A Study of Urban Transport System Suppoting Urban Development Plan in Nairobi City

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Japan International Cooperation Agency (JICA) had implemented the traffic survey in 2004 at the Nairobi Metropolitan Area (NMA) in the Republic of Kenya, in order to propose Master Plan for Urban Transport in the Nairobi Metropolitan Area (NUTRANS). The survey collected traffic data such as person trips in NMA, travel purposes, travel mode, travel time and so on. Road network in NMA has not been developed so far as reccommended in NUTRANS, while NUTRANS recommended staged development of radial and ring road networks from city center to suburban outskirt based on the traffic survey 2004.

Consequently, JICA again had implemented the traffic survey in 2013, and revealed that traffic between the city center and subarban outskirt as well as east-west through-traffic had increased compared to the survey 2004. Based on the survey 2013, an urban development model to connect the city center and outskirt sub-centers by the trunk road was adopted in the Integrated Urban Planning Master Plan for the Nairobi City (NIUPLAN).

This paper aims at analyzing the effectiveness of the traffic survey to propose an urban development master plan in line with an urban transport system by comparing the two traffic surveys conducted in NMA.

Key Words : *Traffic Survey, Nairobi Metropolitan Area, Urban Development, Urban Transport System*

1. INTRODUCTION

JICA has implemented a numerous urban traffic surveys in order to propose urban development master plans in many developping countries[1)]. Several traffic surveys have recently started in the African major cities as an importance of African countries emerged, while many traffic surveys had already been implemented in the Asian major cities untill the early 2000's. Urban transport master plans were proposed based on the various traffic surveys, among which Person Trip (PT) survey provides the following important information[2)].

1) car and mortercycle ownership, and household membership (household characteristics)
2) individual information e.g. age, sex, occupation, etc. (individual characteristics),
3) person trip information by transport modes, travel purposes, individual characteristics and origin and destination (OD), and
4) level of services (LOS) of transport modes.

By accumulating the various PT survey results, JICA developed database to systematically analyze urban transport problems, and consequently propose urban development master plans[3)] (Table 1).

Kenya is one of the leading countries in this field in Africa, which aims to be a middle-income country by realizing its prosperity with international competitiveness of the country and high-quality of life. Following the national development plan, VISION 2030, which focuses on three pillars i.e. economy, society and plitics, Kenyan government decided to primarily develop Nairobi city as an economic engine to sustainablly develop the country, however, the Nairobi urban development master plan has not been revised since its completion in 1973. Accordingly, various important issues remain unaddressed and most recent urban development strategy remains undecided for Nairobi city. Taking this situation into accout, JICA implemented the NUTRANS project for the target year 2025, to comprehensively resolve the unaddressed issues by

proposing new urban transport system to upgrade urban functions of Nairobi city. Furthermore, JICA also implemented the NIUPLAN project for the target year 2030, to resoleve the crucial issues e.g. traffic congestion which significantly deteriorates economic activities, everyday life of the citizens, and surrounding environment. As a result, JICA implemented two traffic surveys and accumulated important experiences in both projects.

This paper aims at analyzing the effectiveness of the traffic survey to propose an urban development master plan in line with an urban transport system by comparing two traffic surveys conducted in Nairobi city. The authors also explore how donnors' cordination interferes the the individual project under the integrated urban development master plan.

Table 1 JICA-studied cities compiled in the database

No.	City	Country	Population (thousand)	JICA M/P
1	Chenngdu	China	4,785	'01
2	Ulaanbaatar	Mongol	885	'09
3	Jakarta	Indonesia	22,000	'87, '90, '01, '04
4	Bangkok	Thailand	8,250	'79, '88, '90
5	Manila	Philippines	20,795	'72, '73, '85, '99
6	Hanoi	Vietnam	2,355	'97, '07
7	Ho Chi Minh	Vietnam	7,785	'04
8	Phnom Penh	Cambodia	1,560	'01
9	Dhaka	Bangladesh	10,135	'10
10	Colombo	Sri Lanka	2,080	'84, '06
11	Baku	Azerbaijan	1,650	'02
12	Damascus	Syria	2,370	'99, '08
13	Bogota	Colombia	7,845	'96
14	Lima	Peru	7,995	'05
15	Nairobi	Kenya	3,365	'06
16	Lusaka	Zambia	1,395	'09
17	Istanbul	Turkey	13,135	'09
18	Bucuresti	Romania	1,995	'00

