

18.4 PROPOSED ROAD PROJECTS

The proposed road projects, which re classified into nine (9) sub-projects, are summarised in Table 18.4-1.

TABLE 18.4-1 PROPOSED ROAD DEVELOPMENT PROJECTS

Project Components	Project Code	Length (Km)/ (Unit)	Cost (MKsh)
1. Bypass and Link Roads Construction			7,971
1.1 Bypass Roads	B	85.0	4,312
1.2 Link Roads	LR	24.4	2,293
1.3 Link Road Extension	LE	9.4	1,366
2. Missing Link Road Construction			6,059
2.1 Missing Links (Arterials)	MA	19.6	3,308
2.2 Missing Links (Collectors)	MC	8.1	1,962
2.3 Missing Links (Local Roads)	ML	5.1	789
3. Radial Arterial Road Improvement			9,424
3.1 Radial Roads inside C-3	RC	21.9	1,340
3.2 Radial outside C-3 (South-West)	RS	51.1	2,185
3.3 Radial outside C-3 (North-East)	RN	54.2	2,656
3.4 Proposed New Radial Roads	RP	10.9	3,243
4. Circumferential Arterial Road Improvement			1,452
4.1 Circumferential Road C1 & C2	C2	10.0	560
4.2 Circumferential Road C3	C3	6.0	892
5. Secondary Arterial Road Improvement			2,976
5.1 Secondary (South-West)	S-S	40.9	1,864
5.2 Secondary (North-East)	S-N	24.4	1,112
6. Signalisation for Intersection Improvement			1,658
6.1 Signalisation (Stage 1)	SG-S	(18)	663
6.2 Signalisation (Stage 2)	SG-M	(14)	479
6.3 Signalisation (Stage 3)	SG-L	(16)	516
7. Non Motorised Transport Improvement			1,332
7.1 NMT (South & West)	NMT-S	36.0	802
7.2 NMT (North & East)	NMT-N	23.8	530
8. Uhuru Highway Improvement			3,673
8.1 Widening	UW	3.7	775
8.2 Grade Separation	UGS	(2)	2,898
9. Traffic Circulation in City Centre			250
9.1 Traffic Circulation in City Centre	TC		250
Total		434.5	34,795

Missing link road construction is proposed in Figure 18.4-1 with an implementation priority in Table 18.4-2. Radial arterial roads and circumferential arterial roads improvement including secondary arterial road improvement are shown along with the proposed circumferential route (C1, C2, and C3) alternatives in Figure 18.4-2.

18.5 INTERSECTION PLAN

18.5.1 Study Methodology

Many intersections face serious peak hour congestion and traffic accidents. Among these, 54 major intersections, which become bottlenecks of traffic and black spots due to enormous traffic accidents, are selected by CCN with the assistance of the Study Team for urgent improvement. The methodology for selection of these intersections and preparation of proposed improvement measures are illustrated in Figure 18.5-1.

TABLE 18.4-2 IMPLEMENTATION PRIORITY OF MISSING LINK CONSTRUCTION

No.	Name of Missing Link	Road Class	Road Length (km)	Estimated Traffic Volume (1000pcu)	No. of Lanes	Important Works	Construction Cost (MKSH)	Social Impact	Natural Environment	Implementation Priority
M-1	Missing Link No.1 (River Rd to Ngara Rd)	A (S-5)	0.7	146.0	2	2-lane Construction with NMT	203.7	250 units of temporary kiosks.	a few acacia trees no other significant natural environment will be affected.	3
M-2	Missing Link No.2 (Ole Odume Rd-Part) (Muirings Rd to Argwings Kodhek Rd)	L	0.7	82.0	2	2-lane Construction with NMT	37.3	a few gardens and farming plots in set-back areas	20 tall trees but no other significant natural environment will be affected.	6
M-3	Missing Link No.3 (River Side Drive to Ring Rd Westlands)	A (C-3)	1.0	273.0	2	2-lane Construction with NMT Bridge (L=50m) across Nairobi River /	266.2	75 units of temporary kiosks.	148 trees, but no significant natural environment will be affected.	1-b
M-4	Missing Link No.4 (Mpaka Rd) (Mpaka to First Parkland Av)	L	0.7	27.0	2	2-lane Construction with NMT Bridge (L=50m) across Canalized Stream	203.7	33 units of temporary kiosks and a school play ground.	A few trees but no other significant natural environment will be affected.	7
M-5	Missing Link No.5 (Muratina St) (General Waruingi St to Juja Rd)	C	2.5	less 10.0	2	2-lane Construction with NMT	143.4	130 units of temporary kiosks.	No significant natural environment.	4
M-6	Missing Link No.6 (Olotoklok Rd to Ring Rd Kileleshwa)	A (C-3)	3.0	379.0	4	4-lane Construction with NMT	519.4	19 units of temporary kiosks.	26 small trees but no other significant natural environment will be affected.	1-a
M-7	Missing Link No.7 (Argwings Kodhek Rd to James Gichuru Rd)	A (C-3)	3.5	416.7 Max 489	4	4-lane Construction with NMT includes 2 No. Bridges across	567.5	152 units of temporary kiosks. 10 vendors in open space	An old tree of Schinus Molle at the intersection with No.6 but no other significant natural environment will be affected.	1-c
M-8	Missing Link No.8 (Processional Way) (State House Rd to Kenyatta Av)	L	1.3	90.0	2	2-lane Construction with NMT	74.5	45 units of temporary kiosks.	No significant natural environment affected.	7
M-9	Missing Link No.9 (Millimani Rd) (Muslim Hill Rd to Bunyala Rd/C3)	L	0.7	68.0	2	2-lane Construction with NMT	37.3	36 units of temporary kiosks.	28 trees and 20 m wide 150 m long forest area will be affected.	7
M-10	Missing Link No.10 (Likoni Rd Extension) (Enterprise Rd to Mombasa Rd)	A (C-3)	2.5	250.0	4	4-lane Construction with NMT	471.2	45 units of temporary houses.	No significant natural environment is affected.	4
M-11	Missing Link No.11 (Paw Paw Rd Extension) (Muhohe Av to Langata Rd)	C	2.5	100.0 Max 121	2	2-lane Construction with NMT	143.4	205 units of temporary houses. 3 units of permanent houses.	There is no significant natural environment affected.	6
M-12	Missing Link No.12 (Kung'u Karumba Rd to Ngong Rd)	A (C-3)	4.2	Kibera max 636 274.0	4	4-lane Construction with NMT To coordinate with Slum Upgrading project	634.9	Southern part will pass in Kibera slum	There is no significant natural environment affected.	2*
M-13	Missing Link No.13 (Muthora Rd to Hinga Rd)	C	1.5	138.0	2	2-lane Construction with NMT	252.4	156 units of temporary houses. 65 units of permanent houses.	No significant natural environment affected.	6
M-14	Missing Link No.14 (Convent Drive Extension) (Convent Dr to Kabansian Av)	L	0.5	124.0	2	2-lane Construction with NMT	195.1	-	There is no significant natural environment affected.	7
M-15a	Missing Link No.15a (Ring Rd Parkland)	A (C-3)	2.3	382.0 Max 470	4	4-lane Construction with NMT	221.5	11 units of temporary kiosks.	There is no significant natural environment affected.	4
M-15b	Missing Link No.15b (Ring Rd Parkland Ext.) (Limuru Rd to Thika Rd)	A (C-3)	1.6	538	4	4-lane Construction with NMT	154.1	16 units of temporary kiosks.	There is no significant natural environment affected.	4
M-15c	Missing Link No.15c (Ring Rd Parkland Ext.) (Ring Rd Parkland to Limuru Rd thru Kanura Forest)	C	1.6	285.0	2	2-lane Construction with NMT Bridge (L=500m) across Nairobi River	1423.0	No significant social impact.	Length of the road inside the gazetted Kanura Forest is approximately 750m and 400m in the degraded forest.	5
M-15d	Missing Link No.15d (Ring Rd Parkland Ext.) (Ring Rd Parkland to Peponi Rd)	L	1.3	137.0	2	2-lane Construction with NMT	240.9	A temporary kiosks, and several permanent houses.	Approximately 30 m wide of road will pass through 580 m of forest area.	5
M-16	Missing Link No.16 (Quarry Rd Extension) (Landhies Rd to Quarry Rd)	A (C-2)	0.9	282.0	4	4-lane construction w NMT Bridge (L=50m) across Nairobi River	312.3	280 temporary houses 3 large permanent shelters of local market	No significant impacts	3
	Sub Total		32.8				6,101.7			

Note: A: Arterial; C: Collector; L: Local Distributor; (L) Link Road; (C) Circumferential Road; (R) Radial Road
 Implementation priority is based on sequence of forming R/C system (C2 C3 or R Collector Local) taking estimated traffic volume into consideration.
 2*: This implementation shall be coordinated with Slum Upgrading Project.

