

CHAPTER 19

PUBLIC TRANSPORT PLAN

CHAPTER 19 PUBLIC TRANSPORT PLAN

19.1 PLANNING CONCEPT

Considering the traffic problems in Nairobi and to cope with the future increase in traffic demand, it is necessary to improve the current public transport system composed of bus, matatu and railway. The basic concept of the public transport plan is this: Transformation from the current limited modal choice to developing the urban transport environment with a wide variety of modal choice for the Nairobi Metropolitan citizens.

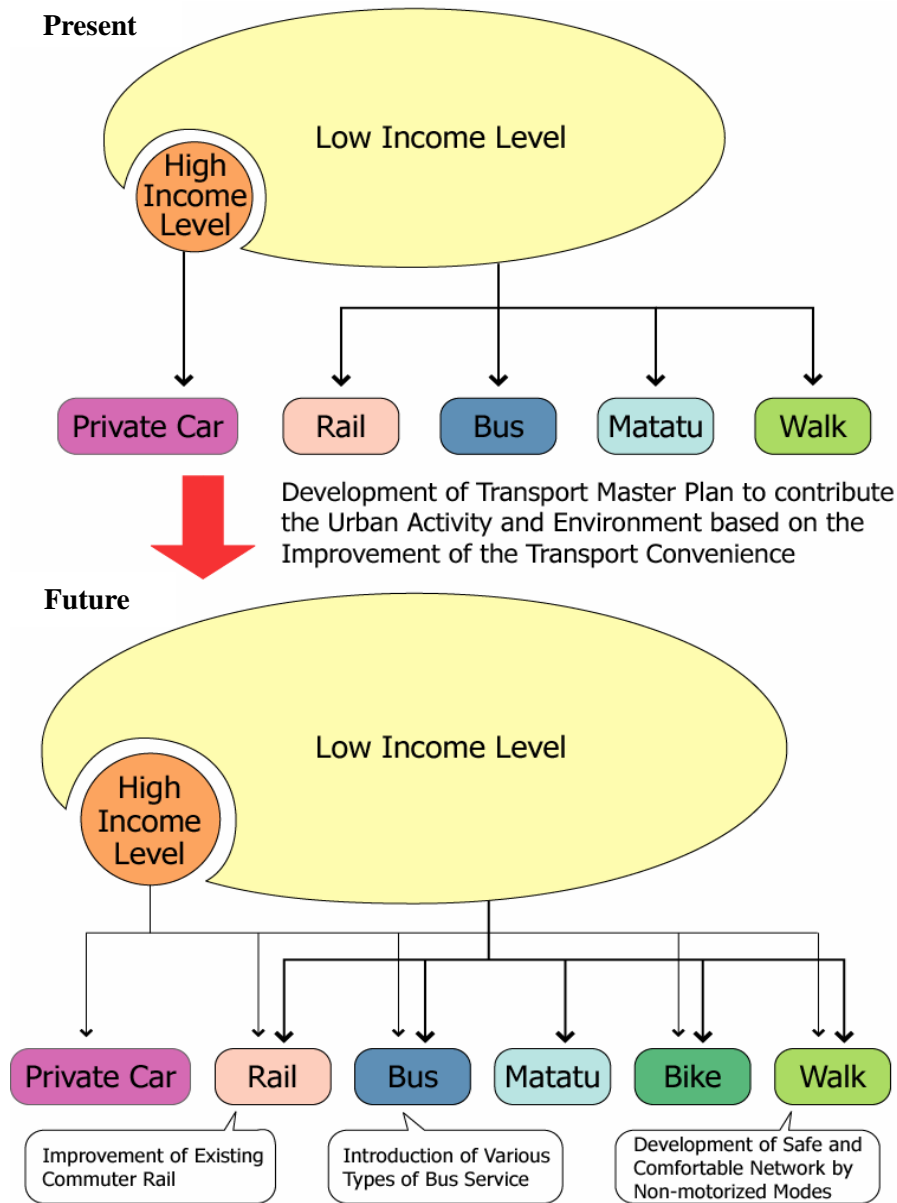


FIGURE 19.1-1 BASIC PLANNING CONCEPT OF THE PUBLIC TRANSPORT PLAN IN NAIROBI METROPOLITAN AREA (PREPARATION AND IMPROVEMENT OF VARIOUS MODES)

As a possible modal choice, there is the bus, which needs to be turned into an efficient, safe and convenient mode of transport. There is also the existing commuter rail whose low frequency of trains and insufficient coaches are just some of its many problems. However, it is recommended that the existing commuter train be developed as the future urban transport system in Nairobi metropolitan area by maximizing the use of the existing railway infrastructure because the railway line network covers most of the major transport corridors. With all this in mind, the target modal share of public transport in 2025 is set below and shown in Table 19.1-1.

- (1) The share of the bus system in 2025 to increase up to 50% based on the improvement of bus convenience, safety and efficiency as the trunk public transport system in Nairobi metropolitan area.
- (2) The share of commuter rail to target 5% based on the maximum use of the existing railway system because the railway network covers most of the major transport corridors.
- (3) The matatus to be efficiently used to serve as the future feeder system in Nairobi metropolitan area to achieve convenient public transport services.

TABLE 19.1-1 FUTURE PUBLIC TRANSPORT MODAL SHARE AND DEMAND

Items		2004	2010	2015	2025
Bus	Percentage (%)	10.2	23.0	36.5	50.0
	Trips	173,848.0	491,000.0	849,000.0	1,448,000.0
Matatu	Percentage (%)	80.1	65.0	50.0	35.0
	Trips	1,365,218.0	1,388,000.0	1,163,000.0	1,014,000.0
Commuter Rail	Percentage (%)	1.1	2.0	3.5	5.0
	Trips	18,748.0	43,000.0	81,000.0	145,000.0
School/Co. Bus	Percentage (%)	8.6	10.0	10.0	10.0
	Trips	146,578.0	213,000.0	233,000.0	290,000.0
PT Total	Percentage (%)	100.0	100.0	100.0	100.0
	Trips	1,704,392.0	2,135,000.0	2,326,000.0	2,897,000.0

The basic concept of future public transport system is to achieve a convenient transport system which is composed of the bus as the trunk public transport system and matatus as the feeder- avoiding its current occupation of 85% of total public transport demand, radial route structure to the CBD and frequent involvement in traffic accidents. Based on this concept and other measures such as development of convenient mode interchange areas with park-and-bus-ride parking spaces, the public transport system shall be established with strict consideration of the urban environment.

With these ideas, the basic planning directions for the public transport plan in Nairobi metropolitan area is worked out as follows:

- (1) Restructuring of public transport network, including improvement/development of bus stop/terminal and introduction of new type of bus services and bus priority measures,
- (2) Improvement of existing commuter rail,
- (3) Strengthening of mode interchange areas/points,
- (4) Improvement of public transport system in suburban towns, and
- (5) Introduction of stage development considering the increase of public transport demand, capability of investment and planning reality.

19.2 BUS/MATATU TRANSPORT

19.2.1 Necessity of Adequate Public Transport System

The current public transport services in Nairobi are basically delivered by bus and matatu. The route structure of buses has east–west routes, passing through the CBD. On the other hand, matatus have radial pattern routes and with origin/destination situated in the CBD.

Table 19.2-1 shows the bus/matatu traffic and passenger flow. Traffic volume and passenger volume of Matatu have higher share of total public transport along many transport corridors, especially along Thika Road and Juja Road in the eastern part of the CBD. The share of these roads exceeds 90%. The share of public transport modes (bus/matatu) to total traffic along these roads is more than 30%, especially the share of Juja Road which exceeds 50%.

TABLE 19.2-1 BUS/MATATU TRAFFIC VOLUME ALONG MAJOR TRANSPORT CORRIDORS

Name of PT corridor	Loca-tion	Matatu (veh./day)	Bus (veh./day)	PT total (veh.)	Matatu (%)	Bus (%)	TOTAL (veh.)	PT share (%)	Matatu (pass.)	Bus (pass.)	TOTAL (pass.)
R1 Mombasa rd	T16	8,045	8,951	16,996	47.3%	52.7%	63,239	26.9%	127,916	298,068	425,984
	S1	11,887	1,401	13,288	89.5%	10.5%	37,129	35.8%	189,003	46,653	235,657
	C1	6,107	1,056	7,163	85.3%	14.7%	35,707	20.1%	97,101	35,165	132,266
	(S1+C2)/2	8,997	1,229	10,226	87.4%	12.6%	36,418	27.9%	143,052	40,909	183,961
R2 Langata rd	T1	8,523	977	9,500	89.7%	10.3%	42,930	22.1%	135,516	32,534	168,050
	S4	4,394	858	5,252	83.7%	16.3%	20,658	25.4%	69,865	28,571	98,436
R3 Ngong rd	T14	10,425	2,218	12,643	82.5%	17.5%	33,174	38.1%	165,758	73,859	239,617
	S6	2,292	1,036	3,328	68.9%	31.1%	10,229	32.5%	36,443	34,499	70,942
Argwings Kodhek rd	T13	5,154	1,780	6,934	74.3%	25.7%	25,857	26.8%	81,949	59,274	141,223
R4 Waiyaki way	T21	11,559	2,810	14,369	80.4%	19.6%	41,672	34.5%	183,788	93,573	277,361
	S2	8,562	732	9,294	92.1%	7.9%	23,982	38.8%	136,136	24,376	160,511
R5 Thika rd	T6	33,862	3,552	37,414	90.5%	9.5%	101,741	36.8%	538,406	118,282	656,687
	S3	14,819	1,817	16,636	89.1%	10.9%	45,951	36.2%	235,622	60,506	296,128
R6 Juja rd	T5	14,340	1,234	15,574	92.1%	7.9%	28,596	54.5%	228,006	41,092	269,098
	S5	1,048	106	1,154	90.8%	9.2%	3,691	31.3%	16,663	3,530	20,193
R7 Jogoo rd	T3	24,804	4,040	28,844	86.0%	14.0%	72,961	39.5%	394,384	134,532	528,916
Total		174,818	33,797	208,615	83.8%	16.2%	623,935	33.4%			

Based on the results of traffic assignment of future public transport demand shown in Table 19.1-1 on the future road network, the increase rates from 2004 to 2025 within the CBD boundary and urbanized area boundaries are 1.56 times and 1.76 times, respectively.

Major findings by direction are as follows:

(1) Within the CBD boundary

Largest public transport demand of 458,000 trips/day can be seen along the northern direction (Thika Road), while the highest increase rate from 2004 to 2025 of 2.71 times can be seen along the eastern direction (Juja and Jogoo Roads).

(2) Around the urbanized area boundary

The largest public transport demand of 771,400 trips/day can be seen along the eastern direction (Juja and Jogoo Roads), while the highest increase rate from 2004 to 2025 of 1.78 times can be seen along the western direction (Ngong Road, etc.).

Considering the efficient use of limited urban transport infrastructure and to cope with the future public transport demand, it is necessary to introduce a more efficient and comfortable public transport system than the current matatu-oriented one.

19.2.2 Restructuring of New Bus/Matatu System

The future public transport demand will increase largely, but the increase of future car demand will be more drastic. Moreover, the infrastructure development, such as widening of trunk roads, development of missing links and construction of new roads, say, a bypass, will not necessarily provide a complete system that will cope with the future traffic demand, particularly within the urbanized area. Consequently, it is necessary to restructure the bus/matatu transport modes which dominate the road public transport together with other vehicles such as private cars, into an efficient, safe and comfortable public transport system.

The basic concept, as mentioned in the planning directions is that the trunk public transport system is composed of bus/matatu and commuter rail. At the same time, the public transport system along the major transport corridors features buses which is a more efficient transport system, compared to matatus and that matatus play a role of feeder system for the enhancement of public transport convenience.

The concept described above is schematically represented in Figure 19.2-1.

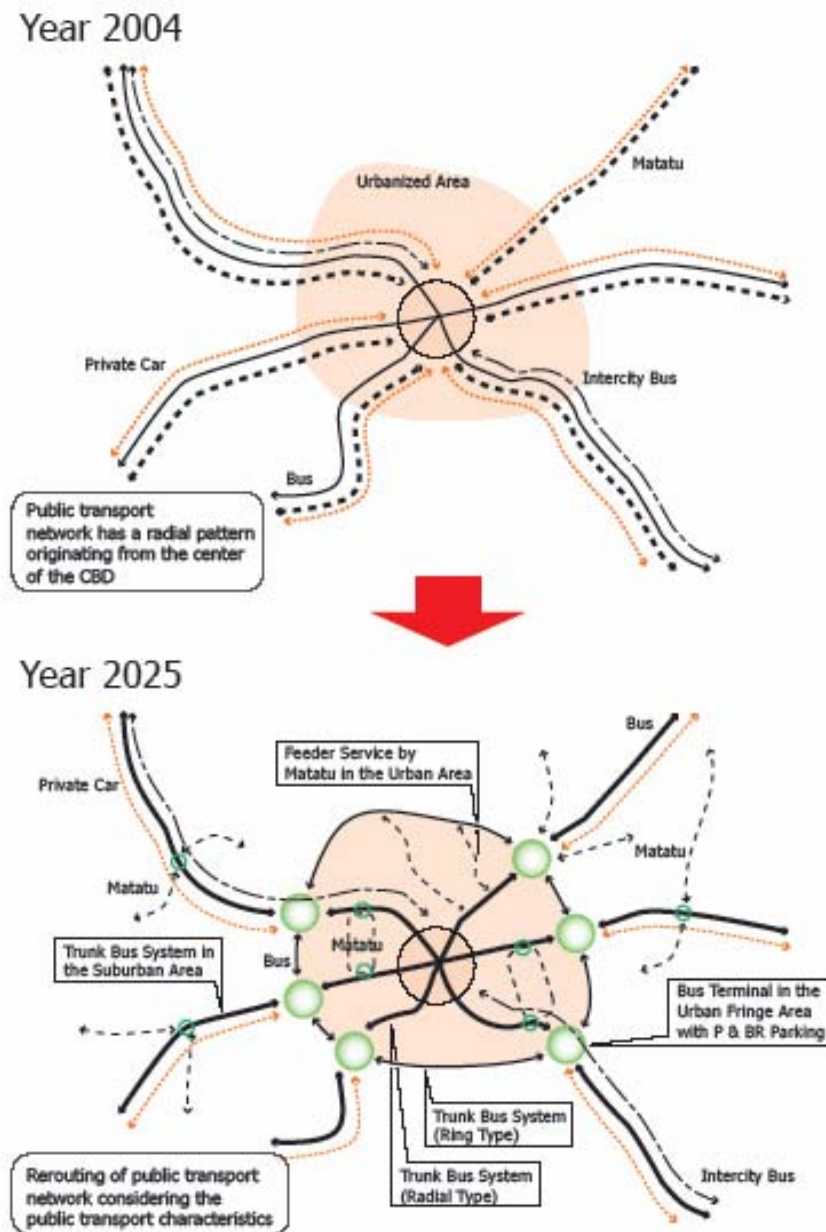


FIGURE 19.2-1 CONCEPTUAL IMAGE OF REROUTING OF PUBLIC TRANSPORT NETWORK

Based on the future public transport demand by corridor, comparison between various public transport system characteristics by the World Bank, current public transport mode characteristics and transport network in the Study Area, the proposed bus/matatu corridor plan is described below and schematically represented in Figure 19.2-2.

The outline of bus/matatu transport plan by major corridor is as follows:

(1) Northern corridor (Thika Road)

This is one of the busiest corridors (447,200 trips/day) in the Study Area because of the rapid urbanization along the corridor. To cope with this demand, not only bus

priority/exclusive lane along Thika Road but also busway using median of Thika Road, and improved commuter rail of Thika line are introduced.

(2) Eastern corridor (Juja and Jogoo Roads)

This is the busiest corridor (771,400 trips/day) in the Study Area because of the high pressure of residential development along this corridor. To cope with this demand, not only bus priority/exclusive lane along Juja, Jogoo and newly developed New Nairobi River Road but also busway along Jogoo Road, and improved commuter rail of Thika line are introduced.

(3) Southwestern corridor (Mombasa Road)

The public transport demand along this corridor is 508,000 trips/day. To cope with this demand, not only bus priority/exclusive lane along Mombasa Road but also busway using the median of Mombasa Road, and improved commuter rail of Athi River line are introduced.

(4) Southwestern corridor (Langata Road)

The public transport demand along this corridor is 392,000 trips/day. To cope with this demand, not only bus priority/exclusive lane along Langata Road but also busway using Langata Road is introduced.

(5) Western corridor (Ngong Road, etc)

The public transport demand along this corridor is 480,200 trips/day. This corridor is car-oriented because the land use along Ngong road is characteristic of relatively high-income residential areas. To cope with this demand, bus priority/exclusive lane along Ngong Road is introduced and diversion of the public transport demand using circumferential bus corridor such as C3 is attempted; improvement of commuter rail for the Limuru line is also introduced.

(6) Northwestern corridor (Waiyaki Way)

This is one of the busiest corridors (450,300 trips/day) in the study area. To cope with this demand, not only bus priority/exclusive lane along Waiyaki Way but also busway using median of Waiyaki Way is introduced.

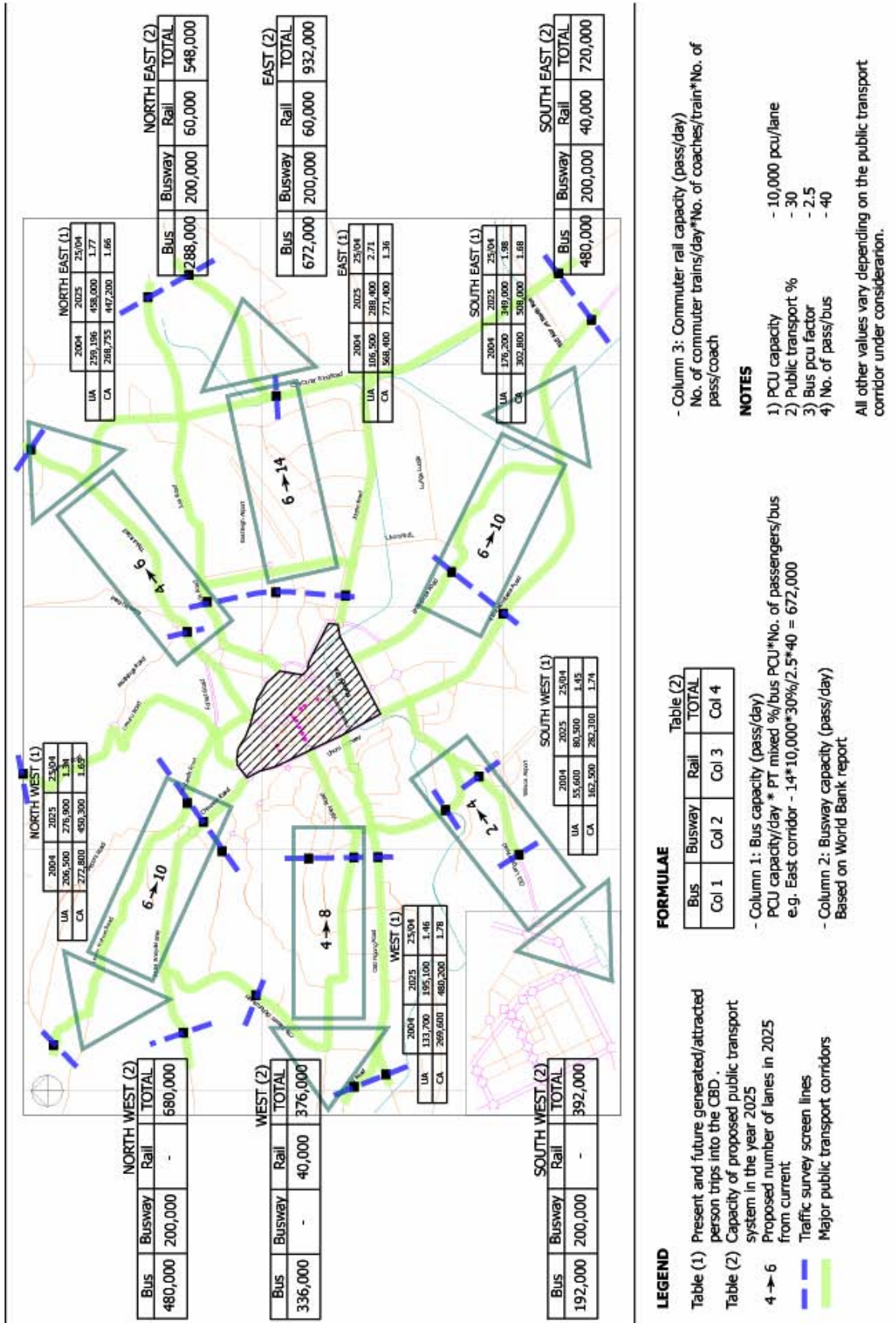


FIGURE 19.2-2 PROPOSED BUS/MATATU CORRIDOR PLAN

Considering the long history of the matatu system, the change of public transport demand, investment possibility and project reality, it is necessary to introduce the staging plan for the future bus/matatu transport plan.