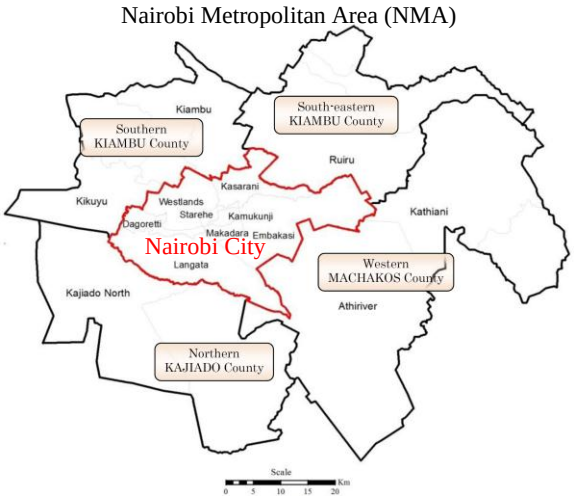


Fig. 1 Nairobi Metropolitan Area (NMA) and Nairobi city

2. COMPARISON OF THE TRAFFIC SURVEYS IN 2004 AND 2013

(1) Procedure of the traffic surveys

Two traffic surveys were conducted in 2004 and 2013, of which various surveys including traffic surveys are illustrated in Table 2.

In order to supplement the PT survey, cordon-line survey and screen-line survey are usually conducted in the traffic survey. Cordon-line survey captures people and vehicles coming in and out of the target area, which crossed the cordon-line, i.e. the border line surraounding the target area. On the other hand, screen-line survey captures all the traffic crossing the screen line e.g. rivers, railway tracks to improve accuracy of PT survey as a sampled survey (Fig. 2).

Table 2 Outline of the traffic surveys

Type of Survey	Contents (2013)	Contents (2004)
Person trip survey	Interview to 10,000 households	Interview to 1,000 households
Cordon line survey	1) Roadside interview survey (12hr, 6:30-18:30): 14 survey points on one workday 2) Roadside traffic counts (12hr, 6:30-18:30): 10 survey points on one workday 3) Roadside traffic counts (24hr, 6:00-6:00): 4 survey points on one workday	1) Road side interview survey, traffic count survey and vehicle occupancy survey at 12 locations on the boundary of the study area 2) 12hrs traffic count: 8 locations 3) 24 hrs traffic count: 4 locations
Screen line survey	1) Roadside traffic counts (12hr, 6:30-18:30): 10 survey points on one workday 2) Roadside traffic counts (24hr, 6:00-6:00): 5 survey points on one workday	1) Traffic count surcey at 15 locations on the Nairobi River scrrenline 2) 12 hrs traffic count: 10 locations 3) 24 hrs traffic count 5 locations
Traffic counts survey	1) Roadside: traffic counts at major roads 2) Traffic counts by direction at major intersections	Traffic count survey of 50 locations of road sections and intersections 2) 12 hrs traffic count: 50 locations
Public transport user survey	Interview to 1,500 passengers at major terminals in Nairobi city centre.	Public transport users interview survey of about 1,500 passengers
Travel speed survey	Survey route: 15 routes, three times a day (morning, afternoon and evening)	Floating car method 15 routes of main roads
Stated preference survey	2,000 samples	2,000 samples

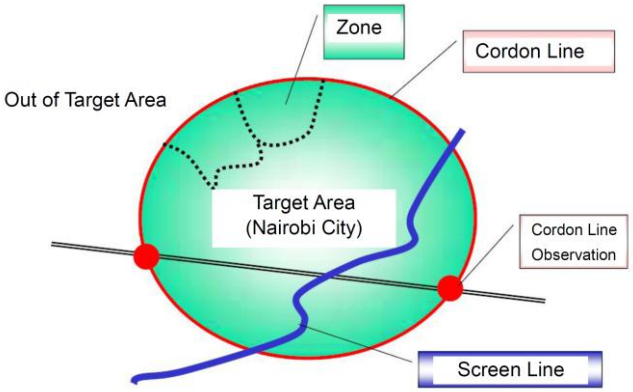


Fig. 2 Concept of cordon-line and screen-line surveys

Traffic zones were devided into 15 large-zones, some 70 medium-zones and some 150 small-zones in both surbeys, so that both surveys can be compared

each other. However, those zones were decided slightly different each other, because traffic situation e.g. road network has changed siginificantly in the last decade.

