabout	4.3 & 4.7
7.	Makerere University Main Entrance	2.3
8.*	Bwaise – Kawempe Road	KIIDP
9.*	Kalerwe Area	
10.	Nakulabye Roundabout	KIIDP
11.*	Bugolobi Middle East	
12.*	Kireka Trading Center	2.1.a
13.	Ntinda Trading Center	3.3
14.	Bukoto near Kabira Club	
15.	Natete Junction	JICA 2002
16.	Kabuusu/ Sembule Junction	2.5
17.*	Namirembe Road- Corridor	
18.	Equatoria Hotel Junction	4.6
19.	Kabakanjagala- Lubaga Rd Roundabout	
20.*	Kasubi Junction	3.1
21.	Spear Motors- Ntinda Road	2.1
22.	Old Port Bell Road- 5th Street Junction	
23.	Namuwongo Rd- Industrial Area Link Junction	
24.*	Mini Price Junction	3.6
25.*	Ben Kiwanuka- William Street	
26.	By Pass Roads	

Notes: 1.4 Included in the Pre-FS Long List

KIIDP: To be implemented under KIIDP (World Bank Finance)

* Junctions at which traffic congestion is deeply related with market activities.

Source: The Study Team based on Strategy of the Improvement of Traffic Flow in Kampala, MoWT, Dec.2009 (Page 13-19)

6.2.4 OTHER PLANS AND STUDIES CONSIDERED FOR LONG LIST

The Study Team selected "Mukwano Road Widening Project including Mukwano Roundabout improvement" and "Makerere Hill Road Widening Project" from the priority projects of KUTIP for the long list.

Meanwhile, the improvement of the following junctions already committed by the WB for finance under KIIDP, were omitted from the long list.

List of KIIDP Junction Improvement (signalization)

- Pioneer Mall Junction on Kampala Road
- Pride Theater Junction on Namirembe Road
- Nakulabye Roundabout on Hoima Road / Makerere Hill Road
- Bwaise Junction on Bombo Road

6.3 LONG LIST OF PROJECTS FOR PRE-FEASIBILITY STUDY CANDIDATE

6.3.1 LONG LIST OF PROJECTS

Considering the above objectives, existing plans, interview results and site conditions, the Study Team selected the long list of projects from which the Pre-FS short-listed projects would be recommended. The long list comprised of the following four components and projects as shown in Table 6.3.1 and Figure 6.3.1. Refer to "Annex 3 Outline of Long / Short List Projects" as to details.

Component 1: Jinja - Kampala Roads Flyover: 3 projects (Phases 1, 2 and 3)

Component 2: Combination of Dual Carriageway, Flyover and Junction Improvement: 5 projects

Component 3: Individual (standalone) Junction Improvement: 7 projects

Component 4: Other Flyovers (For Long List Reference): 7 projects

Table 6.3.1 Long List of Projects for Pre-FS Candidate

Project Component	Project No.	Project Name	Origination of Project				Special Consideration by Study Team
			NTMP/ GKMA	KUTIP	MoWT Strategy	SC & Stakeholder Interview*	
1. Jinja - Kampala Rds - Queen's Way Flyover (JKQ)#	1.1 Phase 1	Jinja - Kampala Rds Flyover	Part			Yes (No.4)	Yes (Flyover)
	1.2 Phase 2	Jinja - Yusufu Lule Rds Flyover (Right-turn Ramp Flyover)	Part			Yes (No.4)	Yes (Flyover)
	1.3 Phase 3	Kampala Rd - Queen's Way Flyover				Yes (No.1&4)	Yes (Flyover)
2. Combination of Dual Carriageway, Flyover and Junction Improvement	2.1 (Phase 1)	Jinja Road (Port Bell Jct - Banda/Northern Bypass Section), including Ntinda/Spear Motor	Yes		Yes	Yes (No.2)	
	2.1a (Phase 2)	Jinja Road (Banda - Northern Bypass Section), including Kireka Jct	Yes		Yes		
	2.2	Bombo Road (Makerere Rbt - Northern Bypass Section), including Makerere Rbt Flyover	Yes			Yes (No.10)	Yes (Flyover)
	2.3	Makerere Hill Road, including Sir Apollo Kaggwa Rd Jct	Yes	Yes	Yes		
	2.4	Mukwano Rd, including Mukwano Rbt and Nsambya Jct Capacity Improvement		Yes	Yes		
	2.5	Mutesa Rd - Kaweesa Rd - Kabasu Rd (South Inner Ring Road) - Single Carriageway Paving	Part		Yes (Part)		Yes (South Inner Ring Road)
3. Individual Junction Improvement	3.1	Hoima Rd - Kimera/ Masiro/ Kawala Rd Jct (Kasubi Jct)	Yes		Yes		
	3.2	Kira Road - Acacia/ Babiha Av/ Kayunga Rd	Yes				
	3.3	Kira Rd - Ntinda Rd	Yes		Yes		
	3.4	Port Bell (Nakawa) - Old Port Bell Rd	Yes				
	3.5	Jinja Rd - Lugogo Bypass	Yes				Yes (Safety)
	3.6	Ben Kiwanuka Rd - Luwum St			Yes	Yes (No.3)	
	3.7	Shoprite & Clock Tower Traffic Safety		Yes	Yes	Yes (No.1)	Yes (Safety)
4. Other Flyovers (For Reference)	4.1	Queen's Way - Kevina/Mutebi Rd	Yes				
	4.2	Yusufu Lule - Mulago Rbts Kira/Haji Kasule	Yes				
	4.3	Yusufu Lule - Fairway Rbt.Sezibwa/Kafu Babiha	Yes				
	4.4	Kibuye Rbt - Masaka Rd Flyover				Yes (No.7)	Yes (Flyover)
	4.5	Wandegeya Jct Flyover				Yes (No.6)	Yes (Flyover)
	4.6	Equatoria & Pioneer Mall Jcts Flyover (Kampala Rd - Ben Kiwanuka St / Kampala Rd - Burton		KIIDP (Signalization)	Yes	Yes (No.5)	Yes (Flyover)
	4.7	GKMA Inner Ring Viaduct (Motorway)					Yes (Long-long Term Plan)

Notes: 1. # Kampala Rd - Queen's Way Flyover crossing over the railway station was planned to divert part of the traffic on Entebbe Rd and Shoprite Jct.
2. * The worst ten (10) traffic jam junctions. Rank No.8 (Bwaise Jct) and No.10 (Pride Theater Jct) are not in this list as these are improved by KIIDP.