An outline of the staging plan along typical major public transport corridors is given below and illustrated in Figure 19.2-3.

(1) Short term

Cut the long distance matatu routes such as Thika route at the urban fringe and develop a transfer terminal at this point together with park-and-bus-ride parking spaces, and introduce the bus routes in the urbanized area side. Along the improvement/development of bus stop/terminal, strict enforcement of regulations pertaining to loading/unloading and distribution of bus/matatu route maps are requirements to increase the convenience of bus operation.

(2) Medium term

All public transport routes along the major roads in the urbanized area shall be to bus routes. New types of bus services and bus priority/exclusive lanes are then introduced.

(3) Long term

Development of the efficient, safe and convenient public transport system, such as development of bus-way, is the target for 2025.

It is necessary to implement various bus priority measures such as bus priority/exclusive lanes, express bus and park-and-bus-ride systems for the preparation of various bus services in favour of the public transport users.

One of the effective measures for bus services is the introduction of various kinds of operations along the major transport corridors, as shown in Figure 19.2-4. The existing and future bus/matatu fleet size and types of buses is shown in Figure 19.2-5.

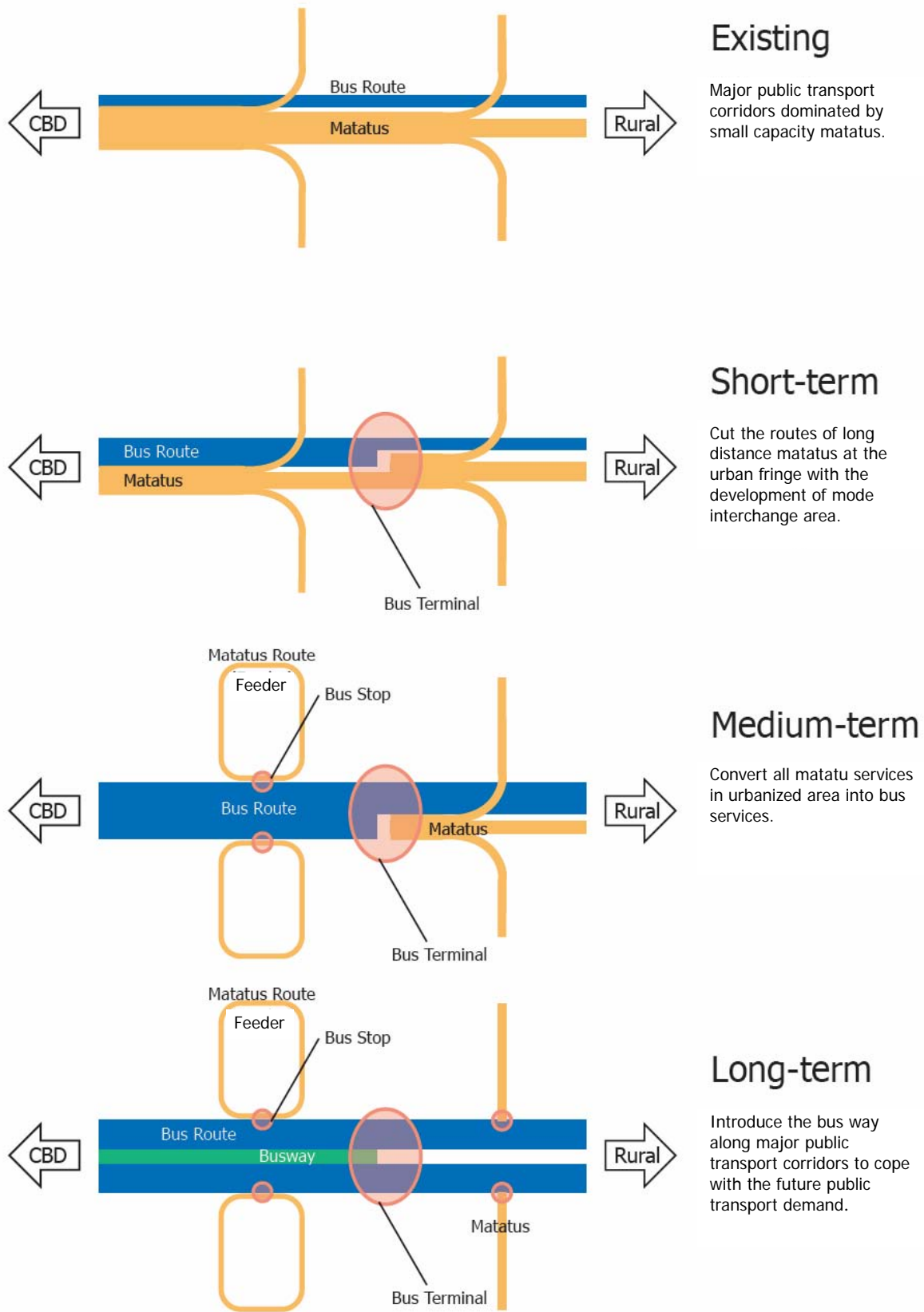


FIGURE 19.2-3 CONCEPTUAL STAGING PLAN OF BUS/MATATU SYSTEM

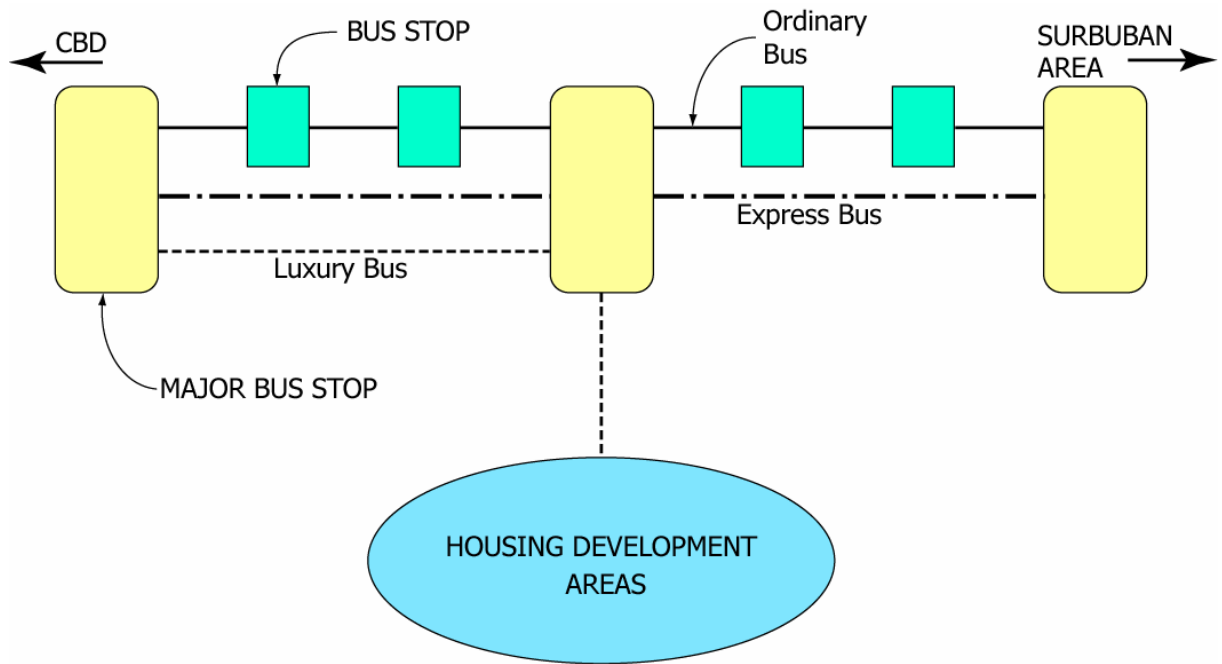


FIGURE 19.2-4 VARIOUS BUS SERVICES

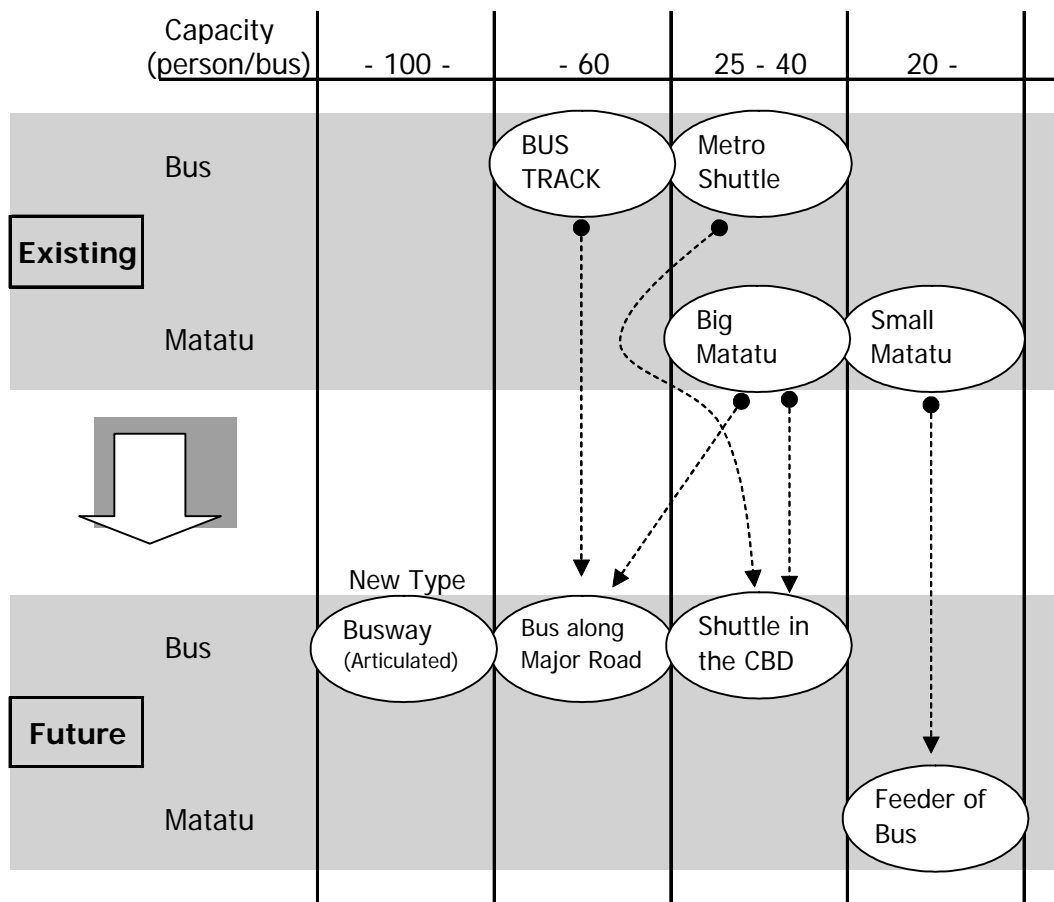


FIGURE 19.2-5 BUS/MATATU FLEET SIZE AND TYPE OF BUS

CHAPTER 20

TRAFFIC MANAGEMENT PLAN

CHAPTER 20 TRAFFIC MANAGEMENT PLAN

20.1 BASIC CONSIDERATION OF TRAFFIC MANAGEMENT MEASURES

The following measures on traffic management are examined in view of rejuvenating the city activities by adopting the maximum use of limited urban space with the aim of decreasing traffic congestion.

(1) Examination of Parking Policies and Countermeasures

Urban activities are deteriorating because most road spaces are used as parking slots. Therefore, parking countermeasures and policies are some of the most urgent issues to be resolved in the CBD of Nairobi.

(2) Traffic Demand Management in CBD

Car traffic volume is increasing rapidly because there is no alternative mode of transport at present. Therefore, it is necessary to provide alternative public transport modes to reduce the numbers of cars for the creation of safe, comfortable and vigorous urban environment.

(3) Traffic Safety Education and Traffic Regulation Enforcement

It is necessary to introduce traffic safety education not only to the citizens and drivers but also to the children. Strict enforcement of traffic regulations handled by the traffic police should be emphasized in order to decrease traffic accidents.

20.2 PARKING FACILITY IN CBD

20.2.1 Introduction

Nairobi is not only the capital city of Kenya but also the business/commercial center in the Eastern African Region. However, the functions of Nairobi metropolitan area as a central business district (CBD) in the region are undermined by the inefficient use of road space, such as illegal on-street parking because of the rapid increase of cars, the lack of a convenient public transport system and cheap parking fees in the CBD. Based on the current parking situation therefore, it is necessary to recommend adequate parking countermeasures to cope with future parking demand.

20.2.2 Current Situation of Parking Supply and Demand

Based on aerial photos and site surveys in the CBD as well as interviews from the relevant agencies/organizations involved in the participation and management of CBD activities, the

capacity and demand (maximum occupancy from 14:00 to 15:00 hrs) of car parking space by type is summarized in Table 20.2-1.

TABLE 20.2-1 PARKING SPACE AND DEMAND IN CBD

Items		Capacity	Demand	Difference
Off-road	Parking Bldg.	4,035	3,158	877
	Parking Lot	1,702	1,484	218
	Subtotal	5,737	4,642	1,095
On-road	Parking Slot	4,480	4,480	0
	Curb	-	2,278	-2,278
	Subtotal	4,480	6,758	-2,278
Total		10,217	11,400	1,183

From field surveys and observations, it is found that the demand for on-street parking is higher for the following reasons:

- It is more convenient because a driver may park closer to his/her destination depending on the availability of parking space.
- On-street parking is generally cheaper because the charge is neither time-based nor space-based, therefore one can park anywhere and at anytime with the same parking ticket (one flat rate of Ksh 70 is charged throughout the day).
- Some of the off-street parking areas and especially basement parking are mainly reserved for the building tenants.

From the results of the parking survey it is clear that the current parking demand exceeds the capacity. This trend is expected to continue in the future as demonstrated in the following section.

20.2.3 Future Parking Demand

Based on the Person Trip Survey Data, the estimated generated/attracted car traffic to/from the CBD by year is shown in Table 20.2-2.

TABLE 20.2-2 GENERATED AND ATTRACTED TRAFFIC BY YEAR

YEAR	2004	2010	2015	2025
Cars	231,948	236,583	241,218	317,674
Increase Rate	-	1.02	1.04	1.37

From the survey results and above data, and assuming that the rate of increase of generated/attracted traffic and car parking demand is constant, the future parking demand is shown in Table 20.2-3.

TABLE 20.2-3 FUTURE PARKING DEMAND

Item	2004	2010	2015	2025
Off-Road	4,640	4,733	4,826	6,357
On-Road	6,760	6,895	7,030	9,261
TOTAL	11,400	11,628	11,856	15,618

A comparison of the current parking conditions in the CBD and the expected future parking demand shows that it is necessary to undertake measures aimed at improving parking conditions both in short term and in long term provisions.

20.2.4 Countermeasures

(1) Development of Multi-story Car Parking

This would maximize the use of off-street parking and ease the demand on on-road parking.

Basic Considerations

In the development of multi-story (2-story) parking buildings, some basic factors need to be considered and these are:

- Environmental and social issues
- Expected capacity of the new parking buildings
- Effective use of the facilities
- Individual locations of the parking facilities

The total increased parking capacity in the CBD after such development is shown in Table 20.2-4.

TABLE 20.2-4 IMPACT OF DEVELOPMENT OF NEW PARKING FACILITIES

	Capacity	Demand	Balance
On-Road	4,480	6,760	-2,280
Existing off-Road	5,740	4,640	1,100
New Parking facilities	1,000	-	1,000
TOTAL	11,220	11,400	-180

Figure 20.2-1 shows the proposed locations for development of 2-story parking buildings.

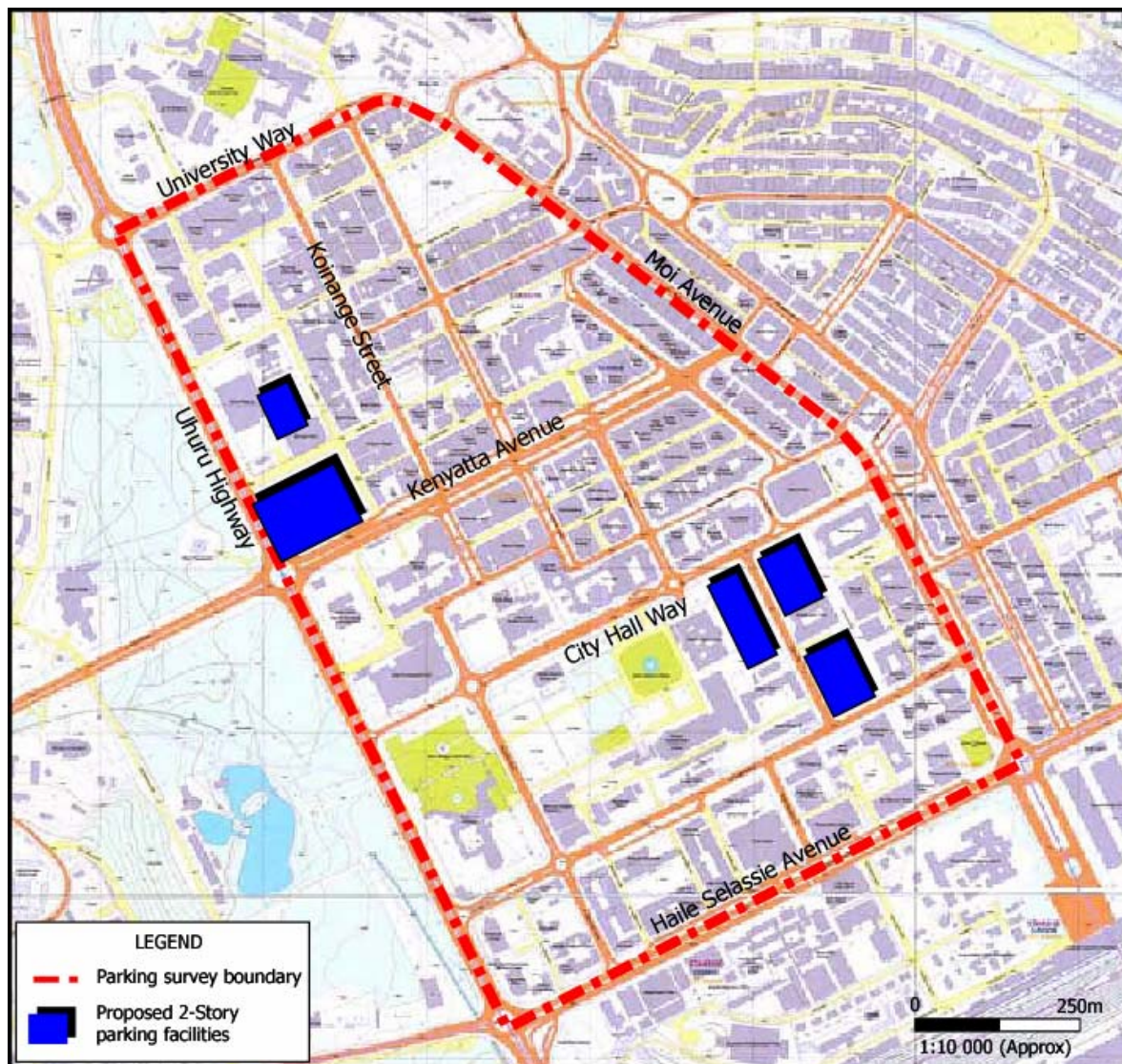


FIGURE 20.2-1 LOCATIONS OF THE PROPOSED 2-STORY CAR PARKING FACILITIES

(2) Parking Guide System

The fundamental idea for the provision of an adequate parking guide system is to maximize the parking space utilization and to minimize traffic congestion caused by car users that constantly seek vacant parking space in the busy CBD. The parking guide system is usually installed at the entrance of the CBD, say, at the corner of Kenyatta Avenue and Uhuru Highway. This is an electric panel that provides information on the parking situation in terms of availability of space, and the shortest access route to the vacant parking space.



**Bluewater Shopping Centre
- England**



**Phoenix Sky Harbor International
Airport – Phoenix, USA**

Source: www.tcsint.com

FIGURE 20.2-2 EXAMPLES OF PARKING GUIDE SYSTEM

Examples of parking guide systems in the other cities are shown in Figure 20.2-2.