Table 3 Total number of traffic zones

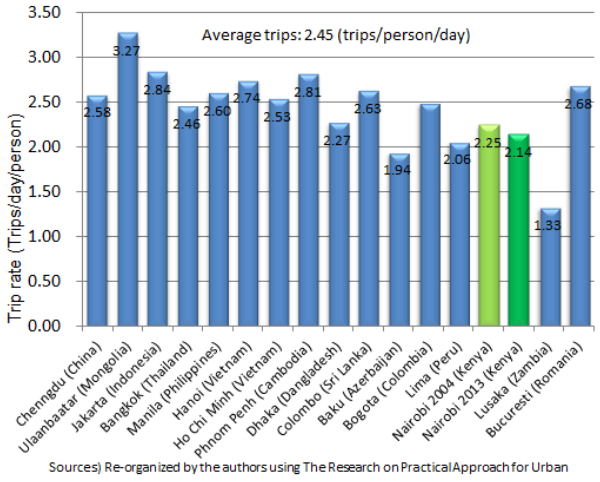
	large-zone	medium-zone	small-zone
2004	15	73	153
2013	15	74	150

(2) Major results of PT surveys

PT survey is a method to analyze individual travel behavior based on person's travel activity record in a certain day. In order to capture person's travel activity, surveyors visit each target household in the survey area and made an interview on travel activities of each household member in a certain day. This is a sampled survey, of which target households were selected randomly from all the households of the survey area. Survey area of PT survey was chosen within Nairobi city. Total number of households interviewed in PT surveys were 10 thousands out of 649 thusands in 2004 and 985 thousands in 2013 for Nairobi city, resulting in the sampled rates of 1.54% in PT survey 2004 and 1.02% in PT survey 2013.

1) Trip generation

Trip rates which represent trips including walking-mode generated by one person in one day, were observed 2.25 in PT survey 2004 and 2.14 in PT survey 2013 for Nairobi city. Trip rates observed in the major cities of which urban transport master plan studies were conducted by JICA for the last twenty years, were compared with Nairobi's case in Fig. 3. Trip rates of 2.25 and 2.14 for Nairobi city are understood relatively smaller than those of 16 major cities average i.e. 2.45 (trips/person/day) (Fig. 3).



Sources) Re-organized by the authors using The Research on Practical Approach for Urban

Fig. 3 Comparison of trip rates in JICA urban transport master plan studies

2) Travel purpose and travel mode observed in 2004

Travel purpose observed in PT survey 2004 revealed that trip to work accounted for 25%, trip to school for 9.8%, trip to others for 18.7%, and trip to back home for 46.5% (Table 4). On the other hand, travel mode observed in PT survey 2004 revealed that walk dominated and accounted for 47.1%, public transport for 35.8% and private transport for 17.1%. More precisely, public transport dominated and accounted for 46.7% for trip to work, while walk dominated and accounted for more than some 50% for all three other travel purposes, i.e. trip to school, trip to others and trip to back home.

Table 4 Trip generation by purpose and mode in 2004

[PT observation] (unit:'000 trips/day)

	Walk	Private	Public	Total
Work	347	295	563	1,205
				[25.0%]
	(28.6%)	(24.5%)	(46.7%)	(100%)
School	274	34	164	472
				[9.8%]
	(58.0%)	(7.2%)	(34.8%)	(100%)
Others	586	135	177	898
				[18.7%]
	(65.3%)	(15.0%)	(34.8%)	(100%)
Home	1,060	358	822	2,240
				[46.5%]
	(47.3%)	(16.0%)	(36.7%)	(100%)
Total	2,267	822	1,726	4,815
				[100%]
	(47.1%)	(17.1%)	(35.8%)	(100%)