Source: JICA Study Team

Project No.1.3, Kampala Road – Queen's Way Flyover, was dropped from the shortlist at the key stakeholder meeting on February 3, 2010. However, on March 4, 2010, the Steering Committee decided to include it in the Pre-FS shortlist with preliminary design since this could be a permanent measure to solve the traffic congestion at Shoprite and Clock tower junctions.

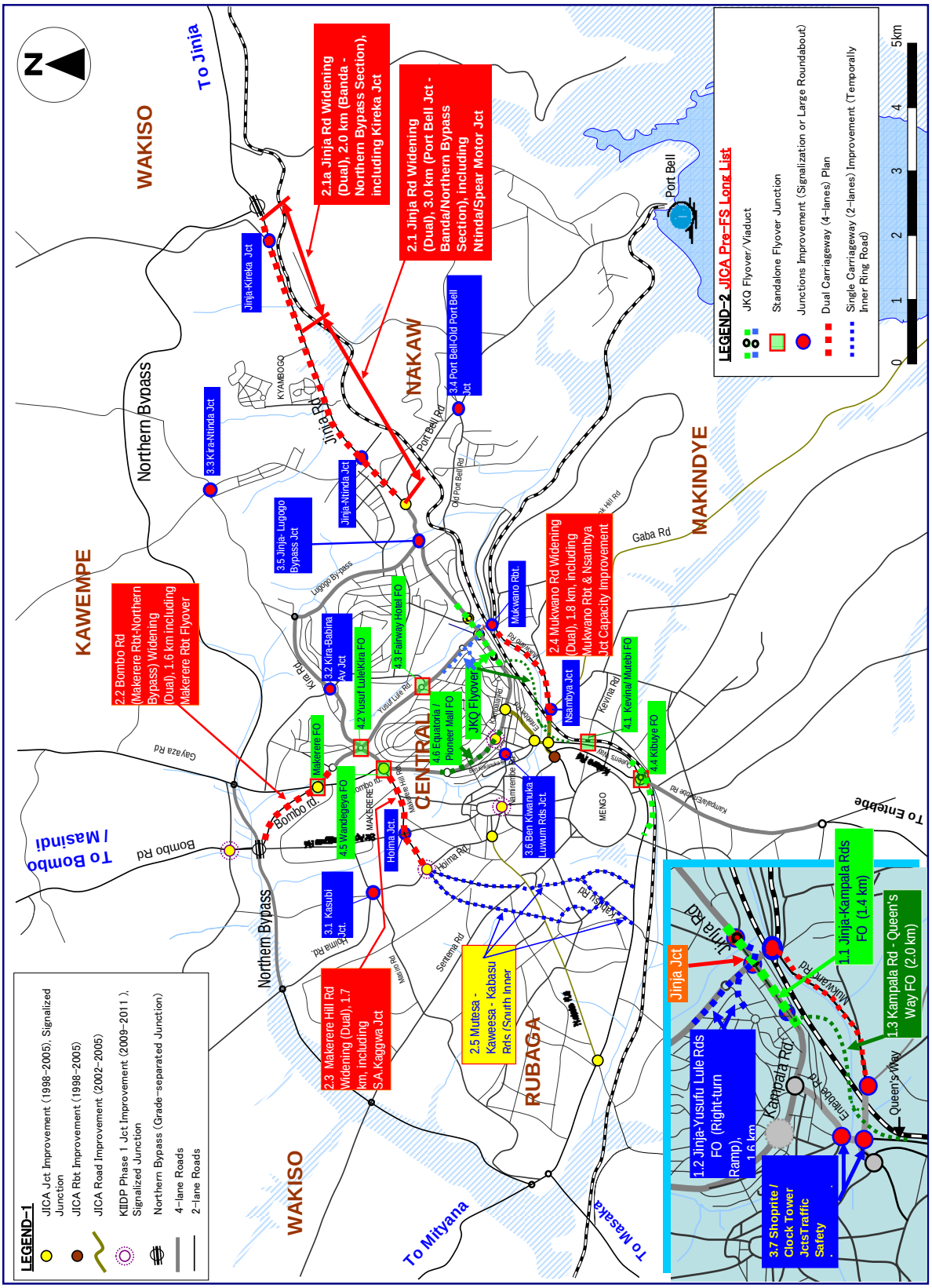


Figure 6.3.1 Location Map of Long List Projects

Source: JICA Study Team

6.3.2 OUTLINE OF LONGLIST PROJECTS BY COMPONENT

(1) Component 1: Jinja Rd – Kampala Rd – Queen's Way Flyovers

A substantial traffic capacity increase is required for the improvement of traffic congestion in the CBD/commercial area and their access bottlenecks at the east gate (Africana, Jinja and Siad Barre Avenue Junctions). Improvements of Jinja and Africana Junctions were planned in KUTIP in 2003 and implemented through a grant aid of the GOJ in 2005-2007. However, as it has not been able to cope with recent high traffic increase, the current traffic congestion on these junctions is very severe. Traffic capacity increase by constructing a flyover would be one of the best solutions for Africana, Jinja and Siad Barre Avenue Junctions as widening of the existing Jinja and Kampala roads are impossible without demolition of many buildings along the road between Jinja Jct and Siad Barre Avenue Jct.

Shoprite/Clock Tower Junctions are the southern gate access to the CBD/commercial center. These junctions have become a bottle neck together with Kampala Road/Entebbe Road Junction since the traffic volumes have far exceeded the capacity at these junctions. Poor traffic management has aggravated the congestion and traffic accidents, especially the conflict between motorized and non-motorized traffic (pedestrians and bicycle taxies).