(3) Sensitivity Analysis of Parking Fees in CBD

Based on the Person Trip Survey and Car User Interview Survey, the results of sensitivity analysis of parking fees in Nairobi CBD are summarized in Table 20.2-5. It appears that the parking demand may be restrained to the existing capacity if the fee is increased to Ksh 250.

TABLE 20.2-5 SENSITIVITY ANALYSIS OF PARKING FEES IN CBD

Destination Zone	Trip Attraction by Car Mode (Unit: Person Trip/Day)				
	70 Ksh	100 Ksh	150 Ksh	200 Ksh	250 Ksh
1	57,772	54,914	50,274	45,848	41,683
2	57,603	54,748	50,122	45,717	41,556
3	57,603	54,748	50,122	45,717	41,556
TOTAL	172,978	164,410	150,518	137,282	124,795
Reduction	-	0.95	0.87	0.79	0.72
2025 demand	15,618	14,837	13,588	12,338	11,245
Existing capacity	11,220				

Note: Zones 1, 2 and 3 of Person Trip Survey represent the CBD.

20.3 TRAFFIC DEMAND MANAGEMENT

One of the effective countermeasures to improve traffic conditions in Nairobi CBD is the pursuit and subsequent implementation of effective parking policies and measures. However, this will not necessarily guarantee a permanent solution to the existing parking problems. The need for an improved and convenient alternative mode of transport cannot be compromised if the private car user has to stop commuting to the CBD by car. Based on the discussions in the previous sections, it is recommended that the fundamental measures to alleviate traffic problems is the introduction of comprehensive countermeasures, i.e. the combination of various traffic demand management to Nairobi CBD.

Based on the typical measures of traffic demand management implemented in various cities in the world, the followings are the applicable measures to the Nairobi CBD considering the traffic characteristics and behavior of the Study Area.

(1) Parking Policies and Measures (as described in the previous section)

- Parking fees
- Development of parking buildings
- Introduction of parking guide system

(2) Staggering of Working Hours

The attracted trips to CBD by car from 7:00 to 9:00 (2 hours) are 75% of total daily trips as shown in Figure 20.3-1. This shows a high concentration of trips in the morning to the CBD which causes serious traffic jams in and around the CBD. Introduction of staggered working hours into the CBD from 6:00 to 10:00 will drastically decrease the incoming peak traffic into the CBD by 43% or 2 hours (7:00 – 9:00) worth of traffic theoretically. But some of the difficulties associated with the staggering of work hours are: loss in customer contact, and inconvenience to private motorists transporting family members to work, school or shop, etc. Therefore, it is difficult to gain public acceptance of this measure. A successful program of staggering of work hours depends on the integration of a wide range of business and other activities and preparation of various modes such as convenient public transport systems.

(3) Improvement of Public Transport

The improvement of the public transport system, described in Chapter 19, is the basis of proper traffic demand management.

(4) Park and Ride and Bus Ride

For ‘park and ride’ to be effective, it is necessary to have secure and convenient parking spaces close to public transport stations/terminals/stops. Parking payment can be integrated with public transport fares. Many successful ‘park and ride’ schemes are associated with rail transit.

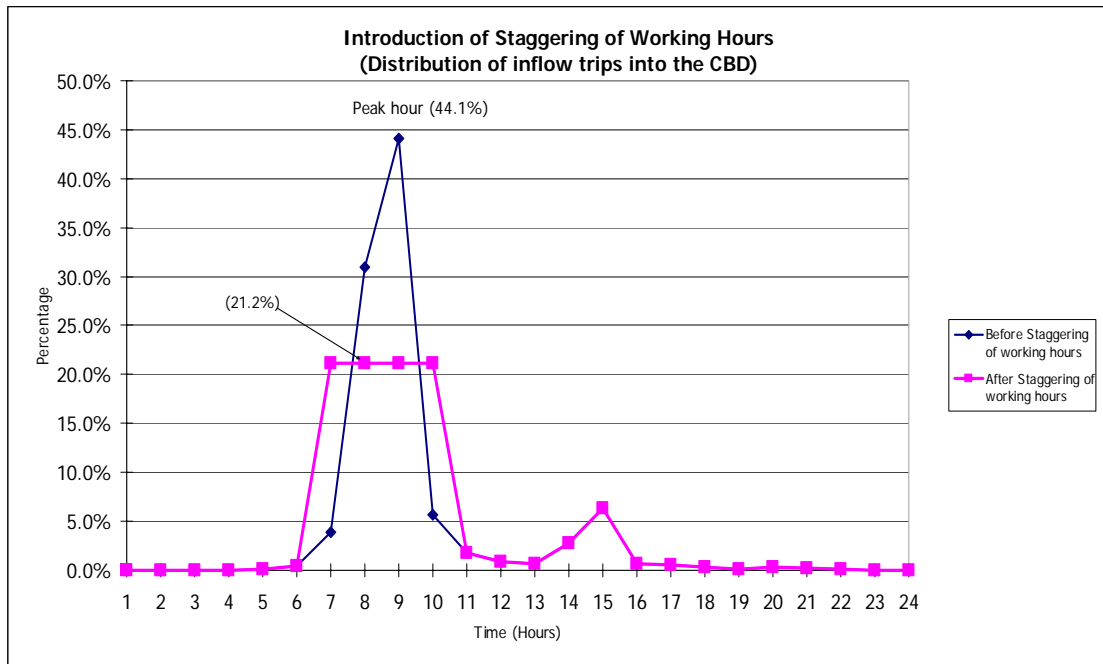


FIGURE 20.3-1 PROPOSED STAGGERING OF WORKING HOURS INTO THE CBD

20.4 TRAFFIC SAFETY EDUCATION AND TRAFFIC ENFORCEMENT

It is necessary to introduce traffic safety education and traffic enforcement thoroughly to safeguard against increasing traffic accidents including the strict matatu regulations in Nairobi metropolitan area. The following are the proposed countermeasures for consideration to decrease traffic accidents based on the traffic characteristics and behavior in Nairobi metropolitan area.

(1) Introduction of System for Traffic Accident Data and Analysis

Currently, traffic accident data is collected manually and individually by traffic police. This is not an appropriate method to conduct traffic engineering analysis for formulating effective countermeasures to reduce traffic accidents. Therefore, it is necessary to introduce a system for integrating such processes as building a database on accidents, analyzing causes of accidents using analytical programs and examining suitable countermeasures in a unified way. The system gives priorities to identifying appropriate measures against locations of high traffic accidents.

(2) Implementation of Periodical Traffic Safety Campaign

Traffic safety campaign is one of the most effective countermeasures in reducing traffic accidents. Moreover, constant periodical implementation of these campaigns at a national, local and district level usually has a relatively greater impact on the public.

(3) Coordination of Driving Manner Education Program done by Various Companies/Organizations for Drivers including Public Transport

Currently, the driving manner education program to the drivers is implemented by individual companies/organizations such as driving schools, bus companies and NGOs. Coordination of these companies/organizations is essential to develop an efficient and effective driving manner education program to the drivers.

(4) Traffic Safety Education for the Schoolchildren

The introduction of traffic safety education to the school curriculum is worth doing, as it is an experience the children could value over their entire life, positively influencing their behavior as future vehicle drivers. They could also exert a large influence over the traffic behavior of their family members. Examples of traffic safety education materials for children in Japan are shown in Table 20.4-1.

(5) Strengthening the Traffic Enforcement by the Traffic Police

It is more effective to select certain regulations and enforce them at a selected time period, day of week etc. rather than try to enforce all the rules simultaneously. This method of selective enforcement makes a greater impression on drivers and is easier for the enforcement officers to perform their duties.

In selecting the regulations to be enforced, violations or causes of traffic accidents that most frequently occur can be listed, based on analyses of traffic accidents, and then given a priority ranking. Those with high priority will then be selected for enforcement.

The recommended areas for selective enforcement based on site observations and traffic accident data from traffic police are as follows:

- 1) Drunk-driving
- 2) Ignoring traffic signals
- 3) Illegal on-road stopping/parking at/near intersections, especially matatus
- 4) Pedestrians crossing the road without the Zebra or crosswalk marking



<http://www.lrta.org/montpellier.html>

FIGURE 20.4-1 EXAMPLES OF TRAFFIC SAFETY EDUCATION MATERIALS FOR CHILDREN

CHAPTER 21

INSTITUTIONAL PLAN

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21.1 ISSUES FOR TRANSPORT INSTITUTION

Reflecting Kenya's national institutional status of the transport sector, responsibilities regarding the transport sector in the NMA are fragmented among the different government ministries and departments, CCN, municipalities, town councils, county councils, and DRCs. This condition of the sector in the NMA, which tends to create unnecessary use of the resources represented by duplication and/ or dispersed efforts mostly associated with inefficiency and lower efficacy due to lack of or insufficient coordination, is one of the main expected causes to hinder effective and efficient implementation of the Master Plan. This situation is aggravated by the increased requirement of the harmonized efforts corresponding to the expected expansion and advancement of urban activities in the NMA.

The responsibilities for Kenya's roads sector are fragmented among different government ministries and departments as shown in Figure 21.1-1, as well as different levels of governments and the sector. This feature of fragmentation is observed in the fields of public transport and traffic management as described in Chapter 5, Chapter 6, and Chapter 7. Major road-based public transport services, bus and matatu, are provided by private operators and are virtually under the *laissez-faire* (non-interference) principle. They are operating without coordination with the rail transport services provided by KR. Traffic management measures to control traffic flow and volume together with those for the traffic safety are almost independently conducted by various organizations.

Consequently, coordinated efforts among the sub-sectors of the transport sector are rarely observed. The road-based public transport service providers are not harmonized with the traffic management. Synchronization of road infrastructure system improvement and traffic management is rarely observed. Furthermore linkage between land use planning and transport sector planning including infrastructure development/ improvement, traffic management and public transport service provision is virtually non-existent. It is ideal that transport sector development functions be established as a guiding tool for the materialization of desirable land use.

Current efforts by the Kenyan side and possible measures regarding the institution to address these issues are described in the subsequent sections. An institutional plan of relevant agencies such as CNN is described in Section 29.11.4 of Chapter 29 and Section 30.12 of Chapter 30.

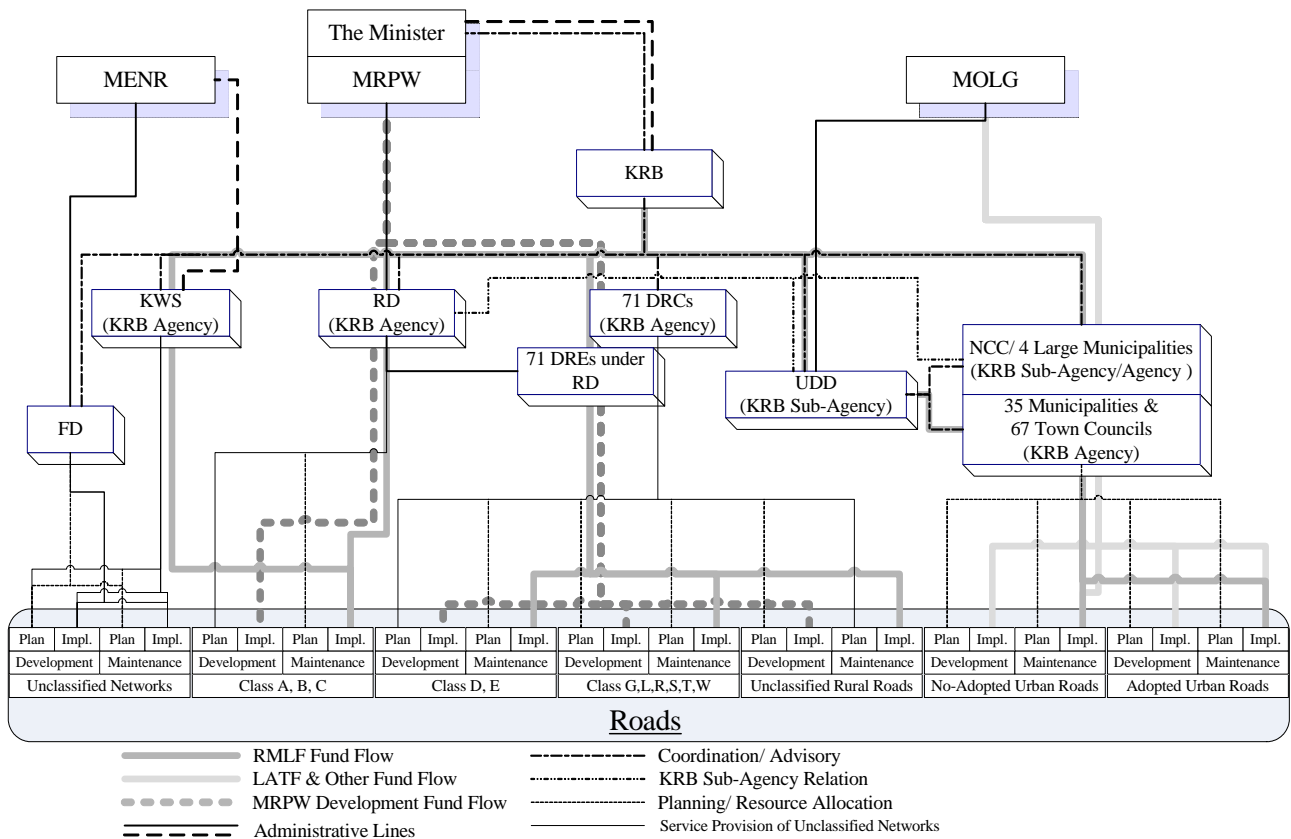


FIGURE 21.1-1 MAJOR PLAYERS OF ROADS SECTOR AND MAJOR FUND FLOWS

21.2 KENYAN EFFORTS FOR INSTITUTIONAL IMPROVEMENT

Establishment of a New Organization for the Nairobi Metropolitan Area Planning and Development

Establishment of a new organization which shall take responsibility of development planning of the area almost identical to the NMA is ongoing. Its establishment is anticipated by the next fiscal year starting from July 2005.

(1) Expected Characteristics

Although details of organizational arrangement including its functions, authorities, responsibilities and finance may yet to be established, the following characteristics of the organization are duly conjectured to be established according to the draft of the respective Presidential Order:

- It is an autonomous state corporation to be established under a particular minister by the presidential order;
- Its tentative title is the Nairobi Metropolitan Authority;
- Its basic authorities are similar to the ones of the regional development authority;
- Its basic functions are coordination of the overall strategic planning and planning

implementation of the Area;

- Its functions for the area include 1) strategic socio-economic and spatial development planning and coordination, 2) urban development program planning and implementation, 3) undertaking and directing of appropriate study and research, 4) information management system development, and 5) mobilization of local and international support for the development;
- Its board members include the Permanent Secretaries of MOLG, MOF, and MOLH, and enough numbers, which formulate majority of the board, of persons from the non public servants; and
- It retains a fund sourced from self-earning, government support, as well as donation and/or lending.

(2) Expected Planning and Implementation Relationship

The expected planning and implementation relationship among the relating organizations is illustrated in Figure 21.2-1 with the respective fund provision relationships. The above mentioned characteristics indicate that the new organization may have coordinating fund allocation authority for the plan implementation while it has a capacity to implement it’s own development programs with its own funds derived from various sources by various means.

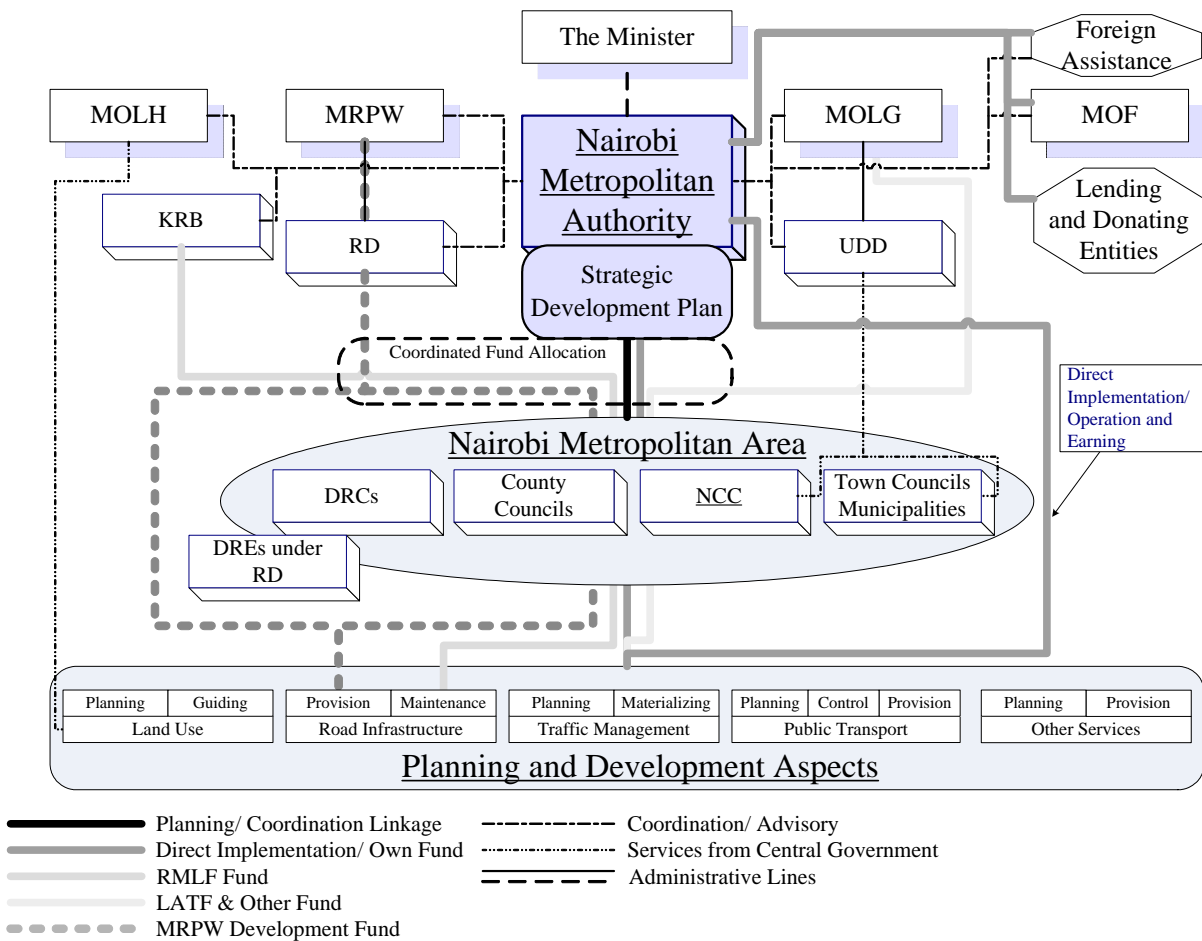


FIGURE 21.2-1 EXPECTED PLANNING AND IMPLEMENTATION RELATIONSHIP OF THE NMA

21.2.1 Roads Sector Institutional Reform

As described in the Appendix 21, reform activities of the roads sector in Kenya were initiated by the GOK leadership in 1992 with recommended direction of the realization of Road Management Initiative (RMI) embraced in the Sub-Saharan Africa Transport Programme (SSATP) under the World Bank. Based on the recommendation, the establishment of RMLF was materialized in 1993/94 followed by the commencement of KRB operations in 2000.

There have been several recommendations for further institutional reforms of the sector. The following studies have proposed such recommendations:

- Road Sector Strategy Review and Stock Take Conference in 2002, funded by RMI/SSTP under the Transport Sector Memorandum prepared by the World Bank with collaboration of several donor agencies in 2002,
- Study on the Kenya transport Policy and Roads Sub-Sector Policy and Strategy by KRB with a consultant financing from the EU in March 2004,
- Integrated Transport Policy for the country prepared by the inter-ministerial Task Force of the Government in January 2004, and
- Reform Task Force under the then Ministry of Road, Public Works and Housing with consultants financed under the World Bank's Northern Corridor Project in March 2004.

Since the above recommendations do not synchronise with each other in several aspects, further contemplations are required to reach a conclusive resolution for further reforms. The followings are the major differences in the recommendations:

- Whether functions of the funding organizations should include overseeing and coordinating functions in association with the issue of necessity regarding an overall roads sector coordinator,
- Whether Jurisdiction of classified roads should deal only with Class A and B roads excluding class C roads or bunch Class A, B, and C together as in the current system, and
- Whether to utilize the current DRCs-DREs structure, institutional arrangement for dealing with lower class roads and unclassified roads.