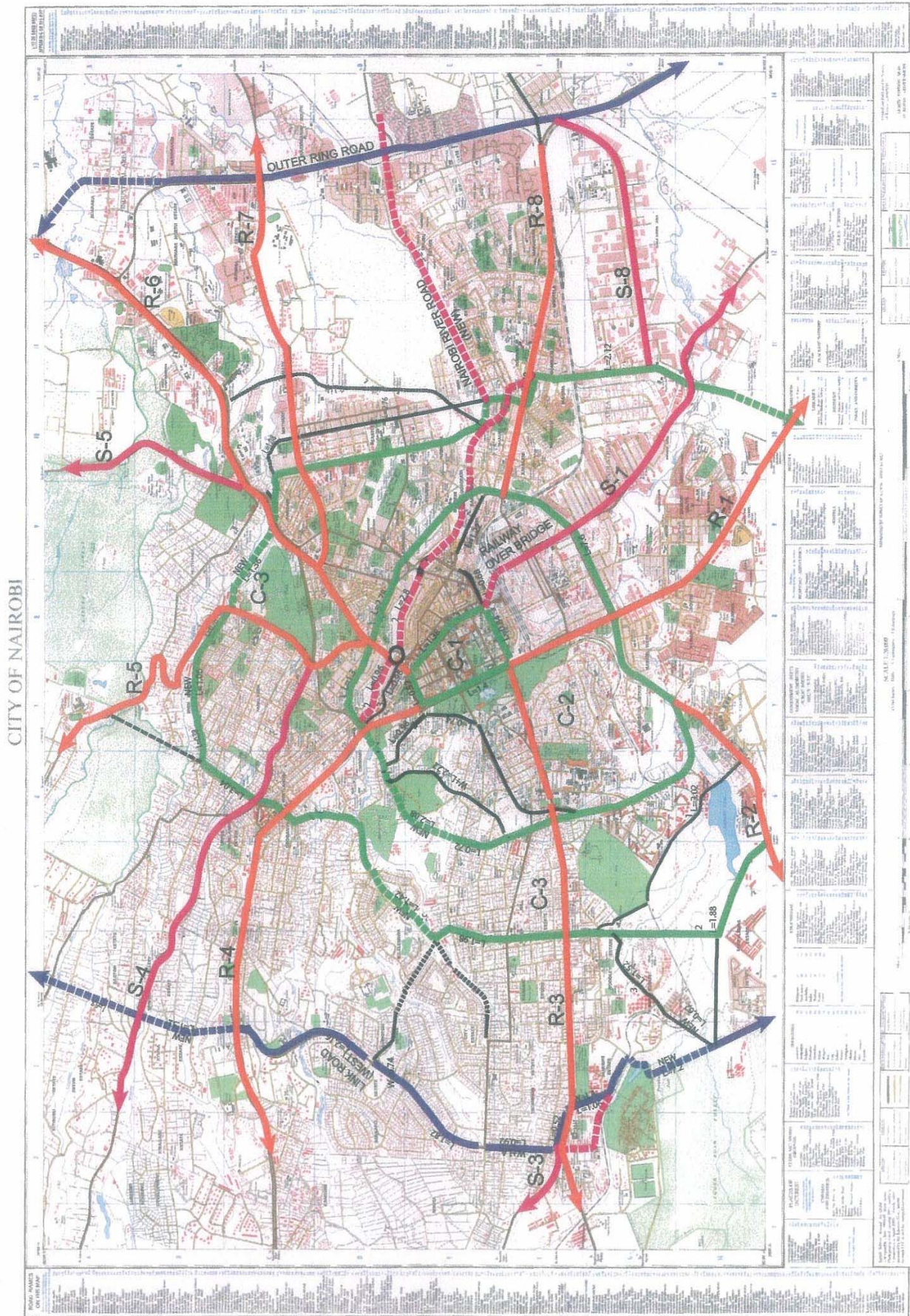


FIGURE 18.4-2 PROPOSED CIRCUMFERENTIAL ROUTE (C1, C2, C3) ALTERNATIVES

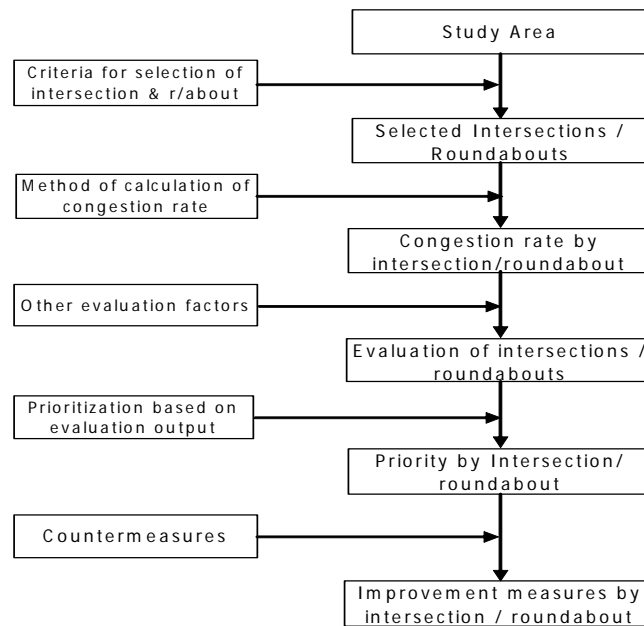


FIGURE 18.5-1 STUDY METHODOLOGY

18.5.2 Selection of Intersections and Preparation of Countermeasures

The intersections and roundabouts are evaluated on the basis of traffic situation, geometric design, environmental and social impacts, operations and maintenance, and traffic safety.

The countermeasures considered for these intersections are the following:

- Geometric improvement
- Installation and improvement of traffic signals
- Pavement markings
- Traffic signs

Table 18.5-2 shows the countermeasures for intersection improvement.

A survey by the Study Team concludes that the fifty four (54) intersections have serious traffic conflicts which resulted to high number of traffic accidents. Signalisation of these intersections are therefore proposed together with the improvement of geometric design.

Regarding to the timing of implementation, it is proposed that three phases are introduced which are the followings:

TABLE 18.5-1 COUNTERMEASURE FOR INTERSECTION IMPROVEMENT

	Name of Junction	Operation and maintenance (junct type)	Priority	Counter measures						
				Do nothing	R/A to R/A with traffic signals	R/A TO I/S with traffic signals	I/S TO I/S with traffic signals	Traffic signal improvement	I/S improvement	
1	Likono road extension	A	4	1						
3	Mombasa Rd. / Airport North Rd.	A	3				1			
4	Waiyaki Way / James Gichuru Rd.	A	2				1			
5	Museum Hill Rd. / Ngara Rd.	A	4		1					
6	Forest Rd. / Limuru Rd.	A	2		1					
7	Forest Rd. / Ring Road Ngara	A	2		1					
8	Mulhaiga Rd. / Thika Rd.	A	2		1					
9	Thika Rd. / Outer Ring Rd.	A	2		1					
10	Kenyatta ave. / Ngong rd	B	3							1
11	Haile Selassie Av. / Ragati Rd.	A	4				1			
12	Ngong Rd. / Mbagathi Way	A	2		1					
13	Ring rd killimani / ngong rd	A	2	1						
14	Ngong Rd. / Elgeyo Market Rd.	A	3				1			
15	Ngong Rd. / Naivasha Rd.	A	2		1					
16	Argwings Khodhek Rd. / Valley Rd.	A	3		1					
17	Argwings Khodhek Rd. / Woodlands Ave.	A	4			1				
18	Muranga Rd. / Tom Mboya St.	A	2		1					
19	Ngara Rd. / Muranga Rd.	A	3		1					
20	Muranga Rd. / Park Rd.	A	3				1			
21	Ring Road Ngara / Juja Rd.	A	2		1					
22	Outer Ring Rd. / Juja Rd.	A	1			1				
23	Lusaka Rd. / Dunga Rd.	A	4		1					
24	Lusaka Rd. / Enterprise Rd.	A	3		1					
25	Jogoo Rd. / Lusaka Rd.	A	1		1					
26	Jogoo Rd. / First Ave.	A	2		1					
27	Jogoo Rd. / Likoni Rd.	A	2			1				
28	Outer Ring Rd. / Jogoo Rd.	A	2		1					
29	Outer Ring Rd. / Airport North Rd.	A	3		1					
30	Haile Selassie Av. / Race Course Rd.	A	2		1					
31	Ring Road Pumwani / Landhies Rd.	A	1		1					
32	Ngara Rd. / Race Course Rd.	A	2		1					
33	River Rd. / Tom Mboya St.	A	4		1					
34	Kenyatta Av. / Koinange St.	A	3						1	
35	Kenyatta Av. / Muindi Mbingu St.	A	4						1	
36	Kenyatta Av. / Wabera St.	A	4						1	
37	Kenyatta Av. / Kimathi St.	A	4						1	
38	Kenyatta Av. / Moi Av.	A	3						1	
39	Kenyatta Av. / Tom Mboya St.	A	4				1			
40	Moi Av. / City Hall Way	B	3	1						
41	Moi Av. / Ronald Ngara Rd.	B	4	1						
42	Moi Av. / Haranbee Av.	B	4	1						
43	Moi Av. / Haile Selassie Av.	C	3	1						
44	University Way / Koinange St.	B	4	1						
45	University Way / Muindi St.	A	4		1					
46	Riverside drive / Ring rd kileleshwa	A	4				1			
47	Ring Road Parkland / Lower Kabeto Rd.	A	3		1					
48	Limuru Rd. / Mulhaiga Rd.	A	3		1					
GIS-0	Westlands (Chiromo Rd. / Lantana Rd.)	A	1		1					
GIS-1	Museum (Uhuru Hw. / Museum Hill Rd.)	A	2		1					
GIS-2	University (Uhuru Hw. / University Way)	A	1						1	
GIS-3	Kenyatta (Uhuru Hw. / Kenyatta Av.)	C	3	1						
GIS-4	Railway Club (Uhuru Hw. / H. Selassie Av.)	C	2	1						
GIS-5	Bunyala (Uhuru Hw. / Bunyala Rd.)	A	2		1					
GIS-6	Nyayo Stadium (Uhuru Hw. / Langata Rd.)	A	3		1					
				9	28	3	7	6		1

Note: GIS-0 by the Pilot Project

TABLE 18.5-2 PROPOSED IMPLEMENTATION PHASE

Phase	Traffic Signal to be installed	
Phase I (2006 to 2010)	23 intersections	(Priority 1 and 2)
Phase II (2011 to 2015)	16 intersections	(Priority 3)
Phase III (2016 to 2025)	15 intersections	(Priority 4)

Note: GIS-0 improvement was made by the Plot Project

18.6 NON-MOTORISED TRANSPORT (NMT)

18.6.1 Study Methodology

Figure 18.6-1 presents the applied methodology for the study of NMT.

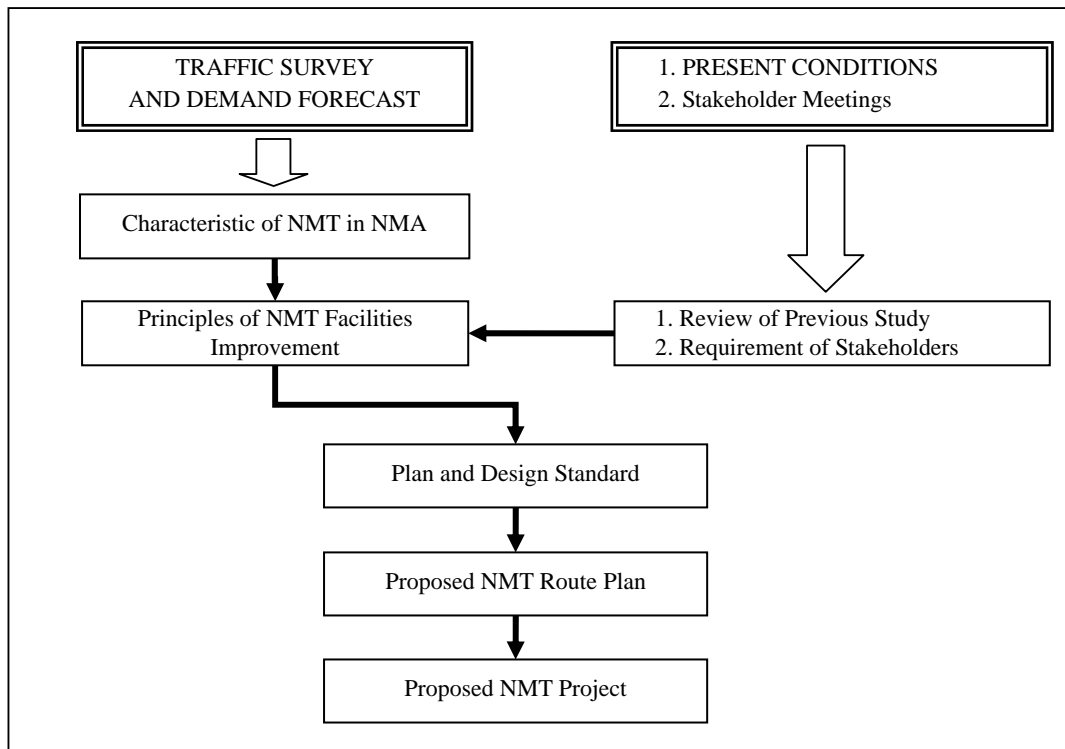


FIGURE 18.6-1 STUDY METHODOLOGY OF NMT

18.6.2 Characteristics of NMT

Figure 18.6-2 presents the number of person trips by walk in 2004.

Out of 4.82 million person trips/day in 2004 in Nairobi City, 2.32 million trips/day were made by walk or bicycles accounting for 48.2%. Number of person trips by walk was 2.27million (47.1%) while by bicycle was 55 thousand (1.1%). Thus almost half of the total trips within Nairobi City depended on walk and more than 20,000 people were supposed to use bicycles for their trips.

Regarding the trip movement by walk among divisions, three notable flow patterns are observed.

- A traffic flow between Central Division and surrounding divisions in apparent radial direction. This flow mainly consists of trips between housing areas in the surrounding Divisions and working places such as informal roadside manufacturers (popularly known as Jua Kali industries), miscellaneous service industries, and commercial areas (markets) in the Central Division.
- A traffic flow between adjacent divisions in circumferential direction. More than 10,000 person trips emerge on a daily basis between Dagoretti Division and Westlands/Kibera Divisions, and between Embakasi Division and Kasarani/ Makadara Divisions.
- A flow to/from Makadara Division containing large volume of commuting trips. The second and third traffic flow patterns can be regarded as the reflection of the NMT trips connecting surrounding industrial areas, Jua Kali industrial areas, and Industrial Area with housing areas constructed by residents in low and middle income classes.

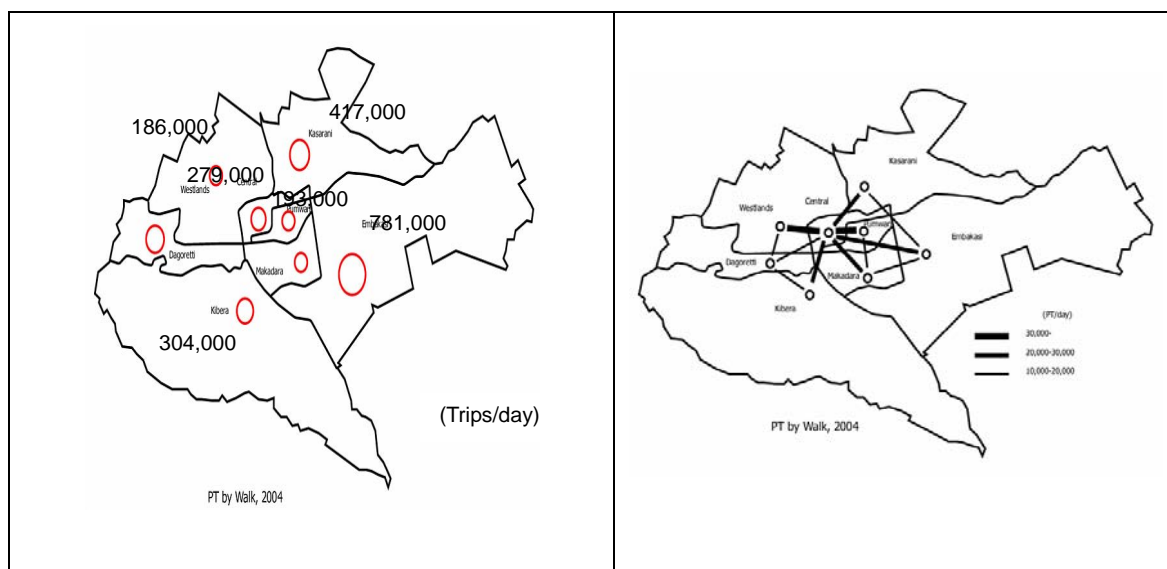


FIGURE 18.6-2 PERSON TRIPS BY WALK IN 2004

18.6.3 Principles for NMT Facility Improvement

Taking into consideration the characteristics of NMT movement pattern mentioned above, the principles for NMT facility improvement are proposed as follows:

- NMT facilities need to be improved corresponding to NMT trips for private purposes and to school, as well as in and around housing areas. Improvement projects all over the Nairobi City are ideal; those in Embakasi, Kasarani, and Dagoretti Divisions can be signified in terms of the volume of NMT.
- NMT facilities shall be improved to connect Central Division, where Jua Kali industries and miscellaneous service industries concentrate, to the surrounding/peripheral housing areas in the urbanized area
- NMT facilities shall be improved to connect industrial area in Makadara Division, to the surrounding industrial areas in Kasarani and Embakasi Divisions, and to Jua Kali industrial areas which have housing areas for low and middle income classes, and to the informal settlements and slum areas in urbanised area (corresponding to second and third NMT flow patterns stated above).

18.6.4 Plan and Design Standard

(1) Design Standard

The following manuals/guidelines are used for NMT design.

1. Ministry of Public Works, Road design Manual Parts I, II, and III
2. Ministry of Public Works, Standard Specification for Roads and Bridge Construction
3. Ministry of Public Work, Manual for Civil Works Details, 1983
4. Ministry of Local Government, Road Design Guidelines for Urban Roads, 2nd Draft, August, 2001

The Study Team also adopted other international manuals and guidelines and the previous study of NMT to supplement the above documents. Some of which are:

5. Guidelines for Pedestrian and Bicycle Traffic in African Cities, version 1.3, World Bank Sub-Saharan Africa Transport Program (SSATP)
6. Road Structures Guidelines of Japan, Japan Road Association, February 2004

(2) Proposed Design OF NMT Facilities

The proposed design concept of NMT facilities is given in Table 18.6-1 while Figure 18.6-3 presents typical NMT design with landscaping.

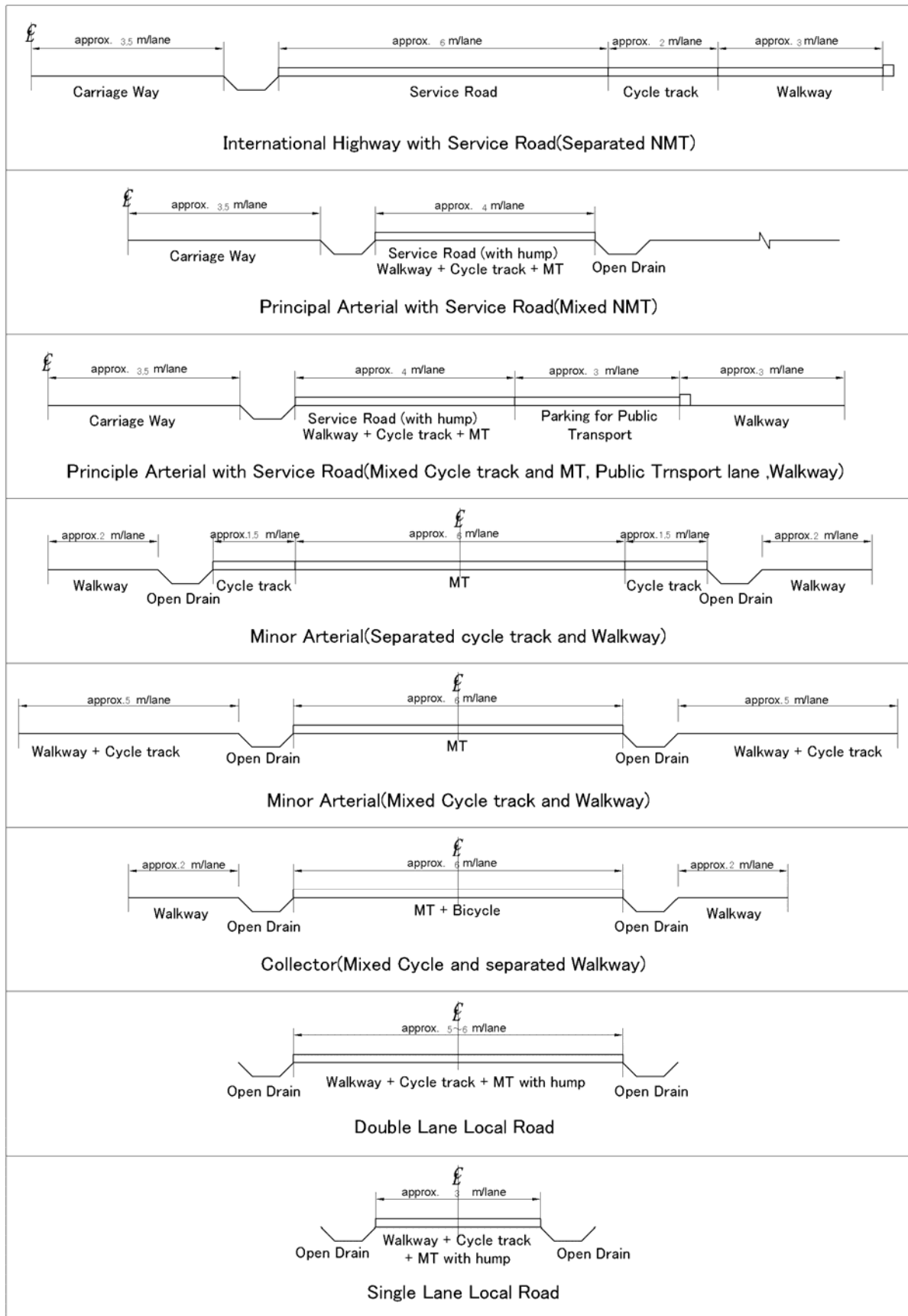
TABLE 18.6-1 DESIGN CONCEPT OF NMT FACILITIES

Item	International Highway	Primary Arterials	Minor Arterials	Collector	Local Road
NMT Domain	• MT • Service Road (NMT)	• Separated	• Separated	• Mixed	• NMT
Walk Way (Pedestrian)	3.5m- wide preferable for disable (See Fig. 18.6.4-2(1)) Minimum 2.0m (See Fig. 18.6.4-2(2))			-	1.5m (Residential Walking Track)
Cycle Way	2.0m preferable Min. 1.5m			-	
Mixed Walk Way + Cycle Way	-	-	-	4.0m preferable Min. 3.0m	(Single lane road) 3.0m (walk + cycle + MT) with speed hump (Local Road) 5.-6m (walk + cycle + MT) with speed hump
Typical Cross Section	See Fig 18.6.4.-3(1)	See Fig 18.6.4.-3(2)	See Fig 18.6.4.-3(3)	See Fig 18.6.4.-3(4)	See Fig 18.6.4.-3(5)

Figure 18.6-4 shows the preferable walk way for disable and traffic vulnerables and Figure 18.6-5 shows the minimum requirement for walkway.