The Study Team has planned the following flyovers for the traffic congestion solution for both the east and south gates (Table 6.3.2 and Figure 6.3.2)

Table 6.3.2 Component 1 Jinja Rd – Kampala Rd – Queen's Way Flyovers

Project No	Project Name	Administrative Status (of Road)	Project Concept			ADT / Current Condition of Traffic Congestion
			Project Length (km)	Viaduct/ Flyover Length (km)	Carriageway & Number of Lanes	
1.1 (Phase 1)	Jinja - Kampala Rds Flyover	KCC	1.4	1.1	Dual Carriageway (two-ways 2 lanes), crossing over Africana, Jinja & Siad Barre Ave Jcts	Jinja Rd ADT: 53,000 - 71,000 Very Severe (Jinja, Africana & Siad Barre Ave Jcts)
1.2 (Phase 2)	Jinja - Yusufu Lule Rds Flyover (Right-turn Ramp)	KCC	1.6	1.3	Single Carriageway (one-way 1 lane), crossing over Jinja and Nine Ave Jcts.	Yusufu Lule Rd ADT: 41,000 Very Severe (Jinja Jct & Nile Ave Rbt)
1.3 (Phase 3)	Kampala Rd - Queen's Way Flyover	KCC	2.0	1.9	Single Carriageway (one-way 2 lanes)	Kampala Rd ADT: 52,000, Shoprite Jct ADT: 99,000 Very-very Severe

Source: JICA Study Team

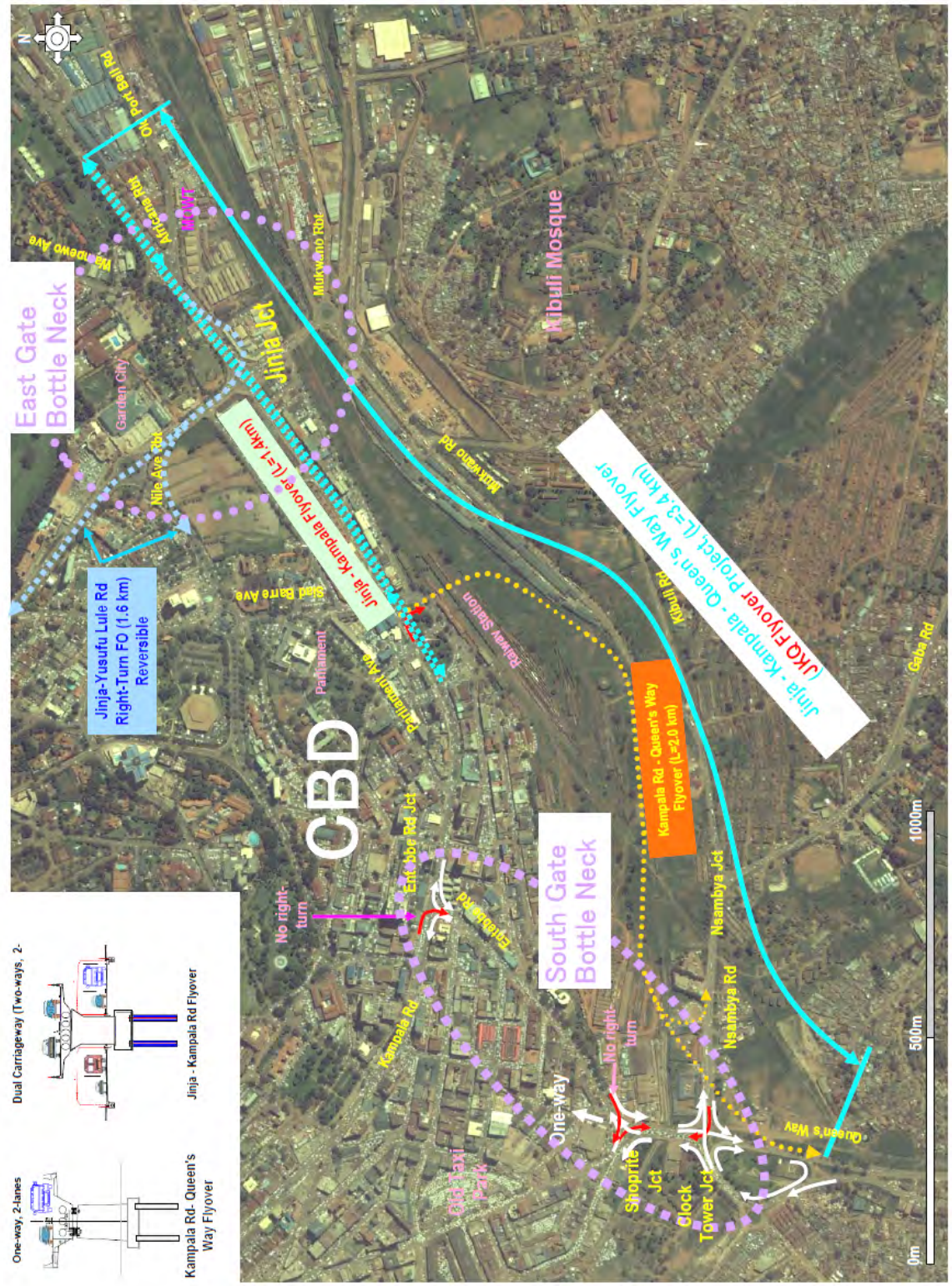


Figure 6.3.2 Plan of Jinja – Kampala – Queen's Way Flyover Plan

Source: JICA Study Team

(2) Component 2: Combination of Dual Carriageway, Flyover and Junction Improvement

Component 2 involves a group of capacity improvement by dual carriageway construction, except for Bombo Road, which could be planned with a flyover connecting Yusufu Lule North Rd and Bombo Rd, above Makerere Rbt. Four road links were selected as the priority road segments for widening of the existing two-lane road to four-lane road with median and mounted sidewalks. As the traffic capacity of the main road will increase by almost thrice with the construction of dual carriageway, it is expected that traffic congestion will be alleviated significantly. The junctions along these dual carriageway roads will also be improved giving sufficient capacity for future traffic.