Table 5 Trip generation by purpose and mode in 2015

[Estimation] (unit:'000 trips/day)

	Walk	Private	Public	Total
Work	487	471	793	1,751
				[26.3%]
	(27.8%)	(26.9%)	(45.3%)	(100%)
School	331	62	238	631
				[9.5%]
	(52.5%)	(9.8%)	(37.7%)	(100%)
Others	604	188	383	1,276
				[19.2%]
	(51.4%)	(16.0%)	(32.6%)	(100%)
Home	1,210	577	1,300	3,088
				[46.5%]
	(39.2%)	(18.7%)	(42.1%)	(100%)
Total	2,633	1,298	2,715	6,646
				[100%]
	(39.6%)	(19.5%)	(40.8%)	(100%)

3) Travel purpose and travel mode forecasted for 2015

Considering this situation, travel demand forecast was conducted for the short-term target year 2015

(Table 5). Travel purpose estimated for 2015 revealed that trip to work would account for 26.3%, trip to school for 9.5%, trip to others for 19.2%, and trip to back home for 46.5% (Table 5). On the other hand, travel mode estimated for 2015 revealed that walk would dcrease by 8% and account for 39.6%, public transport increase by 5% and account for 40.8%, and private transport for 19.5%. More precisely, public transport would dominate and account for more than 40% for both trip to work and trip to back home, while walk still would dominate and account for more than 50% for both trip to school and trip to others.

4) Travel purpose and travel mode observed in 2013

Travel purpose observed in PT survey 2013 revealed that trip to work accounted for 25.6%, trip to school for 13.5% which is 5% more than the estimation, trip to others for 16.4% which is 3% less than the estimation, and trip to back home for 44.5% whici is 2% less than the estimation (Table 5 and Table 6). On the other hand, travel mode observed in PT survey 2013 revealed that walk dominated and accounted for 45.6% which is 6% more than the estimation, public transport for 40.8% and private transport for 13.5% which is 6% less than the estimation. More precisely, public transport dominated and accounted for more than 40% for both trip to work and trip to back home, while walk still dominated and accounted for more than 55% for both trip to school and trip to others.

Consequenly, trip generation estimated for 2015 in NUTRANS is evaluated accurate to a certain extent, being compared to observed trip generation in PT survey 2013.

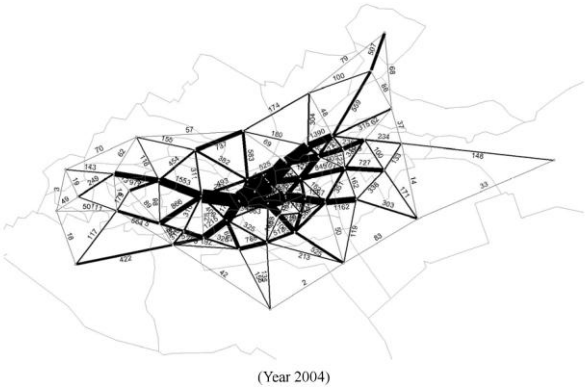
Table 6 Trip generation by purpose and mode in 2013

[PT observation] (unit:'000 trips/day)

	Walk	Private	Public	Total
Work	594	347	794	1,735
				[25.6%]
	(34.2%)	(20.0%)	(45.8%)	(100%)
School	522	50	340	912
				[13.5%]
	(57.2%)	(5.5%)	(37.3%)	(100%)
Others	621	126	363	1,110
				[16.4%]
	(55.9%)	(11.4%)	(32.7%)	(100%)
Home	1,353	393	1,268	3,014
				[44.5%]
	(44.9%)	(13.0%)	(42.1%)	(100%)
Total	3,090	916	2,765	6,771
				[100%]
	(45.6%)	(13.5%)	(40.8%)	(100%)

(3) Trip distribution

Demand forecast was conducted based on the four-step method. One of the major products of the forecast is usually trip distribution estimated for the target year.