TABLE 18.6-2 DETAILED DESIGN CONCEPT FOR DISABLE

Item	Description	
Walk Way Pedestrian	Wide	Minimum of 2m for two wheel chair to pass each other
	Flatness	Minimum of 2m wide flat area on ramp
	Kerb	15 cm high
	Mound up	5cm mound-up. Green belt, plant, hence, etc. if required.
	Pavement	Flat pavement (AC)
	Slope	Vertical slope: max. 5%, traverse slope: max. 1%
	Different Level	Different level of carriageway and walkway at crossing pass: 2cm



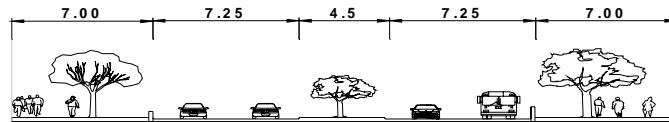


FIGURE 18.6-3 TYPICAL CROSS SECTION OF NMT FACILITIES WITH LANDSCAPING

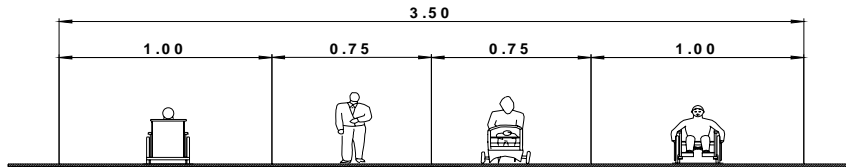


FIGURE 18.6-4 PREFERABLE WALK WAY (PEDESTRIAN WAY) FOR DISABLED AND TRAFFIC VULNERABLES

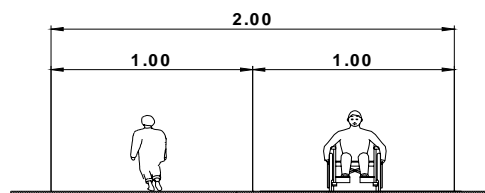


FIGURE 18.6-5 MINIMUM REQUIREMENT FOR WALK WAY (PEDESTRIAN WAY)

18.6.5 Proposed NMT Route Plan and Projects

The NMT routes were delineated from the following principles:

- NMT corridors shall be formulated in compliance with principles corresponding to NMT demand.
- Understanding between NMT and general traffic will be pursued with emphasis on traffic safety.
- NMT corridor network shall be formed within appropriate location and density to efficiently serve housing areas.
- A grade crossing between NMT and heavy traffic shall be avoided as much as possible.
- Possibility of provision of NMT facilities will be well examined with particular attention to existing road width and NMT facilities.

The planning of the proposed NMT routes is largely based on the above principles which are in line with the discussions with local counterparts and data collected from actual and focus NMT volumes on each major road.

The proposed NMT routes are shown in Figure 18.6-6. These routes exclude the NMT routes that will be improved described as the projects of road improvement in this study. The proposed NMT projects are presented in Table 18.6-3 (1) and (2).

**TABLE18.6-3 (1) PROPOSED NMT PROJECT
(SOUTH AND WEST AREA)**

NMT South & West		Length (km)	Section	Major Work	
NMT-1	Ngong Road	-	Lenana School to Naivasha Road		
NMT-2	Kikuyu Road	3.0	Waithaka Shopping Centre to Naivasha Road		
NMT-3	Naivasha Road	3.1	Kawangware to Ngong Road		
NMT-4	Kingara Road	1.0	Ngong Road to Gitanga Road		
NMT-5	James Gichuru Road	-	Gitanga Road to Waiyaki Way	5-m Footpath	
NMT-6	Gitanga Road	2.7	Kawangware to Ole Odume Road	and Bicycle	
NMT-S	NMT-7a	Argwings Kodhek Road	3.6	Kingara Road to Valley Road	Lane and
NMT-7b	Argwings Kodhek Road Extension	0.5	Valley Road to Ralph Bunche Road	Drainage	
NMT-8	Denis Pritt Road Corridor	4.3	Oloitokitok Road to Kenyatta Avenue		
NMT-9	Mbagathi Way Corridor	3.0	Ngong Road to Langata Road		
NMT-10	Valley Road	2.3	Ngong Road to Uhuru Highway		
NMT-11	Waiyaki Way Corridor	12.5	Uthiru to Limuru Road		
<i>Sub Total (NMT - South & West)</i>		<u>36.0</u>			

**TABLE18.6-3 (2) PROPOSED NMT PROJECT
(NORTH AND EAST AREA)**

NMT North & East		Length (km)	Section	Major Work	
NMT-12	Kiambu Road	-	Thika Road to City Boundary		
NMT-13	First Avenue Eastleigh Corridor	3.2	Juja Road to Industrial Area	5-m Footpath	
NMT-N	NMT-14	Heshima Avenue Corridor	4.2	Outer Ring Road to First Avenue Eastleigh	and Bicycle
NMT-15	Mumias Road Corridor	5.9	Kariobangi to Industrial Area	Lane and	
NMT-16	Rabai Road Corridor	1.8	Mumias Road Corridor to Industrial Area	Drainage	
NMT-17	Jogoo Road	5.2	Outer Ring Road to Lusaka Road		
NMT-18	Lusaka Road	3.5	Country Bus Station to Industrial Area		
<i>Sub Total (NMT - North & East)</i>		<u>23.8</u>			

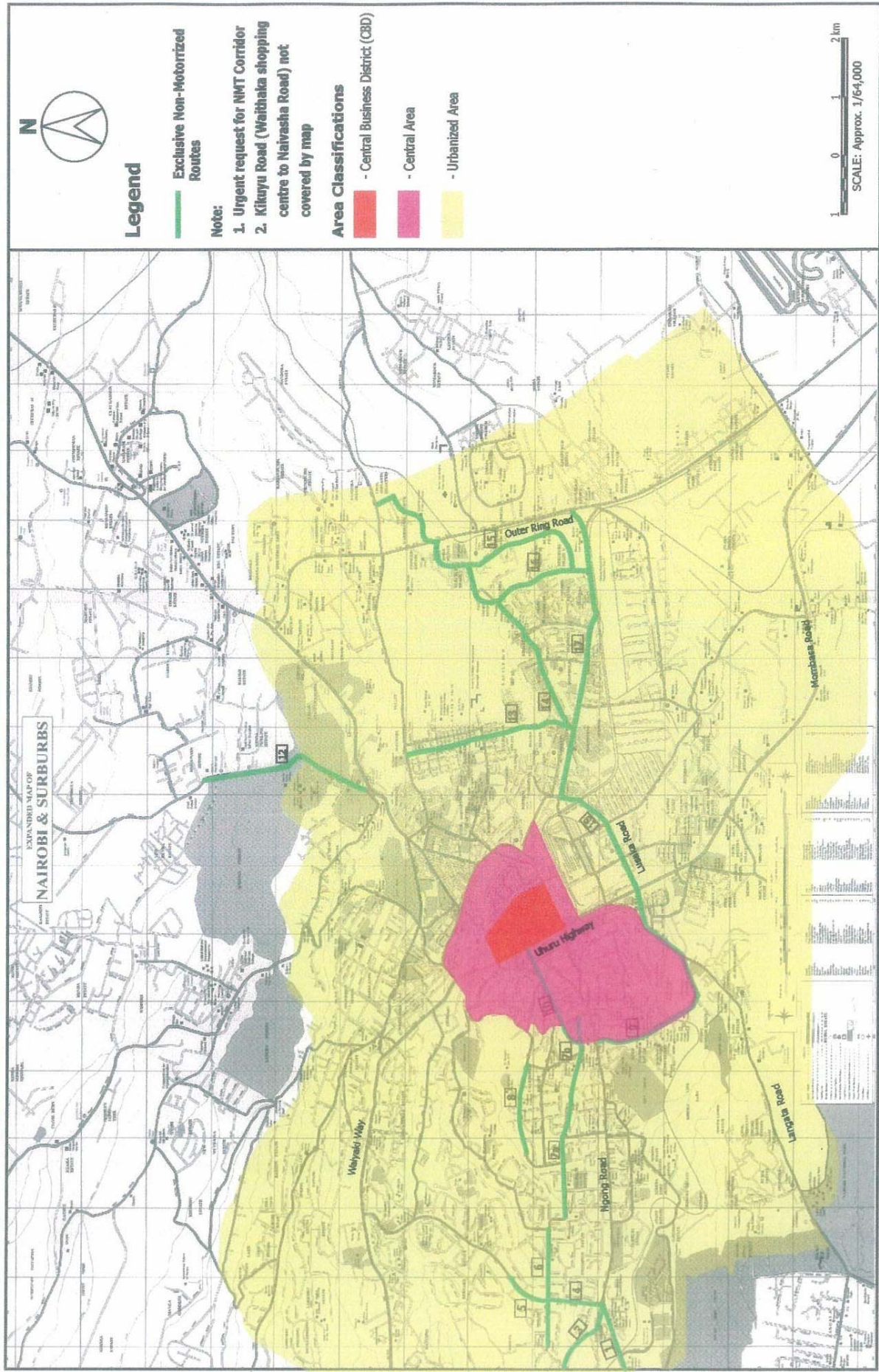


FIGURE 18.6-6 EXCLUSIVE NON MOTORIZED TRANSPORT ROUTES IN URBANIZED AREA

18.7 UHURU HIGHWAY IMPROVEMENT

18.7.1 Present Status of Uhuru Highway Improvement

On 26 January 2005, MRPW and WB issued an announcement regarding invitation for pre-qualification of concession contract for the Northern Corridor Transport Improvement Project. The invitation aimed at inviting experienced firms, organisations or consortiums for the design, construction, finance, operation and maintenance of the Northern Corridor Nairobi Concession as a Toll Highway, including Associated Facilities and Development under a 30 year Concession Contract. The total length is initially designated at approximately 106km.