The Component 2 projects are summarized in Table 6.3.3.

Table 6.3.3 Component 2: Combination of Dual Carriageway, Flyover and Junction Improvement

Project No	Project Name	Administrative Status (of Road)	Project Concept			ADT / Current Condition of Traffic Jam
			Project Length (km)	Flyover Length (km)	Carriageway & Number of Lanes	
2.1 (Phase 1, 3.0 km)	Jinja Road (Port Bell Jct - Banda/Northern Bypass Section), including Ntinda/Spear Motors Jct	N	3.0	-	Dual Carriageway (Add. 2 lanes) & Junction improvement at Ntinda Jct	ADT: 49,000 Very Severe (Port Bell & Ntinda Jcts)
2.1a (Phase 2, 2.0 km)	Jinja Road (Banda - Northern Bypass Section), including Kireka Jct	N	2.0	-	Dual Carriageway (Add. 2 lanes) & Junction improvement at Kireka Jct	ADT: 39,000 Very Severe (Kireka Jct)
2.2	Bombo Road (Makerere Rbt - Northern Bypass Section), including Makerere Rbt Flyover	N	1.6	0.5	Dual Carriageway (Add. 2 lanes) & Flyover (two-ways 2 lanes)	ADT 36,000 Very Severe (Makerere Jct)
2.3	Makerere Hill Road, including Sir Apollo Kaggwa Rd Jct	KCC	1.7	-	Dual Carriageway (Add. 2 lanes) & Junction improvement at Sir Apollo Kaggwa Rd Jct	ADT: 49,000 Severe
2.4	Mukwano Rd, including Mukwano Rbt and Nsambya Jct Capacity Improvement	KCC	1.8	-	Dual Carriageway (Add. 2 lanes) & Junction improvement at Mukwano Rbt and Nsambya Jct	ADT: 20,000 - 40,000 Severe, Very Severe at Mukwano Rbt & Nsambya Rbt
2.5	Mutesa Rd - Kaweesa Rd - Kabasu Rd (South Inner Ring Road)	KCC	3.2	-	Single Carriageway improvement (from Gravel to Paved Road)	ADT: 5,000 Low

Source: JICA Study Team

Project No. 2.1 is a dual carriageway construction of Jinja Road from Port Bell Junction to Northern Bypass. It was divided into No. 2.1 (Phase 1), Port Bell Jct - Banda/Northern Bypass Section (length 3.0 km) including Ntinda/Spear Motors Junction and No.2.1a (Phase 2), Banda - Northern Bypass Section (length 2.0 km) including Kireka Junction. A few existing buildings are subject to resettlement, which are located within 3 km from Port Bell Junction and improvement of the existing Ntinda Junction is urgently required. Thus, the Study Team recommended implementing Phase 1 section in the short term (by 2013). Meanwhile, as there are considerable number of houses and buildings, subject to resettlement, between Banda and the Northern Bypass, this section (Phase 2) should be implemented as soon as after completion of the land acquisition and compensation for resettlement.

Project No.2.2 involves a dual carriageway construction of Bombo Road from Makerere Roundabout to Northern Bypass (Grade-separated Junction). The current ADT is 36,000 vehicles and it has far exceeded the traffic capacity for a two-lane road. Makerere Roundabout is located

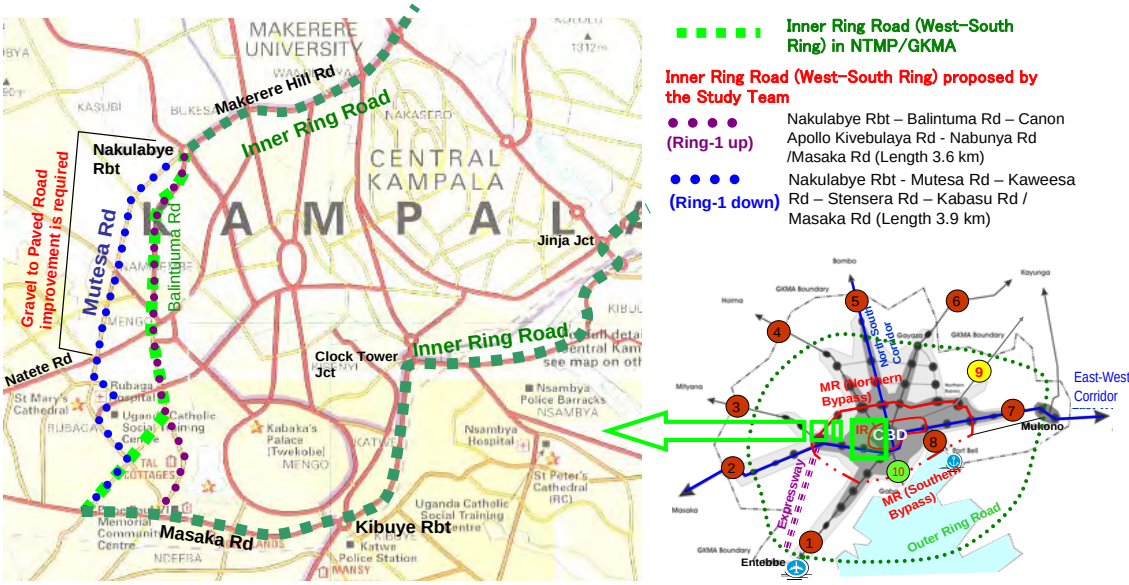
at the cross point of these two busy roads. As the current traffic on Bombo Road and Gayaza Road (ADT 26,000) has far exceeded their capacity, a flyover construction would be one of the best methods to alleviate traffic congestion.

Project No.2.4 is intended for the dual carriageway construction of Mukwano and Kibuli Roads from Nsambya Junction to Mukwano Roundabout. This road has a bypass function for CBD for the traffic from the east to the west/south. ADT is approximately 20,000 for Mukwano/Kibuli Roads and 38,000 for the access road. As it crosses Nsambya/Gaba Road (ADT 41,000), the current junction capacity is also very low.