21.2.2 Human and Organizational Capacity Building

The following human and organizational capacity building programs are under consideration for implementation as part of the EU funded capacity building program:

- Enhancement of Kenya Institute of Highways and Building Technology (KIHBT) to have capacity to implement the Structured Engineers' Training Programme and facilitation of Senior Roads Executive Programme (SREP) with support by the Project Management Unit and Foreign Technical Assistance,
- Implementation of the Structured Engineers' Training Programme,
- Introduction of the University of Birmingham's SREP to Kenya,
- Testing Equipment provision to the Materials Department of MRPW,

- Support to road safety activities,
- Implementation of Best Option Study for Axle Load Control,
- Formulation of Policy and Strategic Plan for ICT, and
- Preparation of Design and Maintenance Manuals.

In addition to the above, “Reclassification of Roads and Road Inventory and Condition Survey for Unclassified Roads” is under process for implementation under the finance of the Nordic Development Fund, which will contribute to the establishment of a unified Road Maintenance and Management System. The following programs are considered necessary undertaking by the GOK to further the above mentioned programs:

Legal Review; Preparation of Rules, Regulations, Procedures, and Guidelines for Road Agencies; and Study on the introduction of concrete roads.

21.3 RECOMMENDATIONS FOR INSTITUTIONAL DEVELOPMENT

Since major organizational restructuring required for the road sector is not yet completed by the Government as stated in Sub-Section 21.2.2, marginal and realistic improvements of operations of two key organizations in Kenya’s roads sector - MRPW with its RD and KRB and the planned Nairobi Metropolitan Authority (NMA) which is directly related to the Master Plan implementation - are recommended.

21.3.1 Recommendations to the New Organization of the NMA based on the Transport Sector’s View Point

(1) Enhancement of Linkage between Land Use Plan and Transport Sector Plan

It is important for the newly established organization to coordinate the entire development plans, programs, and activities in the NMA through provision of an overall land use strategy and a broad development framework by formulation of the strategic development plan of the area. In this context the comprehensive transport planning in association with the land use plan has to be emphasized and enhanced.

(2) Establishment of Firm Linkage between Plan and Fund Allocation

For the success of the Metropolitan Planning Organization which conducts inter local authority transport planning as illustrated by Dr. Hyodo’s booklet entitled “A Sketch of the American Transport Planning” published in August 1999, it is important for a regional planning entity to retain a certain degree of discretion capacity regarding fund allocation to the local authorities of the area considering materialization of the prepared plan.

Considering the current fund availability for the transport sector, establishment of firm linkage between a plan and fund allocation is necessary for the following:

- RMLF and cess fund administered by KRB,
- Development budget administered by MRPW, and
- LATF administered by MOLG.

For proper execution of this function and for the establishment of this functional relationship, appropriate visions and long term plans are indispensable as a base for the formulation of the short and medium term implementation plans. The former are important in judging whether a particular project/ program is appropriate or not. For this purpose, its functions of preparing strategic plans for the area, and undertaking and directing of appropriate study and research have significant importance.

(3) Utilizing Transport Sector Programs as Guiding Tools for Materialization of Intended Land Use and Socio-Economic Development

Implementation of proper transport sector programs enables or aids in the materialization of intended land use. For this purpose, strategic implementation of the programs especially falls under categories of public transport service provision and traffic management described in Chapters 19 and 20 besides coordinated implementation of development and rehabilitation/ maintenance programs for the road network.

Among them the following direct implementation, operation, and/ or fund provision by the organizations are possible and/ or desirable based on their capacities to implement development programs and to operate services together with area wide coordination authority:

- Bus and matatu route development/ reorganizing and control in coordination with the rail commuter service development,
- Bus service provision in coordination with the desirable new area development,
- Establishment of bus lane,
- Development, operation and maintenance of mode interchange areas,
- Traffic demand management program planning and implementation, and
- Traffic safety education and enforcement activity coordination.

Fund raising capability development is essential in this regard.

21.3.2 Organizational Capacity Building of MRPW and RD

(1) Issues for Organizational Capacity Development

Main issues for the organizational capacity development of MRPW and RD for road development, rehabilitation and maintenance have been identified through discussions with RD staff. They are as follows:

- Lack of adequate funding for project/ program implementation,
- Inadequate monitoring and evaluation of project/ program implementation by in-house operations,
- Lack of policy to formulate comprehensive strategy for performance improvement,
- Lack of principles in fund allocation,
- Inadequate planning and management system,
- Inflexible organizational structure hindering effective shift of staff,
- Overlap of duties in various departments and units, and
- Improper supervision of public works due to lack of staff.

(2) Recommended Actions

MRPW in general and RD in particular have large human resources equipped with vehicles, equipment and facilities, and reasonably good track records, although the district offices are suffering from insufficient equipment and poor allocation of other resources. With the given resources, their performance may be improved through adopting more performance-oriented management by using key performance indicators supported by enhanced information technology application.

Performance improvement of any service organization involves several steps.

Step 1: Core functions for the organization to perform need to be clearly identified, and output (services delivery), clients and reporting responsibilities need to be defined.

Step 2: Management strategy should be established to perform the core functions most effectively with given resources.

Step 3: Performance indicators need to be developed to represent important components of the management strategy.

Step 4: Expected attainment levels of performance should be set together with a target date.

Realistic targets should be set on the basis of evaluation of available resources and plan for their expansion. For human resources, the attainment levels of performance by various indicators should be linked to staff salary distribution.

For enhanced information technology application, the following should be undertaken immediately.

- On networking, each department of MRPW should build a LAN connected to the central sever of the MRPW headquarters. This will involve structured cabling, servers, and software to manage the network. The software in MRPW should be standardized for easy communication and transfer of data and files.
- On specifications of networking, MRPW is currently developing standard specifications for procuring network services capable of supporting voice, video and data communications. This has so far been successfully applied to KRB offices. The same should be accomplished for MRPW including field offices.

- On connectivity, currently connection is through normal telephone lines. This is not efficient with low speed, and lacks security. It is also not reliable to serve districts far away from the headquarters. Envisaging the use of leased lines, microwave links and satellite incremental connectivity improvement in terms of the speed and reliability should be implemented.

Training is essential to achieve the objectives of the Government Information Technology Strategic Plan. Considering the status of IT application in Kenya, broad based training is necessary, covering users, system administrators, hardware engineers and technicians, and network administrators to enable continuity in use of machines and equipment by appropriate maintenance and accumulating development to the current assets. MRPW as a major implementing agency of the Government with many provincial and field offices should perform the leading role in the IT drive of the Government.

21.3.3 Organizational Capacity Building of KRB

(1) Issues for Organizational Capacity Development

As KRB represents a relatively new institution in Kenya's roads sector, it contains various issues for the capacity development related to communication with other organizations, insufficient track records, and some provisions of the KRB Act. Major issues have been identified through discussions with KRB staff as follows:

- Heavy reliance on the RMLF as a single fund source and over commitment,
- Lack of an adopted comprehensive and documented national policy and incomplete guidelines and operation manuals, and resulting difficulty in performing coordination function of the policy implementation stipulated by the KRB Act,
- Incomplete technical, financial and management system for monitoring and evaluating the implementation of the APRP,
- Inadequate information and communication technology capacity in terms of a wide area network (WAN) and non-functional road management system (RMS),
- Short track records in road maintenance,
- Insufficient capacity in accessing ongoing R&D and assessing R&D needs,
- Insufficient public information and education on KRB activities, and
- Inadequate provision of the KRB Act for succession of the Board of Directors.

(2) Recommended Actions

Under the powerful Board of Directors, KRB has a total of some 30 staff including highly qualified supporting staff to perform well-documented functions. The KRB performance should improve as its track records are built up but deliberate efforts are necessary in some areas to strengthen their functions.

The management function of road funds should be expanded to cover not only the RMLF but other possible fund sources as well. Some international donors have expressed their willingness to channel their resources through KRB, and some have already started to do so. This is in line with the KRB Act provision as far as road maintenance is concerned.

To strengthen the monitoring function of road agencies, the APRP should be more effectively utilized. Performance indicators should be developed and expected attainment levels of performance should be specified in annual roads programme of each road agency. Monitoring and evaluation in the light of the APRP should be supported by enhanced information technology application.

21.4 CAPACITY BUILDING AND INSTITUTIONAL DEVELOPMENT

To implement the proposed institutional plan, a project framework of capacity building and institutional development is prepared below.

Costs associated with inputs of some soft measures of the urban transport system improvement are estimated. They cover public education and campaign as part of traffic management, capacity building at traffic institutions, and institutional development related to the proposed Nairobi Metropolitan Development Authority. An estimate of costs of main inputs is summarized in Table 21.4-1.

TABLE 21.4-1 ESTIMATE OF COSTS INVOLVED IN CAPACITY BUILDING AND INSTITUTIONAL DEVELOPMENT

Cost category and element	Estimated cost (million Ksh)	Description
1. Traffic Institution		
1.1 Capacity building		
(1) seminars/ workshops	50	25 persons x 10 institutes x 20 times/yr x 5 years at Ksh 2,000/person
(2) study tours overseas	50	20 persons x 10 times at Ksh 250,000/person-time
Sub-total	50	
1.2 Institutional development		
(1) Master planning and Studies	50	5 studies for master planning at Ksh 10 million/study
(2) Advisory	50	25 months at Ksh 2.0 million/month
Sub-total	100	
Total	200	

(1) Overall Goal

- To coordinate efforts among the sub-sectors of transport sector.
- To harmonize the road-based public transport with traffic management.
- To synchronize road infrastructure development and traffic management.
- To establish transport sector development functions as guiding tools for the materialization of desirable land use.

(2) Project Goal

To implement the Master Plan effectively and efficiently in terms of institutional functions.

(3) Expected Outputs

1. The new organization of the NMT based on the transport sector's viewpoints is established.
2. Organizational capacity building of MRPW & RD is enhanced.
3. Organizational capacity building of KRB and relevant agencies is enhanced.

(4) Main Activities

- 1-1 To enhance linkage between land use plan and transport sector plan
- 1-2 To establish firm linkage between plan and fund allocations
- 1-3 To use transport sector programmes as guiding tools for materialization of intended land use and socio-economic development

- 2-1 To improve performance of relevant service agencies
- 2-2 To establish realistic targets
- 2-3 To enhance information technology application
- 2-4 To conduct trainings to achieve objectives of IT

- 3-1 To build up staff track records
- 3-2 To expand management function of road funds
- 3-3 To strengthen the monitoring function

CHAPTER 22

FINANCING PLAN

CHAPTER 22 FINANCING PLAN

22.1 POSSIBLE FUND ALLOCATIONS TO THE TRANSPORT SECTOR IN THE NMA

According to the available statistical sources, central government expenditure on the transport sectors is only distinctively available for the roads sector, since other transport organs are specified in consolidated terms with one communication modes. At the same time, since the proportion of the expenditure on other transport and communication modes is much smaller compared to the one of the roads, analysis on the possible fund allocation is limited to the roads sector. Financing on the rail investment for commuter transport service is examined separately and described in Sub-Section 22.1.2.

Existing budget allocations to the road sector are examined in Chapter 8. Although the funding base for road infrastructure in the NMA is expected to expand through the enhanced private sector participation and the strengthened local revenue base as well as the improved financial management as discussed in Section 22.2, the bulk of funding has been derived from the Central Government Sources. Consequently, as an indicator for the possible allocation of the roads sector development fund against the national economy, reasonably expected government expenditure on roads in the coming decades is analyzed based on the past records, whilst allocations to road infrastructure in the NMA are determined.

22.1.1 Possible Development Expenditure on Roads

(1) GDP and gross fixed capital formation

The gross domestic product (GDP) and the gross fixed capital formation (GFCF) of Kenya in recent years are compared in Table 22.1-1. The ratio of the GFCF to the GDP declined consistently from 17.7% in 1999/00 to 14.1% in 2003/04. The GFCF by the Central Government decreased its ratio of the GDP from 4.2% in 2000/01 to 3.0% in 2002/03, but later increased to 3.4% in 2003/04. The GFCF by local governments is much smaller by the order of magnitude. The ratio of the GFCF by the governments to the GDF also decreased from 4.4% in 2000/01 to 3.2% in 2002/03, and recovered to 3.7% in 2003/04.

(2) Government expenditure on roads

The expenditure of the Central Government on roads and other services is compared in Table 22.1-2 for recent years. While the total government expenditure basically increased steadily during 1999/00-2002/03, the road expenditure did not increase. Of the total road expenditure, 70% or more is recurrent expenditure, which covers the regular road maintenance. The

Government development expenditure on roads corresponds to 6.2-15.5% of the GFCF by the governments during 1999/00-2002/03. The revised estimate of the development expenditure on roads in 2003/04 corresponds to 23.8% of the GFCF by the governments.

TABLE 22.1-1 GDP AND GROSS FIXED CAPITAL FORMATION, 1999/2000-2003/04

	Unit: Million Ksh, current prices				
	1999/00	2000/01	2001/02	2002/03	2003/04
GDP at factor cost	639,056	685,436	767,381	849,988	968,424
Gross Fixed Capital Formation	112,961	116,369	123,079	124,313	136,567
Ratio against GDP (%)	17.7%	17.0%	16.0%	14.6%	14.1%
Of which					
Central government	17,008	28,603	23,929	25,684	33,339
Ratio against GDP (%)	2.7%	4.2%	3.1%	3.0%	3.4%
Municipal councils	1,052	756	805	1,321	1,844
Town & city councils	263	642	538	406	382
Sub-total-governments	18,323	30,001	25,272	27,411	35,565
Ratio against GDP (%)	2.9%	4.4%	3.3%	3.2%	3.7%

Source: Statistical Abstract 2003
Economic Survey 2004

TABLE 22.1-2 GOK EXPENDITURE ON ROADS AND OTHER SERVICES

	Unit: Million Ksh, current prices				
Services	1999/00	2000/01	2001/02*	2002/03*	2003/04**
General Public Administration	54,508.0	77,455.3	73,852.8	84,339.6	101,446.1
Recurrent	45,184.5	64,840.8	65,660.6	70,402.5	83,344.2
Development	9,323.5	12,614.5	8,192.2	13,937.1	18,101.9
Social Services	59,670.5	64,255.9	71,953.1	83,622.3	106,282.8
Recurrent	58,270.3	62,075.5	69,454.0	78,990.0	92,293.3
Development	1,400.2	2,180.4	2,499.1	4,632.3	13,989.5
Economic Services-roads	8,848.5	9,459.1	8,856.7	7,467.2	16,728.0
Recurrent	6,207.3	6,834.8	7,376.1	5,211.6	8,805.5
Development	2,641.2	2,624.3	1,480.6	2,255.6	7,922.5
Other Economic Services	19,332.6	30,643.9	29,212.5	27,566.9	36,828.2
Recurrent	13,113.9	14,698.5	17,154.3	16,616.2	18,217.1
Development	6,218.7	15,945.4	12,058.2	10,950.7	18,611.1
Other services including public debt	83,796.0	86,616.4	123,839.6	101,067.4	127,267.0
TOTAL	226,154.6	268,430.6	307,714.7	304,063.3	388,552.0
Recurrent	206,572.0	235,066.0	283,484.6	272,287.6	329,927.0
Development	19,583.6	33,364.6	24,230.1	31,775.7	58,625.0
GFCF by Central Government	17,008	28,603	23,929	25,684	33,339
Road Dev. Ratio against GOK GFCF	15.5%	9.2%	6.2%	8.8%	23.8%

Sources: Statistical Abstract 2003 (1999/00-2001/02)
Economic Survey 2004 (2002/03-2003/04)

* Provisional
** Revised estimate

(3) Projection

By extending the relationship between the GDP and the GFCF and the allocation of development expenditure on roads in recent years, possible development expenditure on roads is projected over the planning period. The following assumptions are made based on certain parameters (Table 22.1-3).

TABLE 22.1-3 PROJECTED GDP ANNUAL GROWTH RATE AND PROJECTED ALLOCATION TO THE NMA

Parameter	Unit: %		
	2006-10	2011-15	2016-25
GDP Annual Growth Ratio	4.0	4.8	4.6
GFCF by the governments/GDP	4.0	5.0	5.0
Share of the GFCF by the governments on roads	25.0	25.0	25.0
Ratio of development expenditure on roads to the road GFCF	40.0-60.0	60.0	60.0
Allocation to the NMA	20	16	14

The ratio of the GFCF by the governments to the GDP is expected to increase as the Kenyan economy recovers. While the GFCF by the Central Government on roads corresponds to 37.0% of the total GFCF by the Central Government in 2001/02, a large portion was due to road maintenance as part of recurrent expenditure. This ratio will increase from the current level of more or less 30% to 60% in 5-10 years time as the Kenyan economy continues to grow and the road budget increases accordingly.

Allocations to the NMA

The allocations of the projected road development expenditure to the NMA in the coming decades need to be determined in specific terms. The share of population in the NMA to the total national population is expected to increase consistently from 11.3% in 1999 to 15.0% in 2025 according to the socio-economic framework. The contribution of the NMA to the national economy of Kenya is much larger and estimated to be 32.0% in 2004. Thus, the larger allocation of road fund vis-a-vis the population share would be justified for the NMA.

A recent study estimated the costs of restoring/ improving the entire road network of Kenya to a maintainable level at Ksh 128 billion, consisting of Ksh 85 billion for paved roads and Ksh 43 billion for unpaved roads. Of these, the urban roads require Ksh 17 billion for paved roads and Ksh 14 billion for unpaved roads. Of the total requirement of Ksh 31 billion, urban roads in the NMA account for Ksh 25 billion or 19.5% of the total cost required for the entire road network of Kenya.

Comparatively larger allocations to the NMA would be justified at least during initial years of the Master Plan implementation for two reasons. First, the backlog maintenance and rehabilitation needs are comparatively large as the RMLF allocation to urban roads has been small in recent years. Second, the NMA as a functional authority of a capital of the East

African region would need to upgrade its transport infrastructure to support the Kenyan economy as a whole. Based on this reasoning, the allocations of the projected road development expenditure to the NMA are determined to be 20% during 2006-10, 16% during 2011-15, and 14% during 2016-25.

The projection of possible development expenditure on roads is shown in Table 22.1-4. The GDP projection follows the economic framework. The cumulative allocation of the road development expenditure to the NMA by phase is calculated to be Ksh 6,210 million during 2006-10, Ksh 9,241 million during 2011-15, and Ksh 22,870 million during 2016-25.

TABLE 22.1-4 PROJECTION OF POSSIBLE DEVELOPMENT EXPENDITURE ON ROADS

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
GDP (Ksh x10 ⁹)	1,127.80	1,176.50	1,227.40	1,280.50	1,335.90	1,399.80	1,466.70	1,536.80	1,610.30	1,687.30
Annual Growth Ratio		4.3%	4.3%	4.3%	4.3%	4.8%	4.8%	4.8%	4.8%	4.8%
GFCF by GOK (Ksh x10 ⁶)	45,112	47,060	49,096	51,220	53,436	69,990	73,335	76,840	80,515	84,365
Ratio against GDP	4.0%	4.0%	4.0%	4.0%	4.0%	5.0%	5.0%	5.0%	5.0%	5.0%
GFCF on roads (Ksh x10 ⁶)	11278	11765	12274	12805	13359	17498	18334	19210	20129	21091
Ratio against Government GFCF	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%
Dev. Expend. on roads (Ksh x10 ⁶)	4,511	4,706	6,137	7,683	8,015	10,499	11,000	11,526	12,077	12,655
Ratio against Total Road Exp.	40%	40%	50%	60%	60%	60%	60%	60%	60%	60%
Ratio against Government GFCF	10%	10%	13%	15%	15%	15%	15%	15%	15%	15%
Allocation to the NMA (Ksh x 10 ⁶)	902	941	1,227	1,537	1,603	1,680	1,760	1,844	1,932	2,025
Ratio against Total Road Dev.Exp.	20%	20%	20%	20%	20%	16%	16%	16%	16%	16%
Ratio against Government GFCF	2.0%	2.0%	2.5%	3.0%	3.0%	2.4%	2.4%	2.4%	2.4%	2.4%
Accumulated Amount (Ksh x 10 ⁶)				(2006-10)	6,210				(2011-15)	9,241
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
GDP (Ksh x10 ⁹)	1,764.80	1,845.80	1,930.60	2,019.30	2,112.00	2,209.00	2,310.50	2,416.60	2,527.60	2,643.70
Annual Growth Ratio	4.6%	4.6%	4.6%	4.6%	4.6%	4.6%	4.6%	4.6%	4.6%	4.6%
GFCF by GOK (Ksh x10 ⁶)	88,240	92,290	96,530	100,965	105,600	110,450	115,525	120,830	126,380	132,185
Ratio against GDP	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
GFCF on roads (Ksh x10 ⁶)	22060	23073	24133	25241	26400	27613	28881	30208	31595	33046
Ratio against Government GFCF	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%
Dev. Expend. on roads (Ksh x10 ⁶)	13,236	13,844	14,480	15,145	15,840	16,568	17,329	18,125	18,957	19,828
Ratio against Total Road Exp.	60%	60%	60%	60%	60%	60%	60%	60%	60%	60%
Ratio against Government GFCF	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
Allocation to the NMA (Ksh x 10 ⁶)	1,853	1,938	2,027	2,120	2,218	2,320	2,426	2,538	2,654	2,776
Ratio against Total Road Dev.Exp.	14%	14%	14%	14%	14%	14%	14%	14%	14%	14%
Ratio against Government GFCF	2.1%	2.1%	2.1%	2.1%	2.1%	2.1%	2.1%	2.1%	2.1%	2.1%
Accumulated Amount (Ksh x 10 ⁶)									(2016-25)	22,870

22.1.2 Financing on the Rail Investment for Commuter Transport Service

The investments required to upgrade the existing rail for the provision of the commuter service are summarized in Table 22.1-5.