(Year 2004)

Fig. 4 Trip distribution observed in PT survey 2004

According to the socio-economic framework (target year 2025) of the Nairobi city, future population of Nairobi city was expected to increase by 45% and that of outskirt was expected to increase by 191%. Consequently, inter-city-outskirt traffic was expected to increase more than that of intra-city traffic.

For the traffic distribution, east-west traffic was expected to increase more than that of north-south traffic due to the additional sub-centers development along the east-west axis based on the future land use plan. Threrfore, east-west road network was expected to develop in line with the sub-centers development.

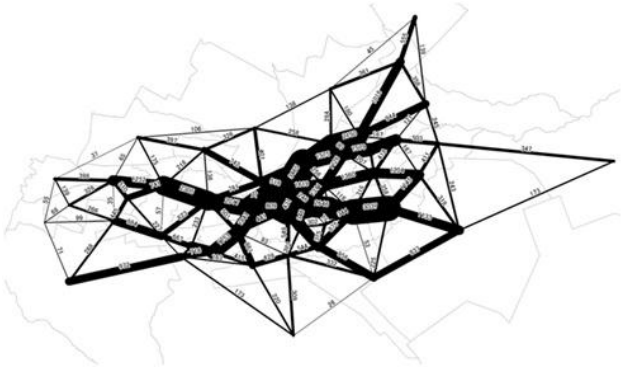


Fig. 5 Trip distribution observed in PT survey 2013

(4) Traffic speed and Vehicle Capacity Ratio (VCR)

Average traffic speed and VCR in Greater Nairobi were observed 34.1 km/h and 0.50 respectively in the traffic survey 2004. Based on the traffic survey 2004, average traffic speed and VCR in Greater Nairobi were estimated 37.8 km/h and 0.64 respectively for the year 2010 by NUTRANS.

However, the average speed and VCR in Greater Nairobi were observed 41.2 km/h and 0.54 respectively in the traffic survey 2013, which revealed that the road congestion in 2013 became better than those

estimated for the year 2010. This is because several road development projects by several donnors had been implemented more than expected since NUTRANS completed in 2004.

Table 7 Primary indices by vehicle assignment results

Area	Year of Traffic Demand	Vehicle-km total (PCU-km)('000)	Vehicle-hours total (PCU-Hour)	Average Speed (km/h)	Average VCR (Volume Capacity Ratio)
Greater Nairobi	2004(*)	10,960	322,000	34.1	0.50
	2010(**)	14,452	383,000	37.76	0.64
	2013	17,780	431,690	41.2	0.54
Nairobi City	2004(*) (city centre)	1,167	38,000	31.0	0.81
	2010(**)	1,293	38,000	34.4	0.75
	2013	10,960	273,910	40.0	0.69

(*) : the target area of the traffic survey 2004 was different from the survey 2013
(**): prospected figure in NUTRANS

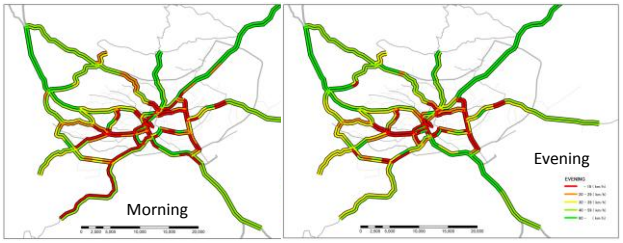


Fig. 6 Traffic speed surveyed in 2013

3. Evaluation of NUTRANS

(1) Recommendations by NUTRANS

NUTRANS evaluated several alternatives based on the criteria, e.g. economic viability, traffic condition, system efficiency, environmental impact and social impact. Consequently, the proposed transport master plan included upgrade of the existing railway and improvement of Uhuru Highway, in addition to radial-circumferential road network and bus services as a priority policy. The cost of the projects was estimated 43,445 mil. khs in total (Table 8).