Project No.2.5 consists of improvement of the existing single carriageway roads. NTMP/GKMA planned an inner ring road development of which the west-south ring was set between Nakulabye Rbt and Masaka Road through Balintuma Road. However, as widening of these roads to dual carriageway is difficult without significant resettlement, the Study Team recommends making following two routes for improvement with one-way operation, utilizing them as a dual ring as illustrated in Figure 6.3.3.

Ring-1up: Nakulabye Rbt – Balintuma Rd – Canon Apollo Kivebulaya Rd - Nabunya Rd /Masaka Rd (Length 3.6 km).

Ring-1down: Nakulabye Rbt - Mutesa Rd – Kaweesa Rd – Stensera Rd – Kabasu Rd / Masaka Rd (Length 3.9 km) Metesa Road. Improvement from the gravel road to paved road is required between Nakulabye Rbt and Natete Road.



Source: JICA Study Team using NTMP/GKMA plan

Figure 6.3.3 Recommended Inner Ring (West-South) by the Study Team

(3) Component 3: Individual (standalone) Junction Improvement

Component 3 is an individual (standalone) junction improvement mostly by signalization. Of these, the Study Team paid a special attention on Project No.3.5, Jinja Rd – Lugogo Bypass, and No.3.7 Shoprite and Clock Tower Junctions, where many accidents have been reported. Segregation of vehicular traffic and non-motorized traffic would alleviate the current traffic congestion to some extent if these measures are also combined with additional dedicated left-turn lane construction.

Project No.3.1, Hoima Rd - Kimera/Masiro Kawaala Rd Jct (Kasubi Jct), is located at Kawaala

Market and has five legs. Hence, signalization will not help any traffic jam improvement. The Study Team therefore recommended a roundabout with large diameter (approximately 60 m).

Project No.3.6, Ben Kiwanuka Rd - Luwum St Jct, is located at the center of CBD/ commercial area. It consists of three taxi parks, three bus terminals, many shopping malls and markets. Pedestrian traffic during peak hour is approximately 10,000 at this junction. Therefore, standalone signalization would worsen the current traffic jam.

Component 3 projects are summarized in Table 6.3.4.

Table 6.3.4 Component 3: Individual (Standalone) Junction Improvement

Project No	Project Name	Administrative Status (of Road)	Project Concept		ADT / Current Condition of Traffic Congestion
			Length (km)	Improvement Method	
3.1	Hoima Rd - Kimera/MasiroKawaala Rd Jct (Kasubi Jct)	N	-	Roundabout (Large Diameter)	ADT 31,000 Medium
3.2	Kira Road - Acacia/ Babiha Av/Kayunga Rd	KCC	-	Signalization	ADT 37,000 Severe
3.3	Kira Rd - Ntinda Rd Jct	KCC	-	Signalization	ADT 37,000 Medium
3.4	Port Bell (Nakawa) - Old Port Bell Rd Jct	N	-	Signalization	ADT 22,000 Severe
3.5	Jinja Rd - Lugogo Bypass Jct	KCC	-	Signalization and Pedestrian Bridges	ADT 44,000 Medium (Many Accidents)
3.6	Ben Kiwanuka Rd - Luwum St Jct	KCC	-	Signalization	ADT 21,000 Very Sevier
3.7	Shoprite & Clock Tower Jcts Traffic Safety Improvement	KCC	-	Pedestrian Bridges, Separated Left-turn Lanes and Traffic Management	ADT 99,000 Very-very Severe (Many Accidents)

Source: JICA Study Team

(4) Component 4: Other Flyovers For Long-Term Reference

Component 4 consists of flyover/viaduct projects for the junctions planned in NTMP/GKMA and were recommended by the Study Team to solve the current serious traffic congestion at major junctions. These projects would require implementation in the long term (2023) or long-long-term in the case of Project 4.7, Inner Ring Viaduct (motorway).

As the traffic volume on these junctions, except Project No.4.1, Queen's Way - Kevina/Mutebi roads, has far exceeded the capacity while road widening is difficult, flyover/viaduct construction would be one of the effective alternative solutions. Project No.4.1 is a new overpass road between Kevina Road and Mutebi Road constructed over Queen's Way. As only a steel pedestrian bridge exists on this route and vehicles which want to go to the opposite side must divert through Nsambya Road and Clock Tower Junction, new overpass would possibly serve as direct access to each community and will reduce some burden to Clock Tower Junction.

At the stage when the population of GKMA reaches 8-10 million in 2035-2040, flyovers at all major junctions would become necessary and, moreover, an elevated motorway (viaduct) system would be the only solution as one of the principal road infrastructures of GKMA. The Study Team recommended a full viaduct inner ring road network (toll) for long-long term as suggested in Section 4.3.3 (3). Such plan should be incorporated into the new GKMA structure plan. Construction of tall buildings along this route and intersections should also be limited.

The Component 4 projects are summarized in Table 6.3.5.

Table 6.3.5 Component 4: Other Flyovers/Viaduct for Reference

Project No	Project Name	Administrative Status (of Road)	Project Concept			ADT / Current Condition of Traffic Jam
			Project Length km	Viaduct/ Flyover km	Carriageway & Number of Lanes	
4.1	Queen's Way - Kevina/Mutebi Rd	KCC	2.0	0.3	Dual Carriageway (two-ways 2 lanes)	ADT 56,000 (one-way road) Medium
4.2	Yusufu Lule - Mulago Rbts Kira/Haji Kasule Rds	KCC	0.6	0.3	Dual Carriageway (two-ways 2 lanes)	ADT 42,000 Severe
4.3	Yusufu Lule - Fairway Rbt.Sezibwa/Kafu Babiha Rds	KCC	0.6	0.3	Dual Carriageway (two-ways 2 lanes)	ADT 42,000 Severe
4.4	Kibuye Rbt - Masaka Rd Flyover or Kibuye Rbt (Queen's Way) to Entebbe Rd Flyover	N	0.6	0.4	Dual Carriageway (Two ways 2 lanes)	ADT Entebbe Rd 60,000, ADT Masaka Rd 29,000 Very Severe
4.5	Wandegeya Jct Flyover	KCC	0.6	0.4	Single Carriageway (One-way 2 lanes) or Dual Carriageway (Two ways 2 lanes)	ADT 49,000 Very Severe
4.6	Equatoria & Pioneer Mall Jcts Flyover (Kampala Rd - Ben Kiwanuka St / Kampala Rd - Burton St)	KCC	0.9	0.7	Dual Carriageway (two-ways 2 lanes)	ADT 52,000 Very Severe
4.7	GKMA Inner Ring Viaduct (Motorway)		15.0	15.0	Dual Carriageway (two-ways 4 lanes) with interchanges	