The works consist of the following eight homogeneous road sections:

- (a) A109: From Machakos Turnoff to Airport I/C (22km) – rehabilitation of existing 2-lane single carriageway (World Bank) and construction of the second 2-lane carriageway (Concessionaire) including the construction of an interchange at the A109/A104 junction (Concessionaire) and the construction of a toll plaza at A109/104 interchange (I/C)
- (b) A104: From A109/A104 junction to Airport I/C (11km) – rehabilitation of the existing 2-lane single carriageway road and improvement to a 4-lane dual carriageway (World Bank)
- (c) A104: From Airport (I/C) to Nairobi Bypass South I/C (7.8km) – rehabilitation of the existing dual carriageway road and improvement to 6 lanes including the construction of interchange at the North Airport Junction, Enterprise Road junction and the Nairobi Bypass South Junction as well as the construction of a toll plaza (Concessionaire)
- (d) Mombasa Road: From Nairobi Bypass South I/C to Langata Road Roundabout (3km) – rehabilitation of the existing 4-lane dual carriageway and upgrading to a 6-lane dual carriageway (Concessionaire)
- (e) Uhuru Highway: From Langata Road Roundabout to Westland Roundabout (5.3km) -upgrading to 10 lanes which includes 4-lane overpasses at the major existing roundabouts (Concessionaire)
- (f) A104: From Westlands Roundabout to the Nairobi Bypass North I/C (16.5km) rehabilitation of the existing 4-lane dual carriageway (Concessionaire)
- (g) Nairobi Bypass: From Nairobi Bypass South I/C to Nairobi Bypass North I/C (29km) – construction of a new 2-lane single carriageway urban arterial (Concessionaire)
- (h) A104: From Nairobi Bypass North I/C (Kikuyu) to Rironi (11.5km) - rehabilitation of the existing 4-lane dual carriageway road and the construction of a toll plaza (Concessionaire)

The outlined components of works were already considered as prerequisite conditions of the Master Plan preparation except for the Uhuru Highway portion which requires coordination with the CBD traffic flow and prevalent conditions of future right of way for public transport.

18.7.2 Proposed Uhuru Highway Improvement

(1) Alternative Schemes of Uhuru Highway Improvement

Five alternative schemes of Uhuru Highway Improvement are proposed as follows.

- Scheme 1: Stage 1 Widening
- Scheme 1: Stage 2 Grade Separation (Depressed)
- Scheme 2: Grade Separation (Overpass)
- Scheme 3: Continuous Box
- Scheme 4: Continuous Viaducts

Figure 18.7-1 (1) presents an example of widening and conceptual grade separation study under Stage 1.

(2) Comparative Evaluation of Improvement of Uhuru Highway

Table 18.7-1 presents the comparative evaluation of improvement of Uhuru Highway in terms of traffic conditions, social impacts, city landscape, compatibility with future plan, and cost.

Table 18.7-1 COMPARATIVE EVALUATION OF IMPROVEMENT OF UHURU HIGHWAY

	Major works	Traffic condition		Social Impact	City Landscape	Compatibility with Future Plan	Cost	Overall Evaluation
		Mobility	Accessibility					
Scheme 1 Stage 1: Widening	Stage 1: Road widening 30m Road length 5.0 km	8 lane-for through traffic 3-signal intersections (reasonable service until year 2010/2015)	4 - lane for local traffic (circulation traffic flow from/to CBD)	With an additional R.O.W. 30m (Road Reserve 90m) National Park will be revived as a City Symbol for citizens and tourist	Best fit to maintain urban scenery and greenery (amenity facilities and shopping mall)	Compatible with minimum works for expressway and LRT	Minimal OO	O
Stage 2:Grade separation(Depr essed)	Stage 2: (L=0.5mx3) (same as Scheme 2)	Signal intersections will be improved into depressed grade separation				Depressed road can be used as express way		
Scheme 2 Grade separation (overpass)	Overpass (L=0.5 m x3) (Museum Hill, Haile Selassie Langata)	4-lane for through traffic 3 -signal intersections still remain Weaving within short section between viaduct and intersection will disturb through traffic	No lane for local traffic	No additional R.O.W (Road Reserve 60m)	Obstruction to urban space due to huge structures (overpass)	Not compatible (Need further improvement with considerable works)	High (Compared with widening)	X
Scheme 3 Continuous Box	4 - lane Box, L=4.5 km On and off ramp (same as Scheme 2)	Continuous 4-lane for through traffic 3 signal intersections still remain Weaving within short section between viaduct and intersection will disturb through traffic	No lane for local traffic	No additional ROW (Road reserve 60m)	Fit to maintain urban scenery	Continuous box may be used for expressway, but no space for LRT	Very high	X
Scheme 4 Continuous Viaduct	4 -lane viaduct L=4.5 km On-off ramp (same as Scheme 2)	Continuous 4- lane for through traffic 3 signal intersections still remain Weaving within short section between viaduct and intersection will disturb through traffic	No lane for local traffic	No additional Row (Road Reserve 60m)	Obstruction to urban scenery due to huge structure (viaduct and ramp)	Continuous viaduct may be used for expressway but no space for LRT	Very high	XX