TABLE 22.1-5 INVESTMENTS REQUIRED FOR RAIL UPGRADEMENT

Unit: Million Ksh

	2006-10	2011-15	2016-25
Total Investment	690	1,470	1,575
(Annual)	138	294	157.5
Infrastructure Investment	420	840	855
(Annual)	84	168	85.5
New Station	0	510	580
New Platform	165	220	55
Signal	110	110	220
Telecom.	145	0	0
Investment for Coach	270	630	720
(Annual)	54	126	72

Considering that the KR's annual revenue level is Ksh 5,000 - 6,000 million as shown in its Annual Report for the year 2003/04, these investments are not so large. The recent total passenger earnings were Ksh 123.0 million in 2002/03 and Ksh 127.9 in 2001/02, about a half of which is estimated to be earned from the commuter service. These earnings are below the annual investment requirement for the initial five years. According to the result of the financial analysis described in Chapter 19, the earnings from commuter passenger services are expected to exceed the annual investment requirement by the year 2015.

The annual investment allocation reasonably expected for the upgrading of the existing rail for the provision of the commuter service is calculated at Ksh 0.5 million as shown in Table 22.1-6.

**TABLE 22.1-6 EXPECTED INVESTMENT ALLOCATION FOR
THE COMMUTER SERVICE INVESTMENT**

Total Revenue (Million Ksh)	5,021
Passenger Revenue (Million Ksh)	123
Commuter Revenue (Est.) (Million Ksh)	61.5
Ratio against Total Revenue	1.2%
Current Total Capital Investment (Million Ksh)	43
Reasonable Commuter Investment (Million Ksh)	0.5

Sources: Annual Report for 2003/04, KR

The amount of Ksh 0.5 million is very small compared to the annual requirement of Ksh 140 - 280 million per annum, estimated by the Study. This clearly indicates necessity of further subsidiary investment by the GOK as recommended in Chapter 19. The annual requirement exceeds the current financial capacity of the KR, which could allocate only Ksh 43.3 million as its capital expenditure, while the requirement for replacement of its assets is already excessive.

The execution of the subsidiary investment depends totally on the decision by the GOK. The requirement of Ksh 140 million per annum for the initial five years is an affordable amount compared to the GOK's annual GFCF ranging from Ksh 24 billion to Ksh 33 billion during the fiscal years 2000/01-2003/4. The case of KR's receipt of Ksh1.6 billion from the GOK as a grant in the fiscal year 2004/5 indicates that the discretion capacity of the GOK is sufficient to execute the investment.

Further to the GOK subsidiary investment, private sector participation is desirable to reduce the burden on the GOK that is currently in critical financial position. The participation package might consist of operation and maintenance with part of investment directed towards the purchase of coaches, for example.

22.2 POSSIBLE MEASURES TO EXPAND THE FUNDING BASE

22.2.1 Expansion of Private Sector Participation

(1) Overview of private sector participation in Kenya

The private sector has already been involved in road maintenance works in Kenya. Most periodical maintenance of classified paved inter-city roads is currently undertaken by contract, and substantial on-the-job training of contractors has been provided in re-gravelling roads as well. Efforts are also underway to involve small contractors in undertaking routine maintenance.

Nevertheless, most routine maintenance of roads has been done in-house by force account of the RD. As the fund available for road works is not increasing and is limited, increasing portions would have to be directed towards routine maintenance. Efforts should be made, therefore, toward contracting out routine maintenance works to reduce the public resources requirements. This applies particularly to urban roads.

The private sector participation in the form of road concession has been discussed in Kenya for some time. A recent study supported by the World Bank evaluated three models: BOT concession using conventional tolls, BOT concession using shadow tolls, and construction contract combined with maintenance concession (maintain, operate and transfer or MOT). These models are compared in Table 22.2-1. The recent study has established the viability of the conventional BOT concession with tolls for the Northern Corridor and also the maintenance concessions on all the other main roads with a traffic flow of 500 or more vehicles per day.

TABLE 22.2-1 COMPARISON OF ROAD CONCESSION MODELS

Model	Public Fund Requirement	Advantages/ disadvantages	Risks to private concessionaire
BOT with conventional tolls	lowest	<ul style="list-style-type: none"> • Road users directly affected • Extra costs for toll-related facilities and O&M 	<ul style="list-style-type: none"> • High return on equity required • Uncertain traffic levels
BOT with shadow tolls	low Can be deferred by private sector loan financing	<ul style="list-style-type: none"> • Road users not affected directly • Lower capital and O&M costs • No new source of funding 	<ul style="list-style-type: none"> • High return on equity required • Defaulting (by KRB) on payment either of shadow tolls or on fixed schedule
MOT	Same as public investment	<ul style="list-style-type: none"> • Initial funding from traditional funding sources 	<ul style="list-style-type: none"> • Very low

(2) Alternative PPP models

Conventional BOT

The public fund requirement is the lowest for the conventional BOT concession as the bulk

investment cost would be borne by the private sector. Extra costs are incurred for toll-related facilities such as tollgates, extra lanes at gates, signs, etc., which would also be borne mostly by the private concessionaire. Some social costs are involved on the part of road users for paying tolls. Under this PPP model, most risks would be borne by the private concessionaire due to uncertain traffic levels and thus revenue, and high return of equity is required to make this model viable for the private profit maker.

BOT with shadow tolls

Under the BOT concession with shadow tolls, the Government would have to bear part of the investment cost and/or risks associated with uncertain traffic levels. Still, the public fund requirement is relatively low, especially if the private concessionaire makes arrangements for loan financing to effectively defer the public fund requirement.

The application of the BOT concession using shadow tolls would require further arrangements on the part of the Government related to an appropriate level of shadow tolls and payment schedule for risk sharing and the provision for default. Under proper arrangements, the risk to the private concessionaire is lower with this model rather than the conventional toll concessions as the capital and O&M costs would be smaller without toll collection, whereas the Government would share the traffic risk effectively. This would increase the possibility for the private concessionaire to introduce loan financing for the capital cost deferring the public fund requirement.

This model would require high return on equity to make it viable for the Government and the private concessionaire. Major risks for the private concessionaire are related to possible defaulting by the Government (or KRB in the case of road concession) on payment of shadow tolls on a fixed schedule as agreed with the Government.

MOT

Under the MOT, the construction is undertaken as a public invest project by contracting out the construction works to the private contractor, who would obtain the maintenance concession to maintain, operate and transfer the facilities after the construction. Thus, the application of this model would not contribute to the reduction of public fund requirement. Risks to the private contractor/concessionaire are naturally very low.

(3) Major Issues of Introducing PPP Scheme

Outline of Public Sector Participation

PPP is normally applied for the provision of infrastructure, for instance road infrastructure

project. The private sector might get involved in helping financing the project based on the three types of financing schemes.

- a) Total cost for maintenance and construction
- b) Costs for maintenance and a part of construction
- c) Cost for maintenance

Meanwhile, toll collection of a project is classified into:

- a) Direct user payment, and
- b) Subsidy from the government.

Regarding the concession, there are two patterns which are:

- a) Concession of real tolls - users are required to pay most of construction and maintenance cost.
- b) Concession of shadow tolls - in case the road is justifiable for regional economic development and beneficiaries of the road go beyond the road users.

Merits of Public Sector Participation

PPP combines the best of the public and private sectors with an emphasis to deliver quality public services worth the value of money spent for the project. The merits of PPP are elaborated below.

- a) Highest quality supply to residents at lowest cost
Owing to the efficient utilization of knowledge and techniques belonging to private sector throughout the project life cycle, high quality of services can be supplied to residents at lowest cost.
- b) Mitigation of budgetary constraints
By the participation of the private sector on the future revenue derived from the infrastructure as collateral, public sector can drastically reduce the cost for infrastructure construction and maintenance.
- c) Proper risk allocation to private sector
Risks of the project, such as financial risk and revenue risk can be dispersed and alleviated by the scheme. In essence, part of the risk of the project is allocated to the private sector.
- d) Quick implementation of the project
Project can be implemented quickly free from the budgetary constraint and the project can be put into operation earlier.
- e) Improvement of public sector services to residents
Because strategic allocation of budget can be achieved to the field of non-profitable public services, public sector services to residents can be improved.

Conditions for Public Sector Participation Promotion for Transport Sector in Kenya

The following major conditions are pointed out to introduce public-private partnership in

Kenya, therefore, Government, private sector and international donor organizations are required to make efforts to overcome these issues.

- a) Improvement of legal environment for public-private partnership is necessary to give scheme and measures for problems arisen for domestic and especially expected foreign capitals because of the insufficient accumulation of local capitals for long term investment.
- b) Capacity building at various levels of individuals and organizations to acquire know-how and techniques for the smooth implementation of public-private partnership is required.
- c) Legal frame, subsidies, refunding and taxation should be newly considered to cope with external positive and negative effect.
- d) So-called country risks including emergency danger and risk of alteration of law for investment shall be reduced.

22.2.2 Other Possible Measures

(1) National Level

The current rate of Ksh 5.80/ liter for petrol and diesel has not been changed since 1999. It is important to consider factors related to commodity price escalation in general, surge of the fuel prices, and devaluation of Kenyan Shilling. The retail price of petrol in 1999, for example, was Ksh 48.18 raised by 16% to Ksh 55.72 and exchange rate against US\$ was devalued by around 5% from Ksh 72.9306 = US\$ 1.00 at the end of 1999 to Ksh 77.0723 = US\$ 1.00 at the end of 2002.

Other than the RMLF, government budget allocations and donor supports, there exist many possible sources of funding for road infrastructure and traffic management. At the national level, these would include the LATF, TLB license fee and annual tax on transport operators, road safety levy on motor vehicle imports, national parks/ reserves levy by KWS and others. Use of TLB license fee currently remitted directly to the Treasury, for specified purposes of traffic management may be examined. Use of road safety levy for road safety initiatives would be justified. Use of national parks/ reserves levy by KWS and the relationship between MRPW and KWS for the maintenance of some classified roads providing access to parks and reserves need to be clarified.

(2) Local Level

At the local level, various possible sources of funding are available, but currently they are not effectively used. The local Cess on transactions of local products and services, of which 80% are under KRB's management and are usually remitted to the respective local for particular

road programs, is potentially an important source of local funds. Its collection from hawkers and the jua kali sector tends to be evaded for political reasons. It is reported that CCN once lost Ksh 1 million a month in early 1990s due to its decision to relax the collection. The license fees or annual tax for matatu operations could be another source of local funds. Introduction of a new system for managing parking such as zoned parking may increase the local revenue from parking fees. Collection of Cess and parking fees would be particularly important in the central area not only for the increased revenue of CCN but also as regulatory measures.

Other possible local sources of funds include property and housing taxes, and public utility charges. A surcharge on water and sewerage charges may be used for drainage works associated with road improvement and widening. The establishment of clear road ownership would encourage CCN to charge for the use of road reserves for commercial purposes.

The Nairobi Metropolitan Development Authority, once established, may embark on large scale urban development or renewal either on its own or jointly with the private sector. A capital gain tax may be introduced as proper value will increase after the development/renewal. Also donor contributions may be channeled directly to the authority once it establishes good track records.

CHAPTER 23

TRANSPORT MASTER PLAN EVALUATION

CHAPTER 23 TRANSPORT MASTER PLAN EVALUATION

23.1 EVALUATION PROCEDURE

(1) Procedure

The flow chart of Evaluation Procedure of the selected optimum Master Plan is illustrated in Figure 23.1-1. It is composed of five levels: “Selected Optimal Master Plan”, “Transport Sector Plan”, “Traffic Analysis”, “Environmental Assessment, Traffic Analysis and Economic Analysis” and “Master Plan Evaluation”. Each level is explained in Section 23.1 to 23.5.

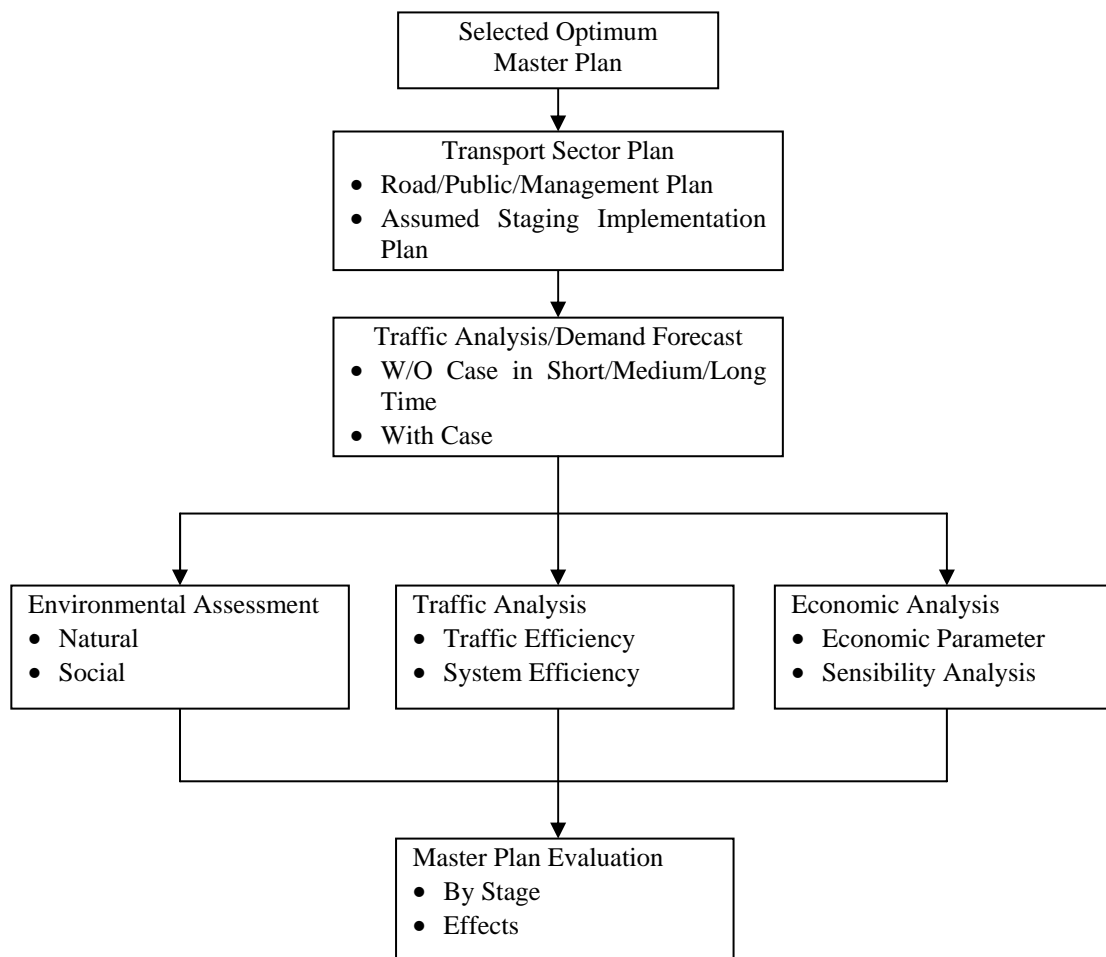


FIGURE 23.1-1 PROCEDURE OF MASTER PLAN EVALUATION

(2) Evaluation Factors

The Master Plan involves evaluation of the following factors;

- 1) Improvement of traffic efficiency
 - Average Travel Speed
 - Average VCR
- 2) Improvement of system efficiency
 - Total PCU-Km
 - Total PCU-Hour
- 3) Economic viability
 - Vehicle Operating Cost (VOC) including Travel Time Cost
 - NPV, B/C Ratio, and EIRR
- 4) Environmental impacts in terms of air pollution
 - HC, CO and NO_x

(3) Selected Master Plan

1) Selected Optimum Master Plan

Alternative 3 was recommended as the Transport Master Plan for future development of the transport system in the Nairobi Metropolitan Area. The detailed component of the plan integrates hard and soft measures of the road network development, public transport services, and traffic circulation and management schemes.

2) Major Projects and Investment Plan

The proposed major projects in the Master Plan are formulated within the following terms:

Short Term	: 2005 - 2010
Medium Term	: 2011 - 2015
Long Term	: 2016 - 2025

The summary of the proposed major projects in the Master Plan is presented in Table 23.1-1 for each development sector.

TABLE 23.1-1 INVESTMENT PLAN

	Total Cost	Short Term (2006-10)	Medium Term (2011-15)	Long Term (2016-25)
Road Improvement	34,545	6,106	9,142	19,297
Public Transport	8,100	1,100	1,600	5,400
Traffic management	600	550	50	0
Traffic institution	200	200	0	0
Total	43,445	7,956	10,792	24,697

Unit: Million Ksh

23.2 TRAFFIC ANALYSIS

23.2.1 Traffic Demand Forecast

Traffic assignment is again carried out for the final year of each term and the results for both “Without Master Plan” and “With Master Plan” cases are presented in Figure 23.2-1 (1) and Figure 23.2-1 (2).

TABLE 23.2-1 TRAFFIC DEMAND FORECAST

Unit Km

V/C	Year			
		2010	2015	2025
Below 1.0	WO MP (A)	1,286	1,239	1,230
	W MP (B)	1,322	1,372	1,432
	B / A	1.03	1.11	1.16
1.0 – 1.5	WO MP (A)	151	195	174
	W MP (B)	140	117	149
	B / A	0.93	0.60	0.86
1.5 and above	WO MP (A)	47	66	115
	W MP (B)	39	31	34
	B / A	0.83	0.47	0.30

23.2.2 Traffic Efficiency

The traffic system performance of the M/P is assessed as shown in Table 23.2-2 based on traffic parameters between two cases, i.e. “Without Master Plan” and “With Master Plan”. Evaluation results of traffic efficiency are expressed as follows:

- a) Average travel speed in the Study Area would increase by about 6 % to 20 % if the Master Plan is adopted, while that in the City Centre would increase by about 22 % to 27 %. This implies that the Master Plan would improve the travel speed in the Study Area as well as in the City Centre.
- b) Average congestion degree (VRC) in the Study Area would decrease by about 7 % to 17 % under the Master Plan case, while that in the City Centre would decrease by about 11 % to 16 %. This implies that the Master Plan would contribute to the decrease in traffic congestion in the Study Area as well as in the City Centre.

The transport system efficiency can be measured in terms of PCU-km and PCU-hr as shown in Table 23.2-3. The following observations are made:

- a) The PCU-km in the Study Area would decrease by about 4 % to 5 % under the Master Plan case, while that in the City Centre would decrease by about 24 % to 28 %. This implies that the Master Plan would contribute to the decrease in vehicle-km in the Study

Area as well as in the City Centre.

- b) The PCU-hour in the Study Area would decrease by about 21 % to 26 % if the Master Plan is adopted, while that in the City Centre would decrease by about 24 % to 29 %. This implies that the Master Plan would greatly contribute to the decrease in travel hour in the Study Area as well as in the City Centre.