Source: JICA Study Team

6.4 EVALUATION OF LONG LIST OF PROJECTS AND RECOMMEDNED SHORT LISTED PROJECTS FOR PRE-FEASIBILITY STUDY

6.4.1 EVALUATION METHODS AND CRITERIA

(1) Methodology of Project Prioritization

The multi-criteria analysis (MCA) methodology was adopted for the prioritization of the 15 projects in the long list in Components 1, 2 and 3. Component 4, which would be implemented in the long term or long term, was not subjected to evaluation.

The procedures for conducting MCA are as follows:

i) Selection of factors to be evaluated

ii) Allocation of weights and 5-grade scoring

iii) Normalization of scores and calculation of weighted-scores for ranking (prioritization) of projects

(2) Establishment of Items to be evaluated

The following factors were chosen as evaluation factors:

Main Factor	Sub-Factor	Remarks
Consistency with Superior Plans	Consistency with NTMP/GKMA	Whether listed in NTMP/GKMA
	Policy of Government of Uganda	Whether listed in "Strategy for the Improvement of Traffic Flow in Kampala", MoWT, Dec.2009
Engineering Factors	Function of Road	Main corridor, Inner ring road, etc.
	Technical Effectiveness to Traffic Jam Improvement Method	How improvement is effective on an engineering aspect
Socio-Economic Factors	Traffic Volume (Current) / Project Cost	As EIRR is not available at this stage, traffic volume and project cost, which are key factors for EIRR calculation, are used instead.
	Contribution to CBD / Commercial Center Development Sustainability	The projects which contribute to traffic congestion improvement in the CBD/commercial center are given higher scores. The sustainability of development of the CBD/commercial center is prerequisite for both national economy and reduction of the poor.
	Interview Ranking by Stakeholders on Traffic Jam	The results of Interview Surveys at Steering Committee Meeting on November 20, 2009 and Stakeholder Meeting on December 8, 2009 were reflected.
Environmental Impacts (negative)	Land Acquisition	Quantity of land acquisition
	Resettlement Requirements (Households)	If possibility of the number of resettlement is over 20 households, the project will be listed for the medium term implementation candidate.

(3) Allocation of Weight and Five-Grade Scoring Criteria

The weights and Five-Grade scoring criteria for each factor are as shown in Table 6.4.1. An equal weight of 25% was given to consistency with superior plans and engineering factors. Socio-economic factors and environmental negative impacts were given 30% and 20%, respectively.

Table 6.4.1 Evaluation Factor and Weight

Grade	Consistency with Superior Plans (25%)		Engineering Factors (25%)		Socio-Economic Factors (30%)				Environmental Impacts (20%)	
	Consistency with NTMP/GKMA	Policy of Government of Uganda [a)]	Function of Road	Technical Effectiveness to Traffic Jam	Traffic Volume (Current)	Project Cost	Contribution to CBD/C.Center Development Sustainability	Interview Ranking by Stakeholders on Traffic Jam [b)]	Land Acquisition	Resettlement Requirements (Households) [c)]
Weight	12.5%	12.5%	12.5%	12.5%	7.5%	7.5%	7.5%	7.5%	10.0%	10.0%
5	Yes (in NTMP/ GKMA)	Superior Priority (Flyovers if budget is available)	East-West Corridor / North-South Corridor	Very-very High	Very Large	Small	Very High	The 1st - 3rd	None	None
4	Not Applicable	High Priority	Inner Ring Road/ Middle Ring Road	Very High	Large	Medium	High	The 4 th - 6th	Small	Very Small (Less than 10)
3	No (in NTMP/GKMA but very important)	Priority	Major Radial Roads	Medium	Medium	Large	Medium	The 7th - 10th	Medium	Small (10-20)
2	Not Applicable	Not Applicable	Other Arterial Roads	Low	Small	Very Large	Low	The 11th - 15th	Large	Medium (20 - 50)
1	No in NTMP/GKMA and not much urgent	Not Applicable	Local Roads	Very Low	Very Small	Very-very Large	None	Over 15th or not listed	Very Large	Large (More than 50)

Notes: a) "Superior Priority" for Jinja-Kampala Rds Flyover, "High Priority" for the junctions/roads listed in "Strategy for the Improvement of Traffic Flow in Kampala", MoWT, Dec.2009 and "Priority" for others.
b) Based on the result of Interview Surveys at Steering Committee Meeting on 20th November 2009 and Stakeholder Meeting on 8th December 2009.
c) If possibility of the number of resettlement is over 20 families, the project will be listed for the medium term implementation candidates.