Table 8 Proposed transport master plan

(Unit: Mil. ksh)

Plan Component	Total Cost	Short term (2006-10)	Med. term (2011-15)	Long term (2016-25)
1) Road Improvement	34,795	6,356	9,142	19,297
2) Public Transport	8,100	1,100	1,600	5,400
3) Traffic Management	350	300	50	0
4) Traffic Institution	200	200	0	0
Total	43,445	7,956	10,792	24,697

The road network of 395.6 km in total was proposed and high priority was given, in order to promptly achieve urgent solutions for the existing heavy traffic consgestion, which includes missing link projects, radial road projects inside the C-3, and signalization and non-moterised transport projects. The traffic circulation plan in the city center should be developed as a part of the urgent solutions within the short-term priod (Table 9 and Fig. 7).

Table 9 Major projects of transport master plan

Projects	Unit	Short term (2006-10)	Med. term (2011-15)	Long term (2016-25)	Total
1. Bypass and link					
1) Bypass Roads	km			85.0	85.0
2) Link Roads	km			24.4	24.4
3) Link Road Extension	km			9.4	9.4
2. Missing Links					
1) Arterial Roads	km	19.8			19.8
2) Collector	km	6.5	1.6		8.1
3) Local Road	km		5.1		5.1
3. Radial Roads					
1) Inside C-3	km	21.9			21.9
2) C-3 South & West	km		51.1		51.1
3) C-4 North & East	km		54.2		54.2
4) New Radial Roads	km		9.7	1.2	10.9
4. Circumferential Roads					
1) C-1 & C-2	km		11.4		11.4
2) C-3	km			6.0	6.0
5. Secondary Arterial	km			65.3	65.3
6. Intersection Improvement	No.	18	30		48
7. Non Motorized Transport	km	23.8	18.2	17.8	59.8
8. Uhuru hightway Improvement					
1) Widening	km	1.2	2.5		3.7
2) Grade Separation	No.	1		6	7
Total	km	92.1	223.7	79.8	395.6

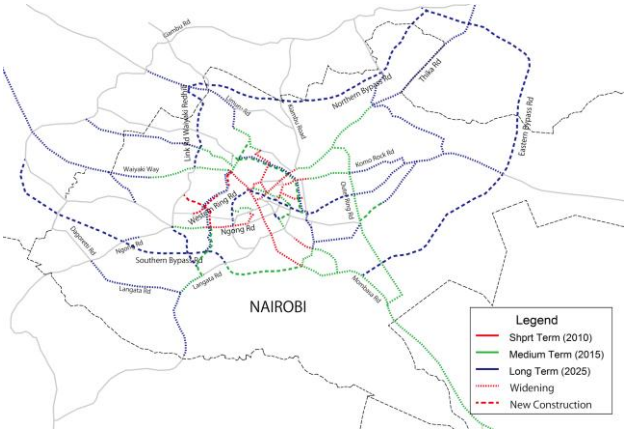


Fig. 7 Recommended road networks in NUTRANS

(2) Actual implementation after NUTRANS

1) Donor's activities

Several major projects had been implemented by AfDB, China and Japan since NUTRANS was completed, although many of those projects were not identified in NUTRANS. In addition, some projects are still under construction or to be constructed (Fig. 8, Fig. 9 and Table 10).

Japan had assisted 2,507 mil. yen (equivalent to 2,077 mil. ksh, 1ksh=1.207 yen as of April 2014) for the missing link projects of 8.36 km in the last decade. AfDB and China had assisted 180 mil. USD and 100 mil. USD respectively (equivalent to 15,333 mil. ksh and 8,518 mil. ksh respectively, 1 USD=102.82 yen as of April 2014) for Thika road of total 50 km in short and medium term period. China assisted 12,700 mil. ksh for the bypass and link road projects of 70 km in total in a long-term period.

Consequently, China assisted the bypass and link projects of 70 km out of 118.8 km, China and AfDB assisted the radial road projects of 50 km out of 138.1 km, and Japan assisted the missing link projects of 8.36 km out of 17.4 km. It revealed that China con-

tributed to significantly improve the road network in Nairobi city and was the largest donor in the last ten years. Therefore, close communication and coordination among donors are understood crucial from the planning stage.

2) Impact and effect of the completed projects

The road congestion in Nairobi city and its adjacent environment were improved in 2013 comapered to the situation in 2004, mainly due to the completion of above-mentioned several projects by several donors.