23.2.3 System Efficiency

TABLE 23.2-2 TRAVEL SPEED AND TRAFFIC CONGESTION WITH AND WITHOUT THE M/P

			2004 (Base Year)	2010	2015	2025
Study Area	Average Travel Speed (km/hour)	W O M P (A)	34.01	33.10	31.70	31.20
		W/ M P (B)	34.01	37.76	38.30	37.40
		B/A	1.00	1.06	1.21	1.20
	Average V/C Ratio	W O M P (A)	0.501	0.685	0.792	0.889
		W/ M P (B)	0.501	0.639	0.648	0.741
		B/A	1.00	0.93	0.82	0.83
City Centre	Average Travel Speed (km/hour)	W O M P (A)	31.00	28.0	27.0	25.1
		W/ M P (B)	31.00	34.4	32.9	31.8
		B/A	1.00	1.29	1.22	1.27
	Average V/C Ratio	W O M P (A)	0.809	0.854	0.893	0.950
		W/ M P (B)	0.809	0.751	0.750	0.850
		B/A	1.00	0.88	0.84	0.89

Notes: D/N: Without Master Plan, M/P: With Master Plan

TABLE 23.2-3 TRAVEL SPEED AND TRAFFIC CONGESTION WITH AND WITHOUT THE M/P

			2004 (Base Year)	2010	2015	2025
Study Area	PCU – Kilometre ('000)	W O M P (A)	10,960	14,995	17,902	23,523
		W/ M P (B)	10,960	14,452	17,143	22,390
		B/A	1.00	0.96	0.96	0.95
	PCU –Hour ('000)	W O M P (A)	322	515	565	753
		W/ M P (B)	322	383	448	598
		B/A	1.00	0.74	0.79	0.79
City Centre	PCU – Kilometre ('000)	W O M P (A)	1,167	1,402	1,538	1,823
		W/ M P (B)	1,167	1,293	1,439	1,758
		B/A	1.00	0.92	0.94	0.96
	PCU –Hour ('000)	W O M P (A)	38	53	57	73
		W/ M P (B)	38	38	44	55
		B/A	1.00	0.71	0.77	0.76

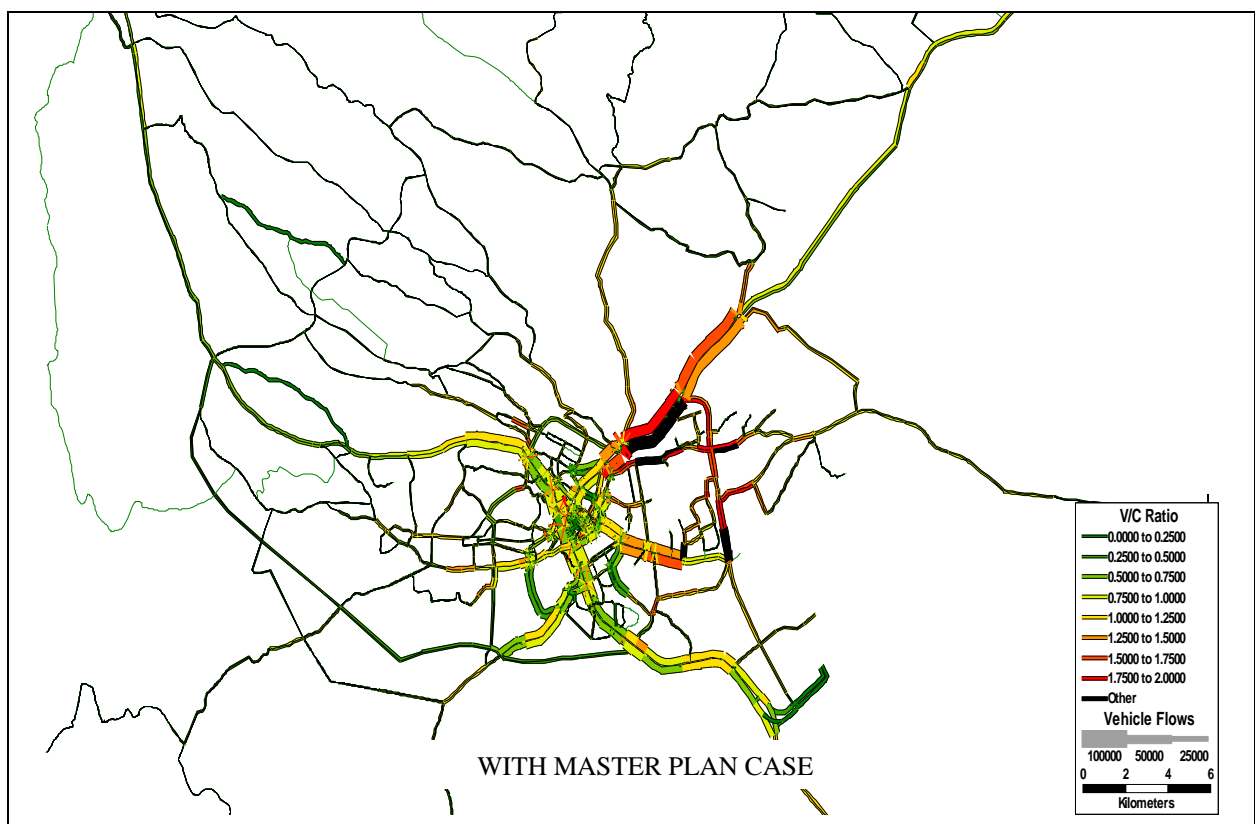
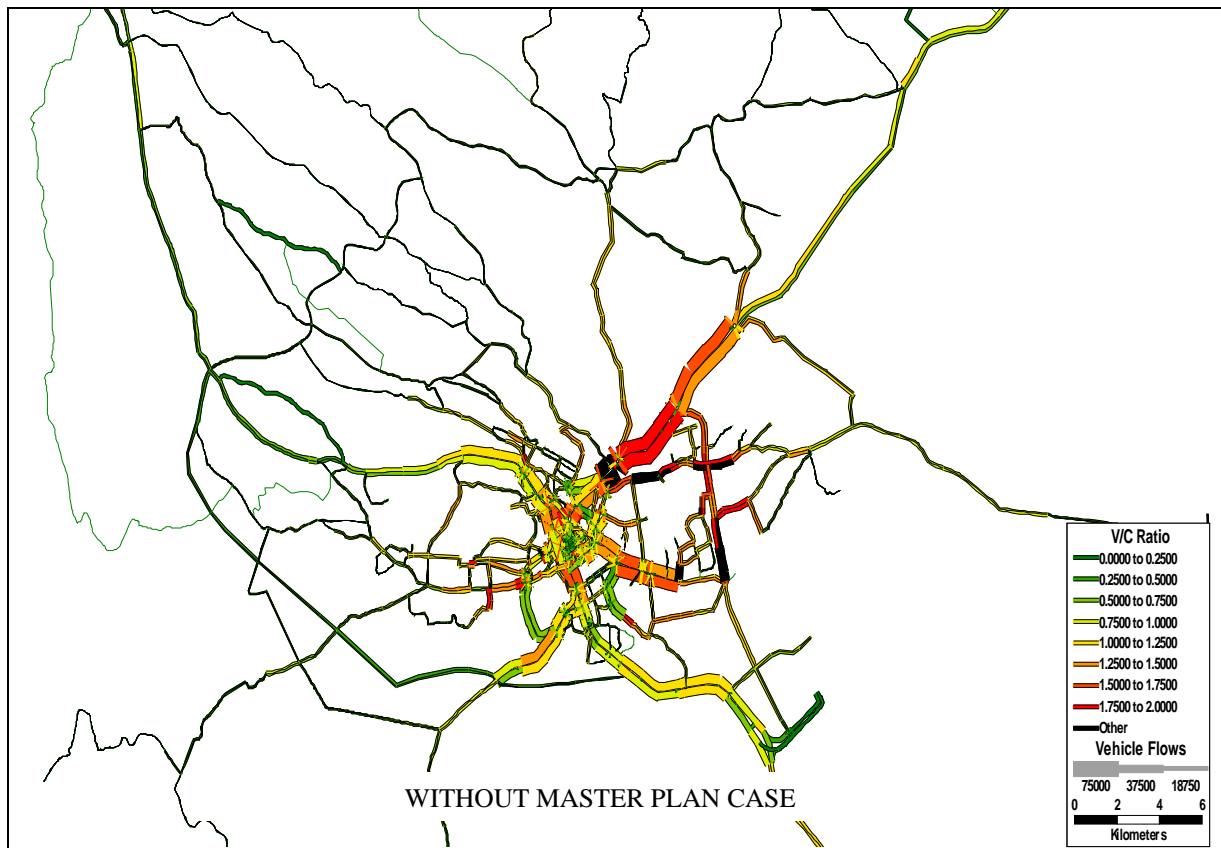


FIGURE 23.2-1 (1) TRAFFIC ASSIGNMENT COMPARISON WITH AND WITHOUT MASTER PLAN IN 2010

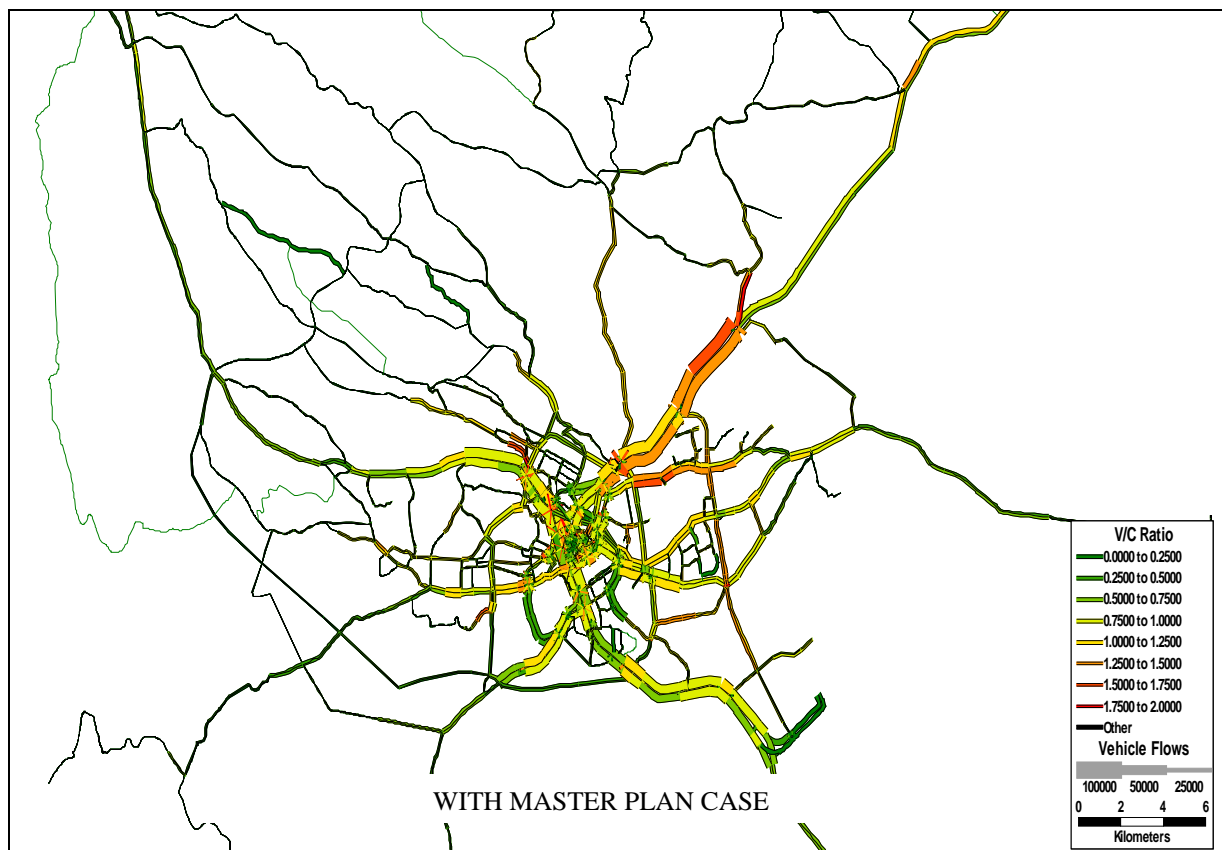
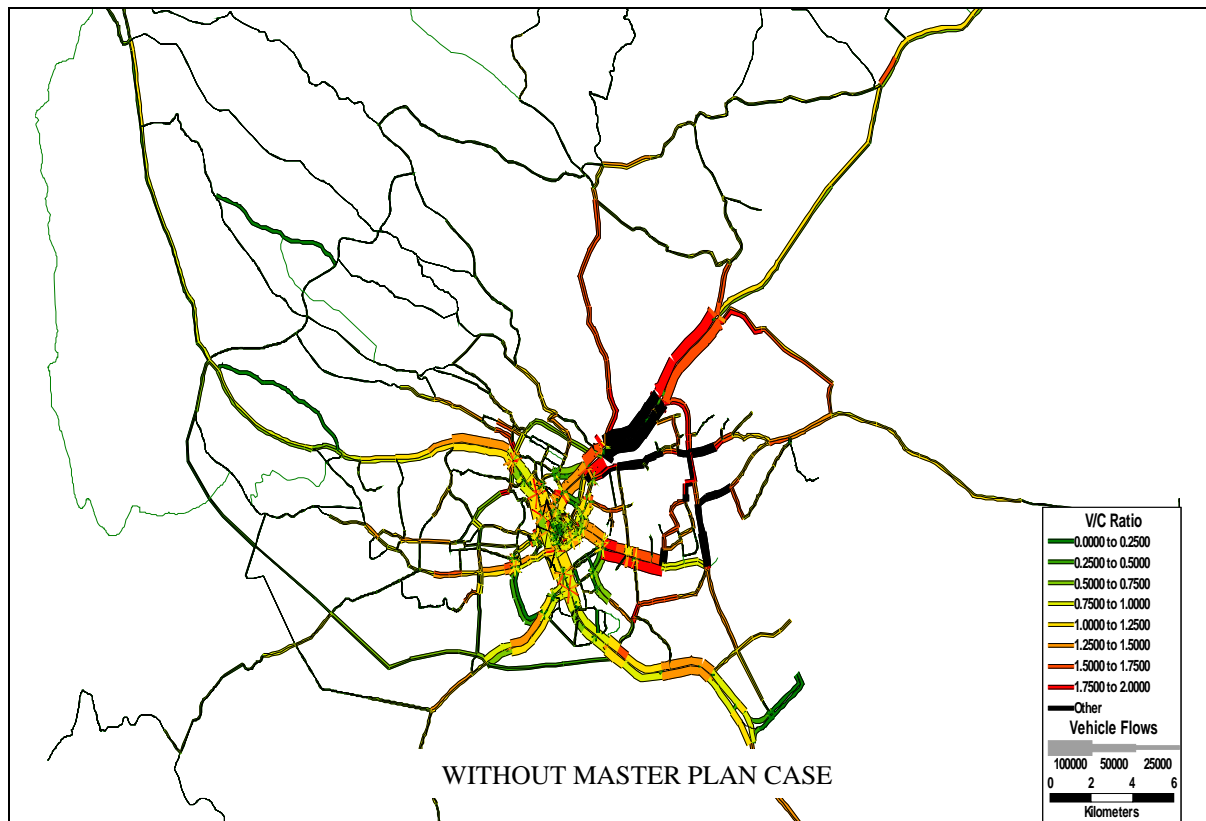


FIGURE 23.2-1 (2) TRAFFIC ASSIGNMENT COMPARISON WITH AND WITHOUT MASTER PLAN IN 2015

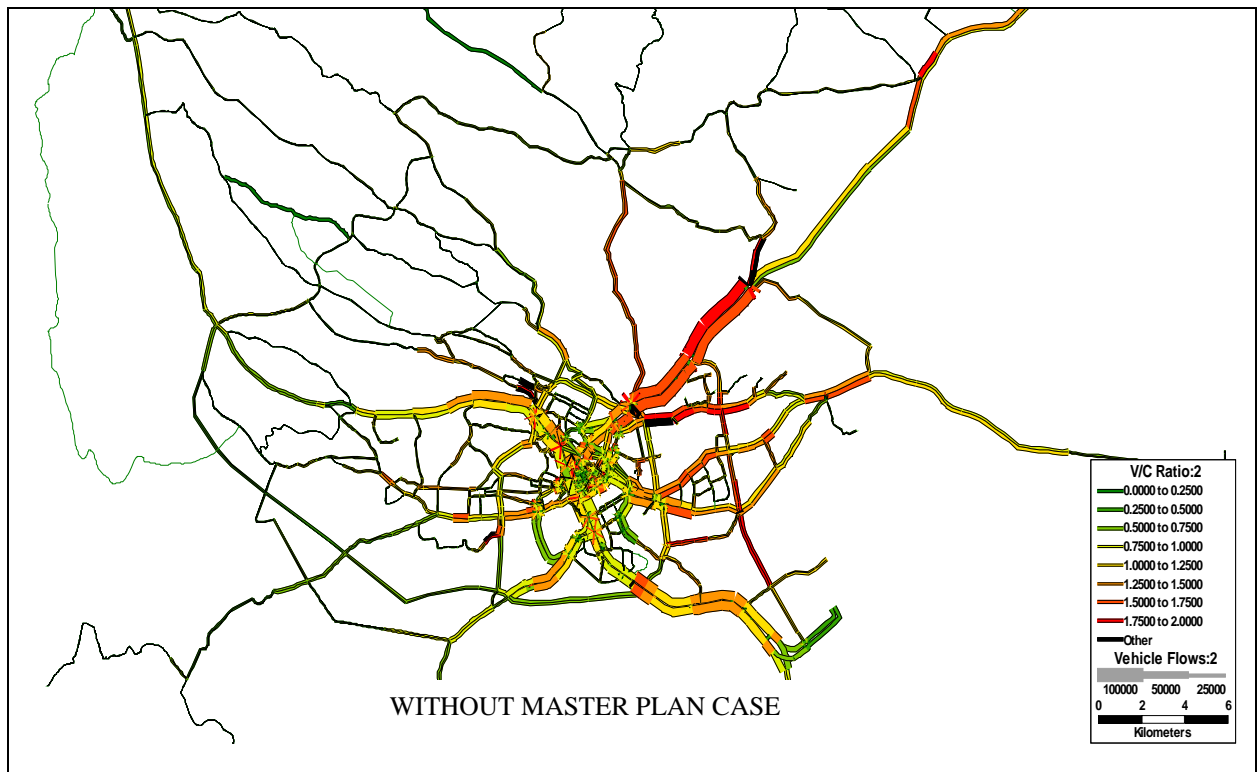


FIGURE 23.2-1 (3) TRAFFIC ASSIGNMENT COMPARISON WITH AND WITHOUT MASTER PLAN IN 2025

23.3 ECONOMIC ANALYSIS

23.3.1 Economic Parameters

(1) Estimation of Benefits

Using unit vehicle operating cost and time cost presented in Chapter 17, as well as traffic assignment results, the vehicle operating cost consists of running cost, fixed cost and travel time cost are estimated as shown in Table 23.3-1. The benefits are expressed as the difference between “Without Master Plan Case” and “With Master Plan Case”.

TABLE 23.3-1 ESTIMATION OF BENEFITS

Unit: Ksh'000 /Day

Year		Running Cost	Fixed Cost	Travel Time Cost	Total Traffic Cost
2010	W/O M/P	28,296	3,602	18,272	50,171
	W/ MP	27,685	3,377	17,273	48,252
	Benefit	610	225	1,083	1,919
2020	W/O M/P	34,386	4,287	21,910	60,553
	W/ MP	33,211	3,299	16,663	53,173
	Benefit	1,175	958	5,247	7,380
2030	W/O M/P	47,160	5,793	32,121	85,074
	W/ MP	44,768	4,766	24,258	73,793
	Benefit	2,392	1,027	7,862	11,281

(2) Estimation of Economic Costs

The project cost, which has already been estimated in the previous section, is expressed as the financial cost. It is therefore merely converted from financial cost to economic cost. In this Study, the economic cost was estimated by deducting government taxes and import duty from the financial cost as shown in Table 23.3-2.

TABLE 23.3-2 ECONOMIC COST ESTIMATE

Unit: Ksh Million

Description		Financial Cost	Economic Cost
1	Road Improvement		
	1) Bypass and Link Roads	7,972	6,696
	2) Missing Links	6,059	5,090
	3) Radial Roads	9,424	7,916
	4) Circumferential Roads	1,453	1,221
	5) Secondary Arterial Roads	2,976	2,500
	6) Intersection Improvement	1,658	1,393
	7) Non Motorized Transport	1,331	1,118
	8) Uhuru Highway Improvement	3,672	3,084
	9) Traffic Circulation in City Centre	250	210
	Sub-Total	34,795	29,228
2	Public Transport		
	1) Bus Incentive Policy	400	336
	2) Bus Priority Policy	1,900	1,596
	3) Upgrading of Existing Rail	5,800	4,872
	4) LRT	-	-
	Sub-Total	8,100	6,804
3	Traffic Circulation and Management		
	1) On Street Parking	100	84
	2) Enforcement	100	84
	3) Public Education	150	126
	Sub-Total	350	294
4	Traffic Institution		
	1) Human Resource Capacity Building	100	84
	2) Institutional Development	100	84
	Sub-Total	200	168
	Total	43,445	39,852

(3) Maintenance Cost

The maintenance cost, which has already been calculated in the previous section, is also expressed in terms of financial cost. It is therefore merely converted from a financial maintenance cost to an economic one.