Note: OO Very Good O Good Δ Fair X Bad XX Very Bad

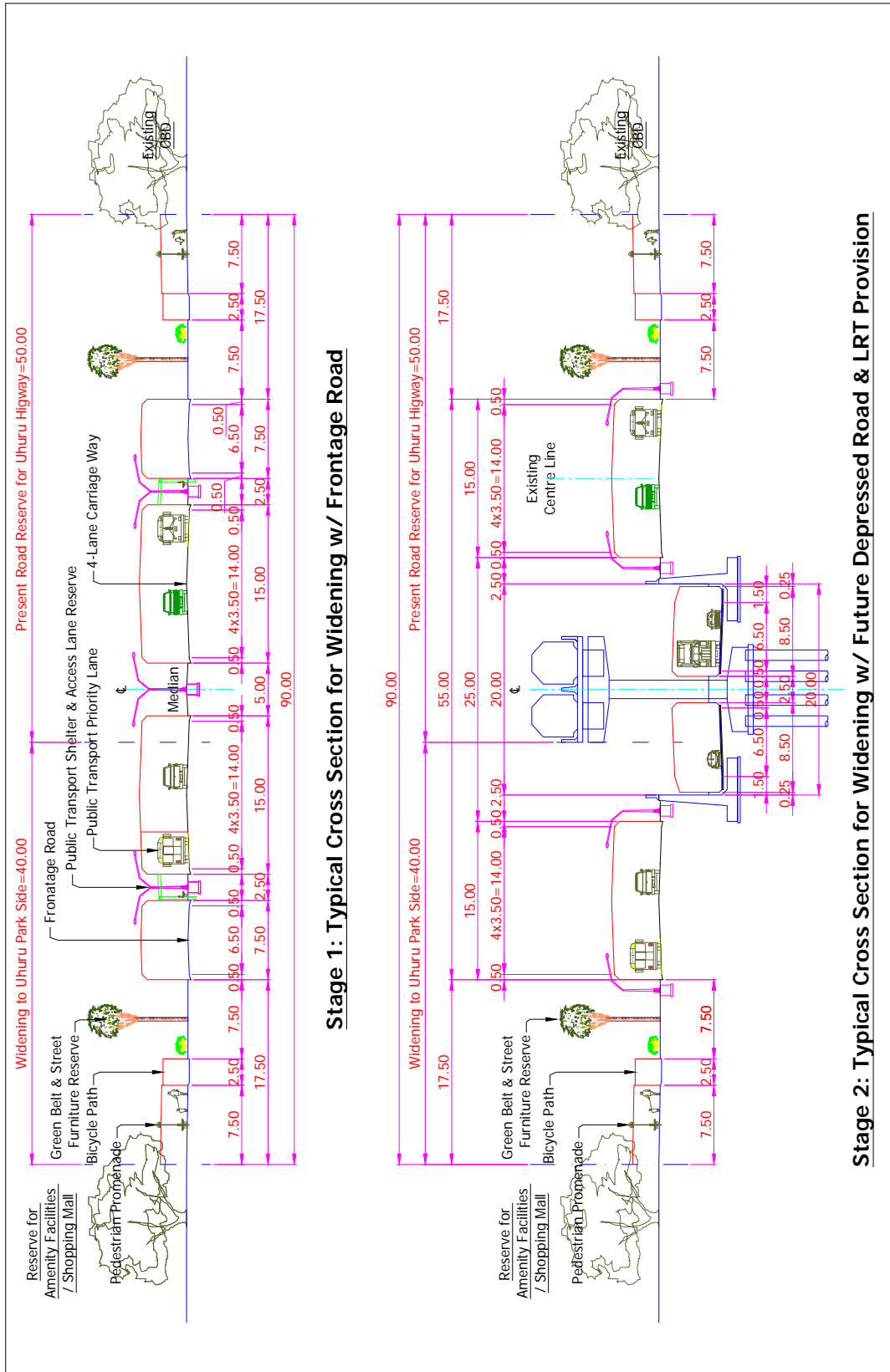


FIGURE 18.7-1 SCHEME 1: WIDENING AND FUTURE GRADE SEPARATION

18.8 PROBLEM AREAS FOR ROUTE SELECTION

The Master Plan proposes primarily the preliminary corridors / routes of road networks based on field inspection of existing roads, reserved road right of way, and open spaces probably available for routes. However, the availability of those areas shall be verified and the alignments of proposed road networks shall be decided based on an accurate detailed engineering study and public consultation. Figure 18.8-1 shows the locations of problem areas.

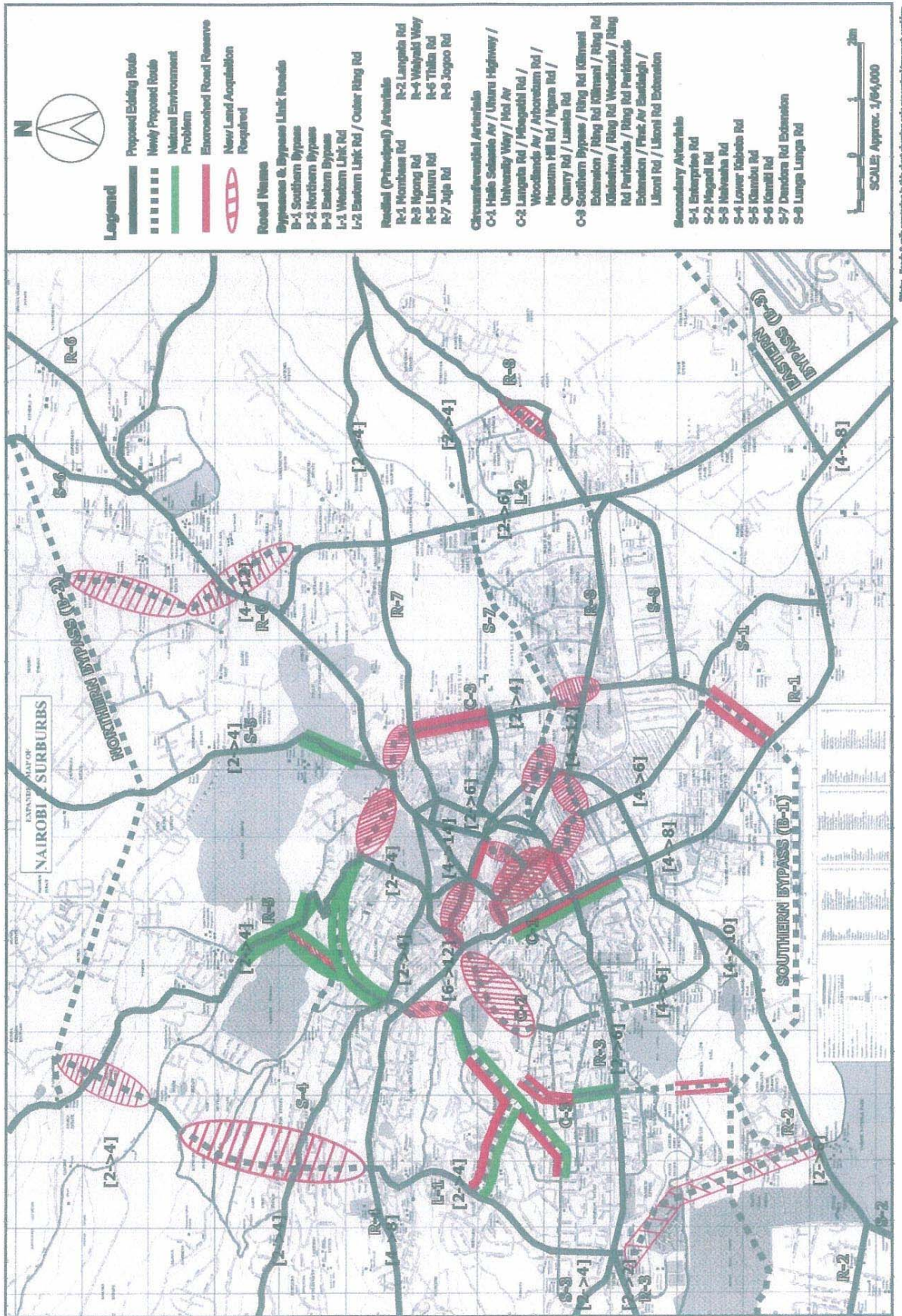


FIGURE 18.8-1 MAJOR PROBLEM AREAS FOR ROUTE SELECTION

18.9 PRELIMINARY COST ESTIMATE

18.9.1 Unit Construction Cost Analysis

(1) Unit Rate of Construction Items

A preliminary cost estimate was carried out based on the prevailing unit prices and previous studies. Unit rates of major construction items are shown in Table 18.9-1.

TABLE 18.9-1 UNIT RATE OF MAJOR CONSTRUCTION ITEMS

Items	Unit	Rate (Ksh)	Description
I. Carriageway			
1 AC	m ³	14,412	
2 Base Course	m ³	2,854	Cement/Lime Stabilisation
3 Subbase course	m ³	1,750	Graded crush stone
4 Sub grade treatment	m ³	25	Compaction
II Bicycle Way (Cycle Way)			
1. AC	m ³	14,412	t=25mm
2. Base Course	m ³	2,854	t=150mm
3. Subbase course	m ³	1,750	t=250mm
III. Walkway			
1. Concrete Block	m ³	43,867	
IV. Drainage			
1. Stone pitching	m ²	680	t=200mm
2. Excavation	m ³	218	Structure excavation
V. Earthwork			
Fill	m ³	135	
Cut	m ³	125	

Source: MRPW, Pilot Project and Consultants estimate

(2) Unit Price by Type of Work

Based on the above unit price, the unit price by type of work is estimated in Table 18.9-2.

TABLE 18.9-2 UNIT PRICE BY TYPE OF WORK

Project Components	Description	Unit	Million Ksh
1. Road Improvement			
1.1 Type 1: New Construction	6-lane RR=60m	km	113.8
1.2 Type 2: New Construction	4-lane RR=60m	km	89.5
1.3 Type 3: New Construction	4-lane RR=30m	km	86.0
1.4 Type 4: New Construction	2-lane RR=30m	km	51.2
1.5 Type 5: New Construction	NMT	km	19.9
1.6 Type 6: Widening from 2 to 4 lane	with NMT 7m to 14m	km	40.7
1.7 Type 7: Widening from 4 to 6 lane	with NMT 14m to 21m	km	40.7
1.8 Type 1a: NC with frontage road	6-lane RR=60m	km	99.5
1.9 Type 8: Rehabilitation with NMT	2-lane RR=30m	km	32.7
Signalisation for Intersection Improvement			
Roundabout Improvement wt signals		Set	32.9
RA Signal Installation Only		Set	12.2
RA to Intersection w/ Signal		Set	39.9
Grade Separation 4-lane	L=520m, W=18m 4-lane	Set	1,293.6
Grade Separation 2-lane	L=520m, W=13m 2-lane	Set	975.2
Structure			
Bridge 1	4-lane L=50m	Set	230.4
Bridge 2	2-lane L=50m	Set	166.4

Source: MRPW, Pilot Project and Consultants estimate

(2) Engineering and Construction Supervision Cost

Detailed design cost was estimated at 4% of construction cost and construction supervision cost at 8% of construction cost.