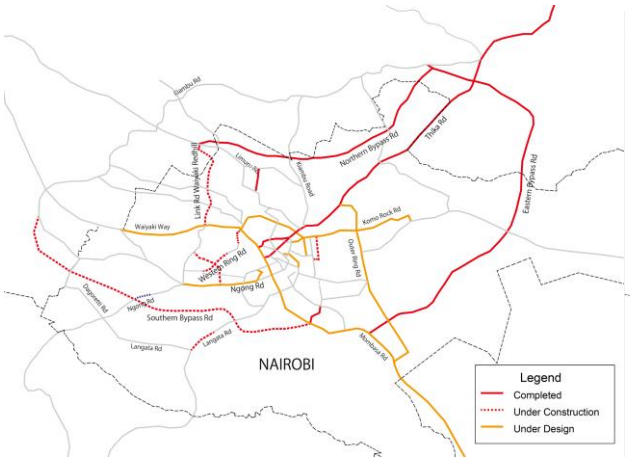


Fig. 8 Actual constructed roads after NUTRANS

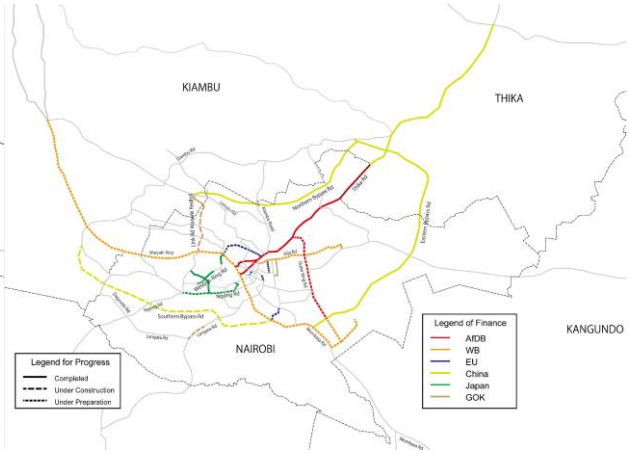


Fig. 9 Donors' project map

Table 10 Progress of Road Development After NUTRANS

	Term	Category	Length	Finance	Progress
1.Bypass and Link Roads	Mid-term	Bypass Roads	13km	0.8mil. USD (grant), 116mil. USD (loan) by AfDB	To be constructed
			30km	17,200 mil. Ksh by China	Under construction
	Long-term	Bypass and Link Roads	39km	4.2 bil. Ksh by China	Completed
			31km	8.5 bil. Ksh by China	Completed
			6.5km	Kenya	Earth work completed
2.Missing link	Short-term	Missing links (arterial)	0.7km	3.5 bil. Ksh by EU (1)	To be constructed
	Mid-term	Missing links (arterial)	1.8km	EU(1)	To be constructed
		Missing links (collector)	3.0km	EU(1)	To be constructed
		Missing links (local)			
3.Radial Roads	Short-term	Radial roads within C-3	3.3km	Japan	To be constructed
			-	AfDB finance in the Thika road project (2)	Completed
			1.3km	WB	To be constructed
	Mid-term	Radial roads outside C-3	50km	180mil. USD by AfDB and 100 mil. USD by China(2)	Completed
			4.2km	WB	To be constructed
			2.1km	Japan	To be constructed
			2.0km	2.67 mil. Ksh by Kenya	Under construction
	Long-term	Radial roads outside C-3	4.5km	WB	To be constructed
4.Circumferential Arterial Roads	Short-term	Nairobi western ring roads	8.36km	2,507mil. JPY by Japan	Completed
	Mid-term	Circumferential arterial roads C-3	5.6km	EU(1)	To be constructed
		Circumferential arterial Roads C-2	2.5km	EU(1)	To be constructed
	Long-term	Circumferential arterial roads C-2			
		Circumferential arterial Roads C-3			
5.Secondary Arterial Roads	Short-term	-	-	AfDB finance in the Thika road project (2)	Completed
	Mid-term	-			
	Long-term	Secondary arterial roads			
		Secondary arterial roads			
6.Intersection Improvement	Short-term	Intersection improvement			
	Mid-term	Intersection improvement			
	Long-term	Intersection improvement			
7.Non-Motorised Transport (NMT)	Short-term	NMT (north & west)			
	Mid-term	NMT (south & west)			
	Long-term	NMT (south & west)			
8.Uhuru Highway	-	JKIA Likoni road jct	8.0km	WB	Design completed
	-	Likoni jct .– James Gichuru jct.	12km	WB	Design completed
	-	James Gichuru jct. - Rironi	25km	Total 223.26 mil. USD for northern corridor by WB	Design completed