(4) Economic Parameters

Based on the above mentioned benefits and cost estimation, the economic analysis of the Master Plan is made. Table 23.3-3 shows a summary of the benefit – cost analysis of the Master Plan during the project life period of 30 years, while Table 23.3-4 shows the benefit - cost stream. The results of the economic analysis show that a Net Present Value (NPV) of Ksh 18,930 million and BCR of 2.38 will be achieved over 30 years life of the Master Plan using a discount rate of 12.0 % which is designated by the Ministry of Planning of Kenya. The Economic Internal Rate of Return (EIRR) was resulted at 39.5%.

TABLE 23.3-3 ECONOMIC PARAMETERS

Economic Parameter	Results
Net Present Value (NPV)	Ksh 18,350 million
BCR	2.34
EIRR	39.4%

Notes: 1) Project life is assumed to be 30 years
2) Discount rate is assumed at 12.0%

23.3.2 Sensitivity Analysis

The sensitivity analysis is conducted under a worst case scenario incorporating increase and/or decrease of the estimation of costs and benefits. Table 23.3-4 shows the results of the sensitivity analysis.

TABLE 23.3-4 SENSITIVITY ANALYSIS REGARDING COSTS AND BENEFITS OF MASTER PLAN

Item		Benefits			
		20% down	Base Case	20% up	
Costs	20% down	NPV (RO Million)	14,680	21,090	27,501
		BCR	2.34	2.92	3.51
		EIRR (%)	39.4%	52.7%	67.4%
	Base Case	NPV (RO Million)	11,940	18,350	24,761
		BCR	1.87	2.34	2.81
		EIRR (%)	29.4%	39.4%	50.0%
	20% up	NPV (RO Million)	9,200	15,610	22,020
		BCR	1.56	1.95	2.34
		EIRR (%)	23.1%	31.1%	39.4%

Notes: 1) Discount rate is assumed at 12.0 % per annum
2) Project life of the project is assumed to be 30 years

23.3.3 Summary of Economic Analysis

The implementation of the Master Plan is justified from the view point of national economic development although some of the road projects rate below opportunity of capital in Kenya.

TABLE 23.3-5 BENEFIT – COST STREAM OF MASTER PLAN

Undiscounted Cost Benefit Stream Revenue										Discounted Cost Benefit Stream Revenue									
Sq.	Year	Construction Cost	O & M Cost	Cost Total	Benefit	Benefit - Cost	Sq.	Year	Discounted	Construction Cost	O & M Cost	Cost Total	Benefit	Benefit - Cost					
0	2005						1	2005											
1	2006	1,336	-	1,336	-	-1,336	2	2006	1,120	1,193	-	1,193	-	-1,193					
2	2007	1,336	27	1,363	1,091	-272	3	2007	1,254	1,065	21	1,087	870	-217					
3	2008	1,336	53	1,390	1,309	-81	4	2008	1,405	951	38	989	932	-57					
4	2009	1,336	80	1,417	1,581	164	5	2009	1,574	849	51	900	1,004	104					
5	2010	1,336	107	1,443	1,919	476	6	2010	1,762	758	61	819	1,089	270					
6	2011	1,813	134	1,947	2,343	396	7	2011	1,974	919	68	986	1,187	201					
7	2012	1,813	170	1,983	2,876	893	8	2012	2,211	820	77	897	1,301	404					
8	2013	1,813	206	2,019	3,548	1,528	9	2013	2,476	732	83	816	1,433	617					
9	2014	1,813	242	2,056	4,396	2,341	10	2014	2,773	654	87	741	1,585	844					
10	2015	1,813	279	2,092	6,331	4,239	11	2015	3,106	584	90	674	2,038	1,365					
11	2016	1,965	315	2,280	6,636	4,355	12	2016	3,479	565	91	656	1,908	1,252					
12	2017	1,965	354	2,320	6,959	4,639	13	2017	3,896	504	91	595	1,786	1,191					
13	2018	1,965	394	2,359	7,302	4,943	14	2018	4,363	450	90	541	1,673	1,133					
14	2019	1,965	433	2,398	7,666	5,267	15	2019	4,887	402	89	491	1,569	1,078					
15	2020	1,965	472	2,438	8,053	5,615	16	2020	5,474	359	86	445	1,471	1,026					
16	2021	2,184	512	2,695	8,464	5,769	17	2021	6,130	356	83	440	1,381	941					
17	2022	2,184	555	2,739	8,901	6,162	18	2022	6,866	318	81	399	1,296	898					
18	2023	2,184	599	2,783	9,367	6,584	19	2023	7,690	284	78	362	1,218	856					
19	2024	2,184	643	2,826	9,863	7,037	20	2024	8,613	254	75	328	1,145	817					
20	2025	2,184	686	2,870	10,392	7,522	21	2025	9,646	226	71	298	1,077	780					
21	2026		686	686	10,392	9,706	22	2026	10,804	-	64	64	962	898					
22	2027		686	686	10,392	9,706	23	2027	12,100	-	57	57	859	802					
23	2028		686	686	10,392	9,706	24	2028	13,552	-	51	51	767	716					
24	2029		686	686	10,392	9,706	25	2029	15,179	-	45	45	685	639					
25	2030		687	687	10,393	9,706	26	2030	17,000	-	40	40	611	571					
26	2031		686	686	10,392	9,706	27	2031	19,040	-	36	36	546	510					
27	2032		686	686	10,392	9,706	28	2032	21,325	-	32	32	487	455					
28	2033		686	686	10,392	9,706	29	2033	23,884	-	29	29	435	406					
29	2034		686	686	10,392	9,706	30	2034	26,750	-	26	26	388	363					
30	2035		686	686	10,392	9,706	Residual Value	2030	29,960	-	23	23	347	324					
							Total	17,000	-358	1,812	-358	-	358						
							Total	11,888	13,700	1,812	13,700	32,051	18,350						

12.0%

Net Present Value (Million Rial)	18,350
B/C Ratio	2.34
EIRR	39.4%

23.4 ENVIRONMENTAL IMPACT ASSESSMENT

23.4.1 Natural Environment

The environmental and social impact assessment has already been carried out and reported in Part III. Among the various environmental impacts, air pollution is taken into account in both 'Do Nothing' and 'Master Plan' cases. The results (HC, CO and NO_x) are presented in Table 23.4-1.

TABLE 23.4-1 AIR POLLUTION BY MASTER PLAN

Unit: Kg / day

		Without Master Plan	With Master Plan	Reduction Amount as a Difference with and without Master Plan
2,010	HC	3,809	3,671	138
	CO	31,489	30,350	1,139
	NO _x	3,719	3,584	135
2,015	HC	4,547	4,354	193
	CO	37,595	35,999	1,595
	NO _x	4,440	4,251	188
2,025	HC	5,975	5,687	288
	CO	49,399	47,020	2,379
	NO _x	5,834	5,553	281

23.4.2 Social Consideration

The proposed measures in the Master Plan would bring tremendous benefits to the society when implemented. When implementing any project, the following should be considered:

- Mitigation measures should be made whenever the project produces negative impact to both natural and social environmental conditions;
- The problem of acquiring road reserve spaces should be handled with the utmost care;
- EIA should be conducted for every major project;
- Resettlement action plan (RAP) should be prepared when a project requires land acquisition; and
- Public consultations or stakeholder meetings on proposed projects are strongly recommended.

23.5 MASTER PLAN EFFECTS

The impact of the Transport Master Plan are summarized in Figure 23.5-1. From the Figure, it can be said that the Master Plan will have positive impacts from economic viability, traffic function, system efficiency, and environmental view point.

Prior to the formulation of future transport system development plan, the transport development objectives are established in Chapter 6. The benefits (economic, social and environmental benefits) that can be achieved for each term of the Master Plan are summarized in Table 23.5-1. It can be concluded that the Master Plan will successfully lead to the achievement of the objectives of the transport system development.

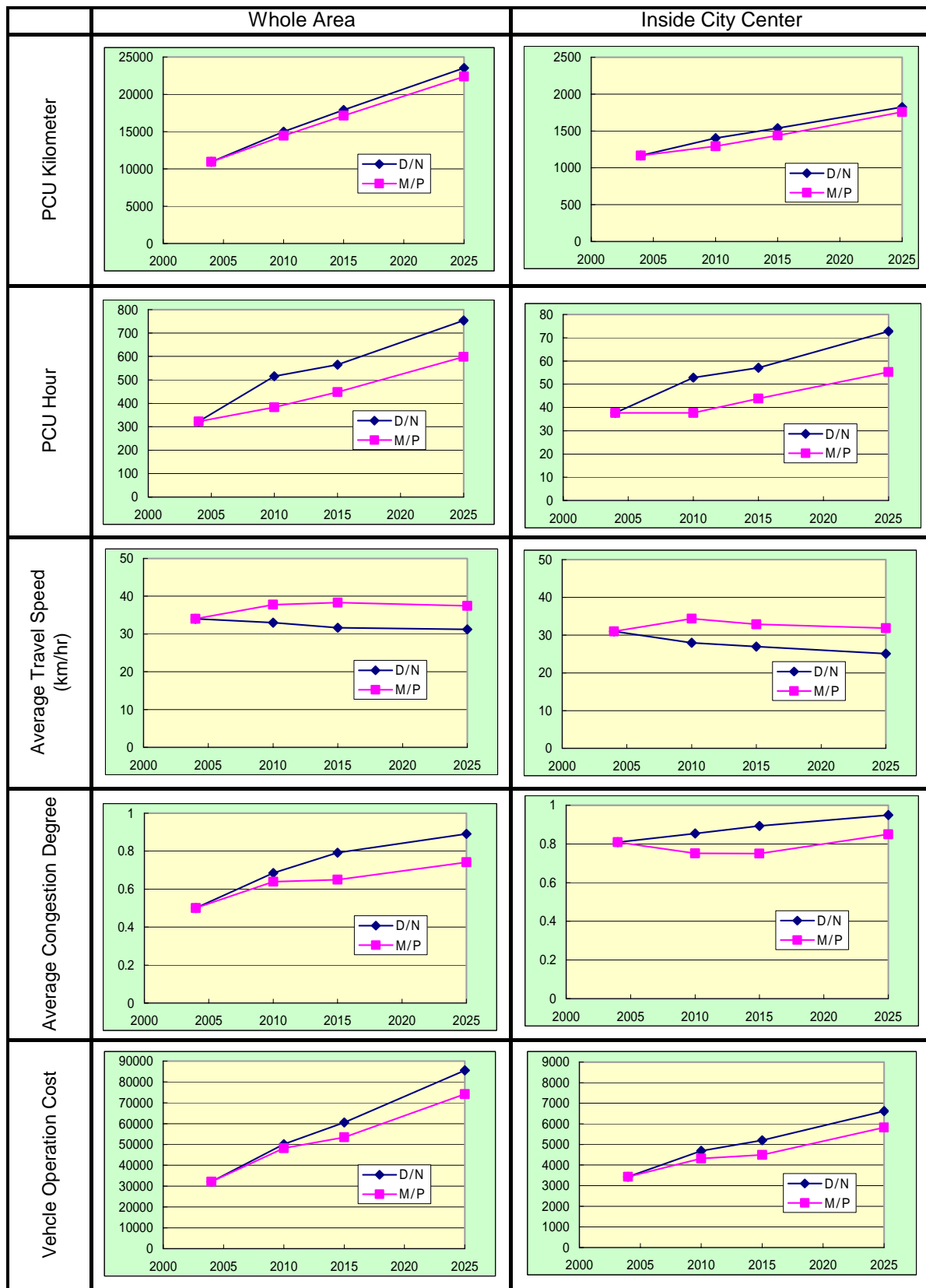


FIGURE 23.5-1 OBJECTIVES REALIZATION BY MASTER PLAN

TABLE 23.5-1 EFFECTS OF TRANSPORT MASTER PLAN

	Urban Development Policy	Target Indicators	SHORT TERM (2006-2010)	MEDIUM TERM (2011-2015)	LONG TERM (2016-2025)
Traffic Efficiency	<ul style="list-style-type: none"> International Level of Improvement 	<ul style="list-style-type: none"> Level of Service (LOS) Mobility Congestion 	<ul style="list-style-type: none"> LOS Level D Travel Speed 38km/hr V/C=0.64 	<ul style="list-style-type: none"> LOS Level D Travel speed 38 km/hr V/C=0.65 	<ul style="list-style-type: none"> LOS Level D Travel speed 37 km/hr V/C=0.74
System Efficiency	<ul style="list-style-type: none"> Hierarchy Road Network System 	<ul style="list-style-type: none"> Accessibility 	<ul style="list-style-type: none"> Increase of accessibility by construction of Radial Road inside C-3 and missing link 	<ul style="list-style-type: none"> Increase of accessibility by improvement of Radial Roads in north-east and C-3 Road. 	<ul style="list-style-type: none"> Strengthen accessibility by construction of Radial Roads outside C-3, C1 and C-2, etc.
	<ul style="list-style-type: none"> Promotion of Bus Transport 	<ul style="list-style-type: none"> Modal Share 	<ul style="list-style-type: none"> Share of bus passenger from 10 % in 2004 to 23 % in 2010. 	<ul style="list-style-type: none"> Share of bus passenger to 36 % in 2015. 	<ul style="list-style-type: none"> Share of bus passenger to achieve at level of 50 % in 2025.
	<ul style="list-style-type: none"> Upgrading of Rail Transport 	<ul style="list-style-type: none"> No. of Passengers 	<ul style="list-style-type: none"> Increase from 24,300 in 2004 to 51,900 in 2010. 	<ul style="list-style-type: none"> Increase to 85,800 in 2015. 	<ul style="list-style-type: none"> Increase to 140,000 in 2025.
	<ul style="list-style-type: none"> System Performance 	<ul style="list-style-type: none"> PCU-km PCU-hr 	<ul style="list-style-type: none"> 0.96 times 0.74 times 	<ul style="list-style-type: none"> 0.96 times 0.79 times 	<ul style="list-style-type: none"> 0.95 times 0.79 times
Economic Viability	<ul style="list-style-type: none"> Economic Viability 	<ul style="list-style-type: none"> Vehicle Operating Cost 	<ul style="list-style-type: none"> Reduction of VOC (0.96) 	<ul style="list-style-type: none"> Reduction of VOC (0.88) 	<ul style="list-style-type: none"> Reduction of VOC (0.86)
Social / Natural Environmental Aspect	<ul style="list-style-type: none"> Use of Non-Motorized Transport 	<ul style="list-style-type: none"> NMT Length 	<ul style="list-style-type: none"> NMT length is expanded to 23.8 km. 	<ul style="list-style-type: none"> Expanded to 42.0 km 	<ul style="list-style-type: none"> NMT length of 59.8 km.
	<ul style="list-style-type: none"> Traffic Security / Safety Management 	<ul style="list-style-type: none"> No of Accident No. of Street Light 	<ul style="list-style-type: none"> Traffic safety and security by control of on street parking and strengthening of traffic enforcement 	<ul style="list-style-type: none"> Traffic safety and security by improvement of Radial Roads in north-east and C-3 	<ul style="list-style-type: none"> Traffic safety and security by construction of bypasses, radial roads and C-1 and C-2, etc
	<ul style="list-style-type: none"> Traffic Demand Management (TDM) 	<ul style="list-style-type: none"> Traffic Congestion in CBD / City Centre 	<ul style="list-style-type: none"> Enforcement and education of TDM policy. 	<ul style="list-style-type: none"> Same as the Short Term 	<ul style="list-style-type: none"> Implementation of TDM policy
	<ul style="list-style-type: none"> Environmental Considerations 	<ul style="list-style-type: none"> HC, CO, NOx 	<ul style="list-style-type: none"> Reduction of about 4 % of outputs of HC, CO, NOx. 	<ul style="list-style-type: none"> Reduction of about 4 % of outputs of HC, CO, NOx. 	<ul style="list-style-type: none"> Reduction of about 5 % of outputs of HC, CO, NOx.
		<ul style="list-style-type: none"> Community Cohesion 	<ul style="list-style-type: none"> Contribute improvement of nationhood community / cohesion. 	<ul style="list-style-type: none"> Same as Short Term 	<ul style="list-style-type: none"> Same as Short Term
		<ul style="list-style-type: none"> City Landscape 	<ul style="list-style-type: none"> Contribute sound city landscape by pedestrian walk and landscape. 	<ul style="list-style-type: none"> Same as Short Term 	<ul style="list-style-type: none"> Same as Short Term

CHAPTER 24

OVERALL IMPLEMENTATION

CHAPTER 24 OVERALL IMPLEMENTATION

24.1 IMPLEMENTATION FRAMEWORK

To establish the overall implementation program of the Transport Master Plan, the framework was set up to include time schedule, project implementation capacity and budgetary considerations.

(1) Time Framework

The planning period, 2006-2025, is divided into the following stages:

- Short Term Period: 2006-2010 (5 years)
- Medium Term Period: 2011-2015 (5 Years)
- Long Term Period: 2016-2025 (10 Years)

(2) Project Implementation Capacity

The Master Plan covers various transport sectors of road transport (road, NMT and signalization), public transport (bus, matatu and railway), traffic management (engineering, enforcement and education) and traffic institution. The administrative and technical capacity of concerned agencies for the implementation of the Master Plan Projects should be developed with efficient deployment of the governmental human resources with the assistance of professional engineers.

The establishment of an umbrella agency such as the Metropolitan Nairobi Transport Authority is recommended to realize integrated coordination of the Plan among concerned agencies.

(3) Expected Budget

The budget for each planning period of the Master Plan is estimated based on the past record and the assumption that the national economic growth will be realized at the rates discussed in Chapter 22. Table 24.1-1 and Figure 24.1-1 show the expected budget and past record and future assumption of budget, respectively.