Source: JICA Study Team

The following is a supplemental explanation or notes on basis of scoring method for some factors:

• Technical Effectiveness:	Flyover/viaduct construction on Jinja-Kampala Roads was given the highest score of 5.
	Dual carriageways construction with flyover junction was given the highest score of 5.
	Dual carriageways construction without flyover junction was given the higher score of 4.
	Very useful measures for roads safety, like a combination of pedestrian bridges and signalization or left-turn lane, were given the highest score of 5.
• Traffic Volume:	5: Main Road ADT is more than 50,000
	4: Main Road ADT is 40,000 – 50,000
	3: Main Road ADT is 30,000 – 40,000
	2: Main Road ADT is 20,000 – 30,000
	1: Main Road ADT is less than 20,000

The factors on project cost, land acquisition and resettlement (number of household) were scored at five-levels based on preliminary estimate as in Table 6.4.2. Evaluation of the project cost was based on ICB level (refer to Annex 4). ROW acquisition area was estimated deducting the existing ROW area from the required new land area estimated from preliminary plan. The estimated number of households to be moved (resettlement requirements), was determined by multiplying the number of buildings/houses that exist within the required new ROW in the preliminary plan, with a factor of 2 - 5 households per building, based on site survey. The government buildings (workshop and depot) of KCC/MoWT were not counted as households since it is clear that no families stay in said facilities. The government quarters (URC/MoWT) at Nsambya Junctions were counted as resettlement requirements.

Table 6.4.2 Five Levels Scores for Project Cost, Land Acquisition and Resettlement Evaluation

Project Component	Project No.	Project Cost		Land Acquisition				Resettlement		
		ICB (Estimate)	5-Grade Score	Area of Land required	Secured ROW (estimate)	ROW to be acquired	5-Grade Score	Number of Buildings	Resettlement (estimate)	5-Grade Score
Weight		(US$ Mill)		(ha)		(ha)		(number)	(household)	
Jinja - Kampala Rds	1.1 Phase 1	67.82	1	1.23	70%	0.37	4	0	0	5
	1.2 Phase 2	46.18	2	1.70	70%	0.51	3	0	0	5
	1.3 Phase 3	85.04	1	3.00	80%	0.60	3	2	10	4
Combination of Dual Carriageway, Flyover and Junction Improvement	2.1 (Phase 1)	6.45	4	6.03	70%	1.81	1	7	14	3
	2.1a (Phase 2)	4.59	4	3.49	50%	1.75	1	18	>50	1
	2.2	32.62	2	1.86	20%	1.49	2	20	>50	1
	2.3	4.03	4	2.00	20%	1.60	1	11	20-50	2
	2.4	4.79	4	2.34	70%	0.70	3	5	10	4
	2.5	5.95	4	0.33	90%	0.03	4	0	0	5
Individual Junction Improvement	3.1	0.87	5	0.12	20%	0.10	4	5	10-20	3
	3.2	0.87	5	0.24	20%	0.19	4	1	5	4
	3.3	0.87	5	0.24	20%	0.19	4	2	10	4
	3.4	0.71	5	0.18	70%	0.05	4	1	5	4
	3.5	2.50	5	0.00	100%	0.00	5	0	0	5
	3.6	0.87	5	0.25	0%	0.25	4	5	20-50	2
	3.7	7.24	4	0.82	50%	0.41	4	3	3	4
Average Value		16.96				0.63				
Max Value		85.04				1.81				
Note: Evaluation Criteria at 5-levels	1	Over 50	V.Very Large			Over 1.5	Very Large		>50	Large
	2	20-50	Very Large			1.0-1.5	Large		20-50	Medium
	3	10-20	Large			0.5-1.0	Medium		10-20	Small
	4	3-10	Medium			0 - 0.5	Small		up to 10	Very Small
	5	Up to 3	Small			0	None		0 (none)	None

Source: JICA Study Team

(4) Normalization of Scores, Calculation of Weighted-scores and Ranking (Prioritization) of Projects

The five-grade scoring is a factor-specific independent evaluation without considering possible biases which may exist among other factors. Thus initial scoring needs to be normalized in order that average scores would have equal basis for all factors. This is a rather mathematical process.

The final score per project was calculated using the weight allocated for each factor and normalized process. Then, the projects in the long list were ranked using the final score for short list consideration as in Table 6.4.3.

6.4.2 EVALUATION RESULTS

The Study Team has held a series of meetings with key-stakeholders (MoWT, UNRA and KCC) and JICA on long and short listing of Pre-FS projects. The Study Team recommended to MoWT the short-listed projects for the Pre-FS as shown in Table 6.4.3 and based on ,MCA (national plans, engineering, socio-economic and environmental aspects), ***giving priority on the strengthening and bottleneck improvement of the east-west corridor (international trunk road network of A109)***.

The Study Team submitted their proposal and the Steering Committee agreed on March 4, 2010 that the preliminary design should be conducted for Jinja Rd – Kampala Road – Queen's Way Flyover Project for which a soft loan of the GOJ or other sources would be applied in the future. The Pre-FS of basic design level was proposed for the remaining four projects, envisaging application of the Japanese Grant Aid for implementation.

Table 6.4.3 Recommended Short List Projects for Pre-Feasibility Study

Component	Proejct No	Project Name	Priority by Multi Criteria Analysis (MCA)	Basic Project Concept			Implementation Period
				Project Length (km)	Viaduct/ Flyover Length (km)	Carriageway & Number of Lanes & Junction Improvement	
Jinja - Kampala Roads - Queen's Way Flyover (Preliminary Design)	1.1 (Phase 1)	Jinja - Kampala Rds Flyover	1	1.4	1.1	Dual Carriageway (two-ways 2 lanes), crossing over Africana, Jinja & Siad Baree Ave	Medium Term (2018)
	1.2 (Phase 2)	Jinja - Yusufu Lule Rds Flyover (Right-turn)	5	1.6	1.3	Single Carriageway (one-way 1 lane) and reversible lane for the evening traffic	Medium Term (2018) or Long Term (2023)
	1.3 (Phase 3)	Kampala Rd - Queen's Way Flyover	3	2.0	1.9	Single Carriageway or Dual Carriageway	Medium Term (2018) or Long Term (2023)
Dual Carriageway Construction, Junction Improvement and Traffic Safety Improvement (Basic Design Level)	2.1 (Phase 1)	Jinja Rd Widening (Port Bell Jct - Banda/Northern Bypass Section), including Ntinda/Spear Motors	7	3.0	-	Dual Carriageway (Add. 2 lanes) & Ntinda Jct improvement	Short (2013)
	2.4	Mukwano Rd Widening, including Mukwano Rbt and Nsambya Jct Capacity Improvement	6	1.8	-	Dual Carriageway (Add. 2 lanes) & Mukwano Rbt and Nsambya Jct	Short (2013)
	3.5	Jinja Rd - Lugogo Bypass Jct	4	-	-	Signalization and Pedestrian Bridges	Short (2013)
	3.7	Shoprite & Clock Tower Jcts Traffic Safety Improvement	2	-	-	Pedestrian Bridges, Separated Left-turn Lanes and Traffic Management	Short (2013)