(1): Total cost for missing link by EU
(2): Thika road project by AfDB
C-2:Langata Rd/ Mbagathi Rd/ Woodlands Av/ Arboreturn Rd/ Museum Hill Rd/ Ngara Rd/ Quarry Rd/ Lusaka Rd
C-3:Southern Bypass/ Ring Rd Kilimani Extension/ Ring Rd Kilimani/ Ring Rd Kileleshwa/ Ring Rd Westlands/ Ring Rd Parklands/ Ring Rd Parklands Extension/ Muratina & Muinami St Likoni Rd/ Likoni Rd Extension

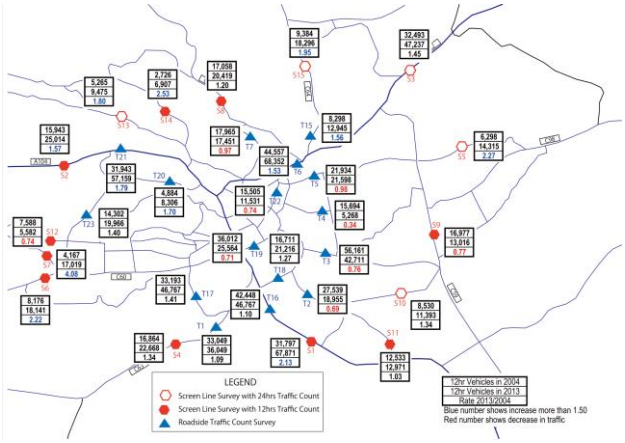


Fig. 10 Result of Traffic Count (12hr)

In NUTRANS, Thika road was planned to be improved and upgraded from double to triple carriageway and widening by 2025, however, triple and quadruple carriageway had been completed acutually until 2013. At the same time, traffic flow within the city center decreased by the early completion of southern bypass project (Fig. 10). As the result, an average traffic speed were observed in the traffic survey 2013, showing higher than those observed in 2004 and estimated for 2010.

Thus, the demand forecast should be revised repeatedly when the staging plans were implemented as scheduled.

6. CONCLUSIONS

In this paper, the authors focused on the urban development planning in Nairobi city of Kenya, and the effectiveness of traffic survey and urban transport system is concluded as the below.

(1) Trip generation estimated for 2015 in NUTRANS is evaluated accurate to a certain extent, being compared with the observed trip generation in PT survey 2013.

(2) China contributed to significantly improve the road network in Nairobi city and was the largest donor in the last ten years. Therefore, close communication and coordination among donors are crucial from the planning stage.

(3) The data acquired by the survey 2004 and the calculated figures, especially trip generation and future modal share, were almost same as the actual figures of the survey 2013. A methodology of the future demand forecast based on the traffic survey data is evaluated as appropriate.

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REFERENCES

1) Hisao UCHIYAMA, Yuichi MOHRI, Herculano FELIAS, Jr.; A study on method of urban transportation planning in developing countries, Journal of JSCE, No. 576/IV-37, 1-10, 1997
2) Akira Nakamura, Tetsuro Hyodo, Naofumi Yamamura, Kenichi Konya; Introduction of database on JICA urban transport development study, Journal of Japan Society of Traffic Engineers, 2004 supplement.
3) Japan International Cooperation Agency: The Research on Practical Approach for Urban Transport Planning, 2011
4) Kenya National Bureau of Statistics; The 2009 Kenya Population and Housing Census, 2010
5) Japan International Cooperation Agency: THE STUDY ON MASTER PLAN FOR URBAN TRASPORT IN THE NAIROBI METROPOLITAN AREA IN THE REPUBLIC OF KENYA, final report, 2006.

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