TABLE 24.1-1 EXPECTED BUDGET

	2000	2001	2002	2003	2004	2006	2007	2008	2009	2010	2011	2012	2013
GDP (Ksh x 10 ⁹)	639.06	685.44	767.38	849.99	968.42	1,127.80	1,176.50	1,227.40	1,280.50	1,335.90	1,399.80	1,466.70	1,536.80
Gross fixed capital formation by governments (Ksh x 10 ⁶)	18,323	30,001	25,272	27,411	35,565	45,112	47,060	49,096	51,220	53,436	69,990	73,335	76,840
Development expenditure on roads (Ksh x 10 ⁶)	2,641	2,624	1,481	2,256	7,923	4,511	4,706	6,137	7,683	8,015	10,499	11,000	11,526
Allocation of road expenditure to the NMA (Ksh x 10 ⁶)						902	941	1,227	1,537	1,603	1,680	1,760	1,844

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
GDP (Ksh x 10 ⁹)	1,610.30	1,687.30	1,764.80	1,845.80	1,930.60	2,019.30	2,112.00	2,209.00	2,310.50	2,416.60	2,527.60	2,643.70
Gross fixed capital formation by governments (Ksh x 10 ⁶)	80,515	84,365	88,240	92,290	96,530	100,965	105,600	110,450	115,525	120,830	126,380	132,185
Development expenditure on roads (Ksh x 10 ⁶)	12,077	12,655	13,236	13,844	14,480	15,145	15,840	16,568	17,329	18,125	18,957	19,828
Allocation of road expenditure to the NMA (Ksh x 10 ⁶)	1,932	2,025	1,853	1,938	2,027	2,120	2,218	2,320	2,426	2,538	2,654	2,776

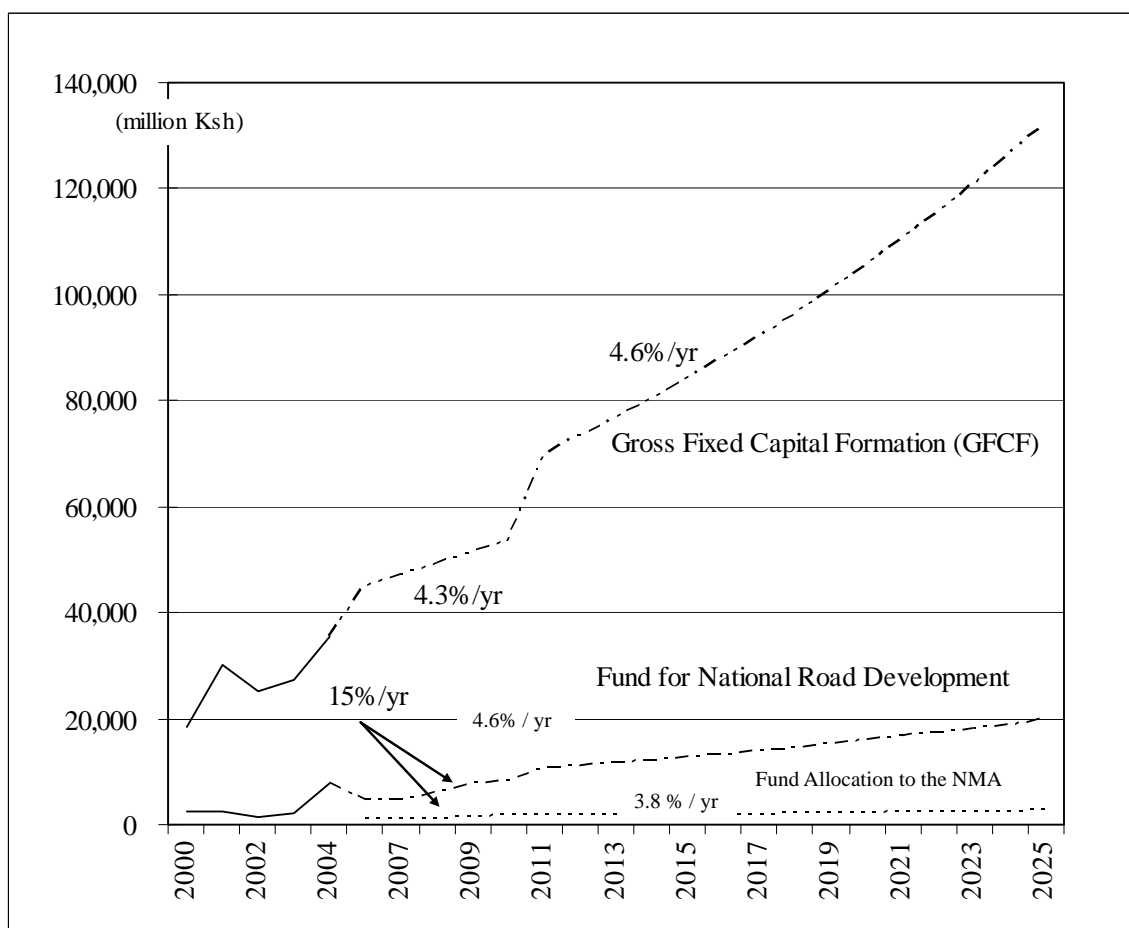


FIGURE 24.1-1 PAST RECORD AND FUTURE ASSUMPTION OF BUDGET

24.2 IMPLEMENTATION SCHEDULE

Within the condition of the implementation framework established, the overall implementation schedule of projects under the Master Plan is proposed as shown in Table 24.2-1.

The staging plans showing projects to be completed within the Short Term, Medium Term and Long Term are graphically demonstrated in Figure 24.2-1.

- Road Project

High priority was given to those projects which contribute to the prompt achievement of urgent solutions related to traffic congestion, such as the construction of missing links, radial roads inside the proposed C-3, signalization and the construction of NMT. The traffic circulation plan in the City Centre should be developed as part of the urgent measure approach under the Short Term Period.

- Public Transport Project

The bus incentive policy is given priority prior to the bus priority policy in view of its advocacy for straight forward implementation of bus promotion. The upgrading of the existing railway system is also proposed under the Short Term Period.

- Traffic Management Project

The on-street parking, traffic enforcement and public education on traffic are very urgent issues that need to be addressed, particularly in the CBD. In-depth study shall be undertaken for immediate implementation. The implementation of Expressways and LRT systems is not recommended within the Planning Period. However, it shall be noted that space be availed for those systems to be considered for future development during engineering design phases of road projects along the respective proposed routes.

24.3 SELECTION OF HIGH PRIORITY PROJECTS

High priority projects were selected for the pre-feasibility study (Pre-F/S Project), to be conducted in the Third (III) Stage of the Study, in accordance with the criteria and requirements mentioned below.

(1) Criteria and Requirements for Selection of High Priority Projects for Pre-Feasibility Study

1) Project Urgency

Selected Pre-Feasibility Study projects shall be projects that are in urgent need to cope with traffic issues, which are included in the Short-Term plan and are intended to directly solve the existing traffic problems.

2) Project Maturity

Pre-feasibility Study projects shall be ready for immediate implementation depending on public acceptance and acquisition of road right of way. Projects which will require the acquisition of new road right of way and relocation of residents are given a lower priority because of the difficulties to be experienced in project preparation.

3) Project Impact

Pre-feasibility Study projects are selected such that they would have a large-scale effect and prompt impact to the accelerated actualization of the proposed Transport Master Plan.

4) Study Example

Pre-feasibility Study projects are expected to demonstrate the mode of effectively solving traffic problems involving new technologies. Projects which will involve the introduction of new technologies are given a high priority.

(2) Recommendation for Pre-Feasibility Study

Table 24.3-1 shows the comparative evaluation of Pre-feasibility Study candidate projects. Among the candidate projects, the following project(s) is/are selected for Pre-feasibility Study.

TABLE 24.3-1 COMPARATIVE EVALUATION OF HIGH PRIORITY PROJECTS

Candidate Project	Study Objectives	Urgent Priority	Project Maturity	Evaluation		Overall Evaluation
				Project Impact	Study Example	
1. Construction of missing Links (No. 3, 6 and 7)	To formulate a part of C-3 and its adjoining collector, and evaluate its technical and economic viability.	Very urgent because of no existence of roads in the vicinity.	ROW is reserved, but encroached by temporary shops	Very large impact and significant effect because of formation of road network.	Standard design for combining road and NMT can be established.	Very urgent and no special problem for implementation.
2. Improvement of intersection at Museum Hill	To study improvement measures including grade separation, and evaluate its technical and economic viability	Very urgent because of heavily congested intersection.	Additional ROW may be required which is not reserved.	Large Impact and Immediate effect because of one of existing traffic bottlenecks.	Technology on intersection Improvement will be introduced	No special problem for implementation (Included in Northern Corridor Project, therefore not recommended for Pre F/s)
3. Improvement of Uhuru Highway	To study improvement measures such as widening or grade separation focusing on through and local traffic flows, cost and city environment as the international highway	Very urgent because of present congestion along the highway and local traffic (entrance/exit problem from CBD)	ROW is not reserved in case of road widening for example, 120m (space at the Uhuru Park side is available)	<ul style="list-style-type: none"> Very large Impact and significant effect because of its location. Possible space for future LRT and expressway can be studied. 	Solution on through traffic and local traffic from CBD can be proposed including city environment improvement.	Very attractive as study example. (Included in Northern Corridor Project, therefore not recommended for Pre F/s)
4. Traffic improvement Plan In City Center	To study smooth traffic flow plan in City Centre identifying the existing bottlenecks such as road geometry, missing road etc.	Very urgent because of missing local streets and most critical problem in the area.	Plan shall be established for immediate implementation.	Large impact and immediate effect because of its location, City centre.	Technology in solving traffic flow problems and geometry improvement will be introduced.	Necessary for urgent implementation
5. Traffic circulation measures and Management Plan in CBD	To Study traffic circulation flow plan in CBD, focusing on traffic flow and management such as traffic rule, on-street parking, traffic accident etc.	Very urgent because of present critical situation of traffic management including on-street parking problems.	Public acceptance on traffic management should be examined	Very large Impact and Immediate effect because of location, CBD	Technology on traffic circulation measures and management will be introduced.	Necessary for urgent implementation
6. Restructuring of bus/matatu System	To study improvement measure of bus/matatu system promotion to establish Government Policy	Very urgent because of the present critical situation of traffic congestion and traffic accident, mainly caused by matatus	Demand for restructuring is great from public and government	Large Impact and significant effect because of the effective use of transport corridor and more choice of transport mode	Technology of bus priority measures and PPP concept will be introduced.	Necessary to establish Government Policy for Pub
7. Improvement of Commuter Rail in NMA	To Study the commuter rail improvement with maximum use of existing infrastructures and minimum investment for basis of private participation	Urgent because of the present critical situation of traffic along railway corridors particularly for transportation poor.	Timely blemish of Government plan of concessionary.	Large impact to transportation poor and the reduction of traffic problems.	Technology on the new railway system and PPP concept will be introduced.	Necessary to formulate Government basic policy for concessionary.

Note: Very Positive Positive Fair x Negative x x Very Negative

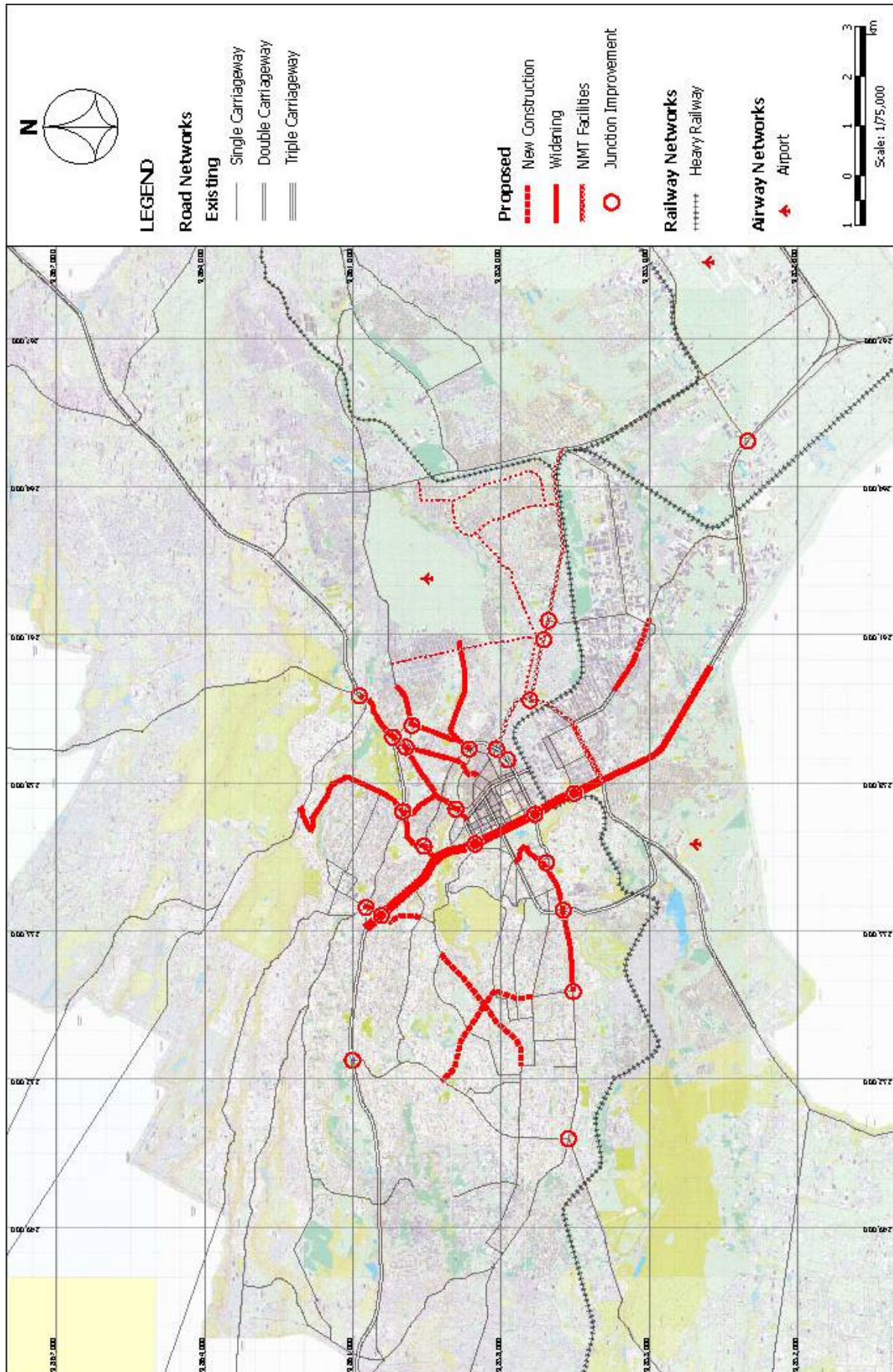


FIGURE 24.2-1 PROPOSED TRANSPORT NETWORKS IN SHORT TERM (~ 2010)

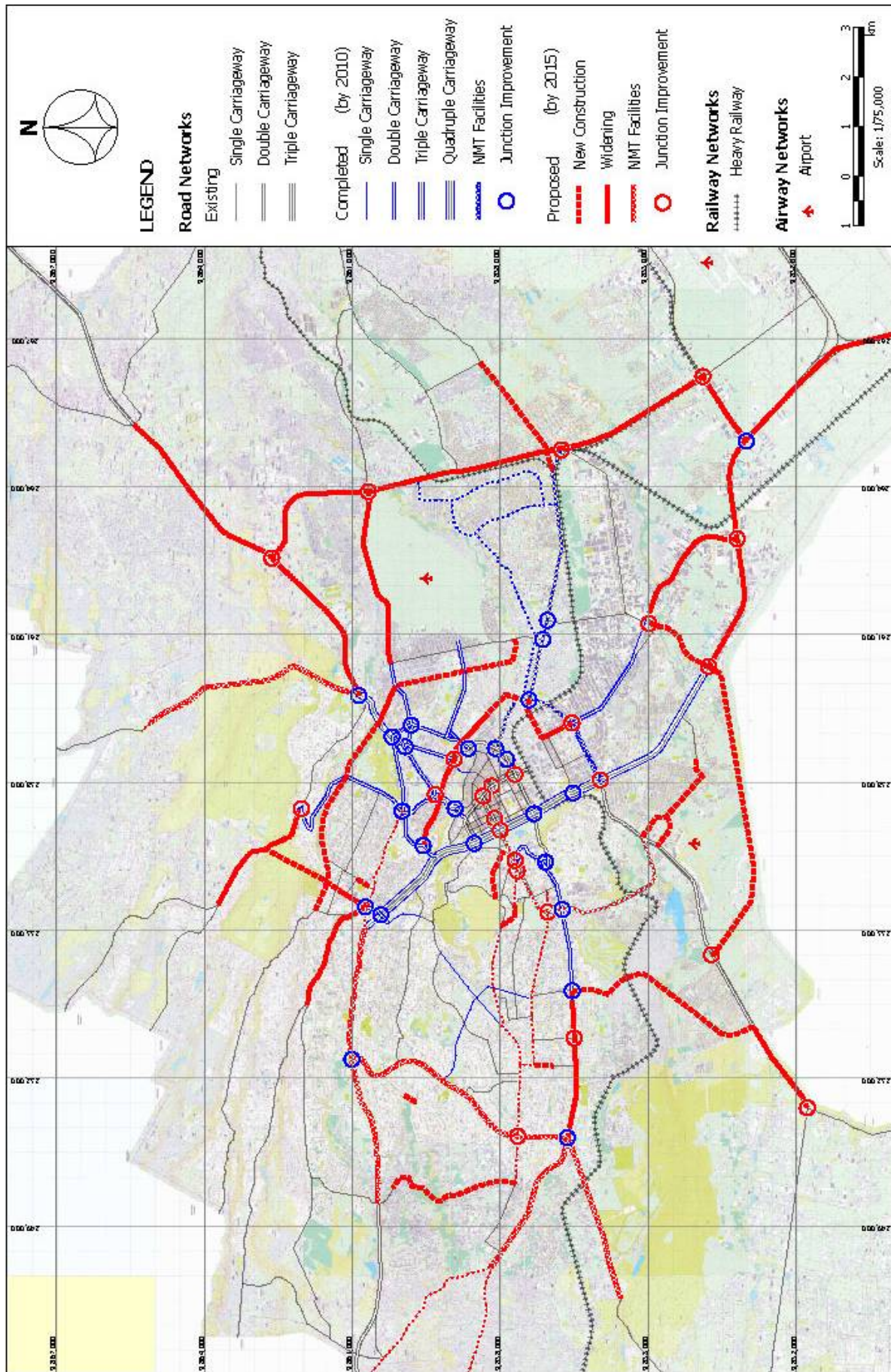


FIGURE 24.2-2 PROPOSED TRANSPORT NETWORKS IN MEDIUM TERM (~ 2015)

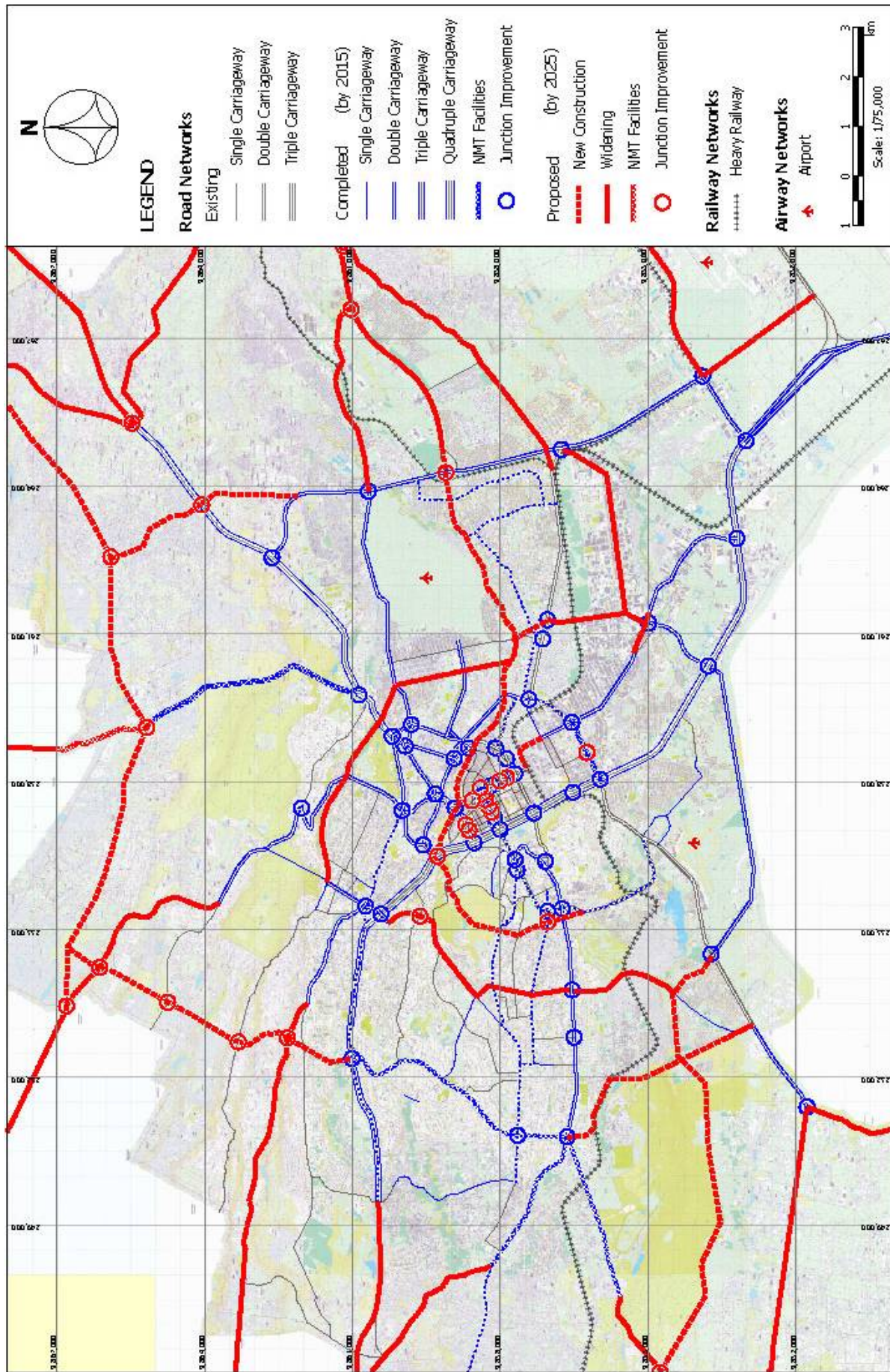


FIGURE 24.2-3 PROPOSED TRANSPORT NETWORKS IN LONG TERM (~ 2025)