Source: JICA Study Team

Table 6.4.4 Scores and Ranking of Long List Projects

Multi Criteria Analysis (MCA) Results with Weighted Index

Project Component	Sub-Component No.	Sub-Component Name	Consistency with Superior Plans 25%		Engineering Factors 25%		Socio-Economic Factors 30%				Environmental Impacts 20%		Total (evaluated score with weight)	Order of Priority by MCA	Implementation Timing based on Budget Availability and Land Acquisition	Remarks (Estimated number of households required resettlement)
			Consistency with TMP-GKMA	Policy of Government of Uganda on Priority	Function of Road	Technical Effectiveness to Traffic Jam	Traffic Volume (Current)	Project Cost	Contribution to CBD/C.Center Development Sustainability	Interview Ranking by Stakeholders on Traffic Jam*	Land Acquisition	Resettlement Requirements				
Weight			12.5%	12.5%	12.5%	12.5%	7.5%	7.5%	7.5%	7.5%	10.0%	10.0%	100.0%			
JKQ Flyover	1.1 Phase 1	Jinja - Kampala Rds Flyover	13.9	16.1	14.3	15.9	11.1	2.0	12.2	8.6	12.5	14.3	120.9	1	Short Term (2013) or Medium Term (2018)	No Resettlement
	1.2 Phase 2	Jinja - Yusufu Lule Rds Flyover (Right-turn Ramp Flyover)	13.9	16.1	14.3	12.7	8.9	4.0	9.8	8.6	9.4	14.3	112.0	5	Medium Term (2018) or Long Term (2023)	No Resettlement
	1.3 Phase 3	Kampala Rd - Queen's Way Flyover (Right Turn)	13.9	16.1	14.3	12.7	11.1	2.0	9.8	14.3	9.4	11.4	115.0	3	Medium Term (2018) or Long Term (2023)	Resettlement (less than 10)
Combination of Dual Carriageway, Flyover and Junction Improvement	2.1 (Phase 1)	Jinja Road (Port Bell Jct - Banda/Northern Bypass Section), including Ntinda/Spear Motor Jct, Length 3.0 km	13.9	12.9	14.3	12.7	8.9	8.0	4.9	14.3	3.1	8.6	101.6	7	Short Term (2013)	Resettlement (10-20)
	2.1a (Phase 2)	Jinja Road (Banda - Northern Bypass Section), including Kireka Jct, Length 2.0 km	13.9	12.9	14.3	12.7	6.7	8.0	4.9	2.9	3.1	2.9	82.2	16	Medium Term (2018)	Resettlement (over 50)
	2.2	Bombo Road (Makerere Rbt - Northern Bypass Section), including Makerere Rbt Flyover	13.9	9.7	14.3	15.9	6.7	4.0	9.8	5.7	6.3	2.9	89.0	13	Medium Term (2018)	Resettlement (over 50)
	2.3	Makerere Hill Road, including Sir Apollo Kaggwa Rd Jct	13.9	12.9	11.4	12.7	8.9	8.0	7.3	11.4	3.1	5.7	95.4	10	Medium Term (2018)	Resettlement (20-50)
	2.4	Mukwano Rd, including Mukwano Rbt and Nsambya Jct Capacity Improvement	8.3	12.9	14.3	12.7	6.7	8.0	9.8	8.6	9.4	11.4	102.1	6	Short Term (2013)	Resettlement (less than 10)
	2.5	Mutesa Rd - Kaweesa Rd - Kabasu Rd (South Inner Ring Road) - Single Carriageway Paving	8.3	9.7	11.4	9.5	2.2	8.0	4.9	2.9	12.5	14.3	83.8	15	Medium Term (2018)	No Resettlement
Individual Junction Improvement	3.1	Hoima Rd - Kimera/ MasiroKawala Rd Jct (Kasubi Jct)	13.9	12.9	8.6	9.5	6.7	10.0	2.4	2.9	12.5	8.6	88.0	14	Medium Term (2018)	Resettlement (10-20)
	3.2	Kira Road - Acacia/ Babiha Av/ Kayunga Rd	13.9	9.7	11.4	12.7	6.7	10.0	4.9	2.9	12.5	11.4	96.1	9	Medium Term (2018)	Resettlement (less than 10)
	3.3	Kira Rd - Ntinda Rd	13.9	12.9	11.4	12.7	6.7	10.0	2.4	2.9	12.5	11.4	96.9	8	Medium Term (2018)	Resettlement (less than 10)
	3.4	Port Bell - Old Port Bell Rd	13.9	9.7	8.6	12.7	4.4	10.0	4.9	2.9	12.5	11.4	91.0	12	Medium Term (2018)	Resettlement (less than 10)
	3.5	Jinja Rd - Lugogo Bypass	13.9	9.7	14.3	15.9	8.9	10.0	7.3	2.9	15.7	14.3	112.8	4	Short Term (2013)	No Resettlement
	3.6	Ben Kiwanuka Rd - Luwum St	8.3	12.9	8.6	6.3	4.4	10.0	12.2	14.3	12.5	5.7	95.4	11	Medium Term (2018)	Resettlement (20-50)
	3.7	Shoprite & Clock Tower Traffic Safety Improvement	8.3	12.9	14.3	12.7	11.1	8.0	12.2	14.3	12.5	11.4	117.8	2	Short Term (2013)	Resettlement (less than 10)

Notes: The projects recommended for implementation in the short term (by 2013) The projects for which resettlement is estimated more than 20 households are not appropriate for implementation in the short term under Grant Aid of the GOJ.

Source: JICA Study Team