(3) Land Acquisition and Relocation Cost

Land acquisition cost is included in the preliminary cost estimate for the project that will require new road reserves based on available information. Relocation cost is not included because those who encroach the road reserves have no right of compensation according to the Law of Kenya. Since the land value of acquisition and compensation can be estimated only by the Commissioner of Lands of MOLH in Kenya, the land acquisition cost should be reviewed based on the road alignment to be prepared by future Feasibility Study for each road project.

18.9.2 Estimated Preliminary Cost

The estimated preliminary cost of selected future road network plan is summarised in Table 18.9-3.

TABLE 18.9-3 ESTIMATED PRIMARY COST

Major Project	MKsh
1. Bypass and Link Roads	7,971
2. Missing Links	6,059
3. Radial Roads	9,424
4. Circumferential Roads	1,452
5. Secondary Arterial Roads	2,976
6. Signalisation	1,658
7. NMT	1,332
8. Uhuru Highway Improvement	3,673
9. Traffic Circulation in the City Centre	250
TOTAL	34,795

18.10 STAGING PLAN

18.10.1 Prioritization Procedure

(1) Prioritization Procedure

Prior to the stage implementation plan, the prioritization of the Projects is made. In the Master Plan, the project will be implemented in the following three stages;

- Short Term Stage: 2006 ~ 2010
- Medium Term Stage: 2011 ~ 2015
- Long Term Stage: 2016 ~ 2025

The prioritization procedure of the road projects is illustrated in Figure 18.10-1.

(2) Prioritization Factors Considered

The prioritization of the road projects is principally assessed from four (4) aspects (planning, technical, environmental and benefit).

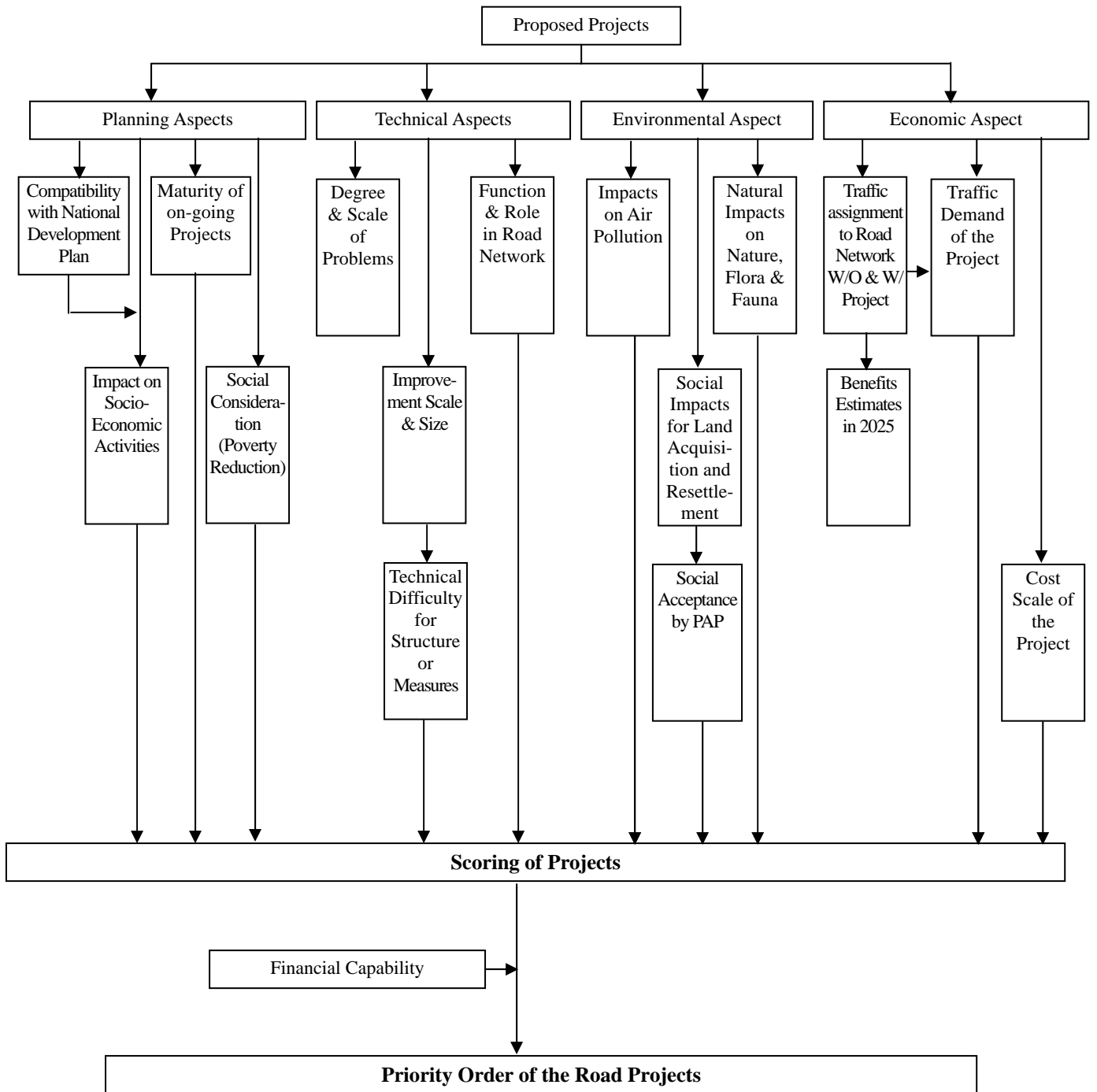


FIGURE 18.10-1 PRIORITIZATION PROCEDURE OF THE ROAD PROJECTS

Planning Aspects

- Compatibility with the National Development Plan
- Impact on Socio-economic Activities
- Maturity and Status of on-going and committed projects
- Requirement of Social Consideration (poverty reduction) on Project Implementation Impact

Technical Aspect

- Urgency based on degree and scale of problems
- Improvement scale and the size of the project
- Function and role in road network
- Technical difficulty and requirement for special structures or measures

Environmental Aspect

- Effect on health in terms of its high impact in mitigation of air pollution
- Social impacts with limited need for land acquisition and resettlement schemes
- Natural Impact with limited negative effects on nature, flora and fauna
- Social acceptance by affected people and user groups

Benefit Aspect

Traffic demand to handle high traffic volumes with high level-of-services

- Cost scale with high priority for low cost projects
- Relative benefit scale that is assessed by the share of the project's benefits to the total benefits

18.10.2 Staging Plan of the Road Projects

Based on the results of the prioritization, the following staging plan is proposed in this study.

TABLE 18.10-1 STAGING PLAN OF ROAD IMPROVEMENT

	Short Term (2006-2010)	Medium-Term (2011-2015)	Long Term (2016-2025)
1 Bypass and Link Roads	-	-	<ul style="list-style-type: none"> · Bypass Roads · Link Roads · Link Road Extension
2 Missing Links	<ul style="list-style-type: none"> · Missing Links (Arterial) 	<ul style="list-style-type: none"> · Missing Links (Collector) · Missing Links (Local) 	-
3 Radial Roads	<ul style="list-style-type: none"> · Radial Roads within C-3 	<ul style="list-style-type: none"> · Radial Roads outside C-3 (North & East) 	<ul style="list-style-type: none"> · Radial Roads outside C-3 (South & West) · New Radial Roads
4 Circumferential Arterial Roads	-	<ul style="list-style-type: none"> · Circumferential Arterial Roads C-3 	<ul style="list-style-type: none"> · Circumferential Arterial Roads C-1 & C-2
5 Secondary Arterial Roads	-	-	<ul style="list-style-type: none"> · Secondary Arterial Roads (South -West) · Secondary Arterial Roads (North - East)
6 Intersection Improvement	<ul style="list-style-type: none"> · Intersection Improvement (Stage 1) 	<ul style="list-style-type: none"> · Intersection Improvement (Stage 2) 	<ul style="list-style-type: none"> · Intersection Improvement (Stage 3)
7 Non-Motorized Transport (NMT)	<ul style="list-style-type: none"> · NMT (North & East) 	<ul style="list-style-type: none"> · NMT (South & West (Part)) 	<ul style="list-style-type: none"> · NMT (South & West (Part))
8 Uhuru Highway	-	-	-
9 Traffic Circulation	Traffic Circulation (Stage 1)	Traffic Circulation (Stage 2)	-

Most of the radial and circumferential roads in Urban Areas pass through residential areas. It is important to limit the damage to the community and environment during the widening and construction of new roads by adopting appropriate mitigation measures. It is therefore recommended that consultations with the stakeholders and comprehensive EIA's be conducted.