

APPENDIX 11

FUTURE SOCIO-ECONOMIC FRAMEWORK

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APPENDIX 11 FUTURE SOCIO-ECONOMIC FRAMEWORK

11.1 DEVELOPMENT POTENTIAL AND CONSTRAINT

Water Supply Capacity

The existing water supply in the Nairobi City has four sources, namely Kikuyu Spring, Sasumua Dam, Ruiru Dam, and Ngethu. Water shortage is a growing problem in the Nairobi Metropolitan Area because of the water loss reportedly amounting to some 50% of total water supply and expanding population.

Water supply plan with target year 2000 was formulated in the "Third Nairobi Water Supply Project". The projected population of Nairobi City would be 3.86 million and corresponding projected water demand would be 752.2 thousand cubic meters per day in 2010.

Planned area of piped water supply covers the whole Nairobi City and some part of Ruiru to the north, and Syokimau to the southeast. Local area water supply projects are proposed in Ngong and Ongata Rongai to the southwest and Western Shamba Area to the northwest of Nairobi City. Gravity type water supply system can be applicable to the areas less than 1,700m above sea level in the Nairobi Metropolitan Region (See Figure 11.1-1).

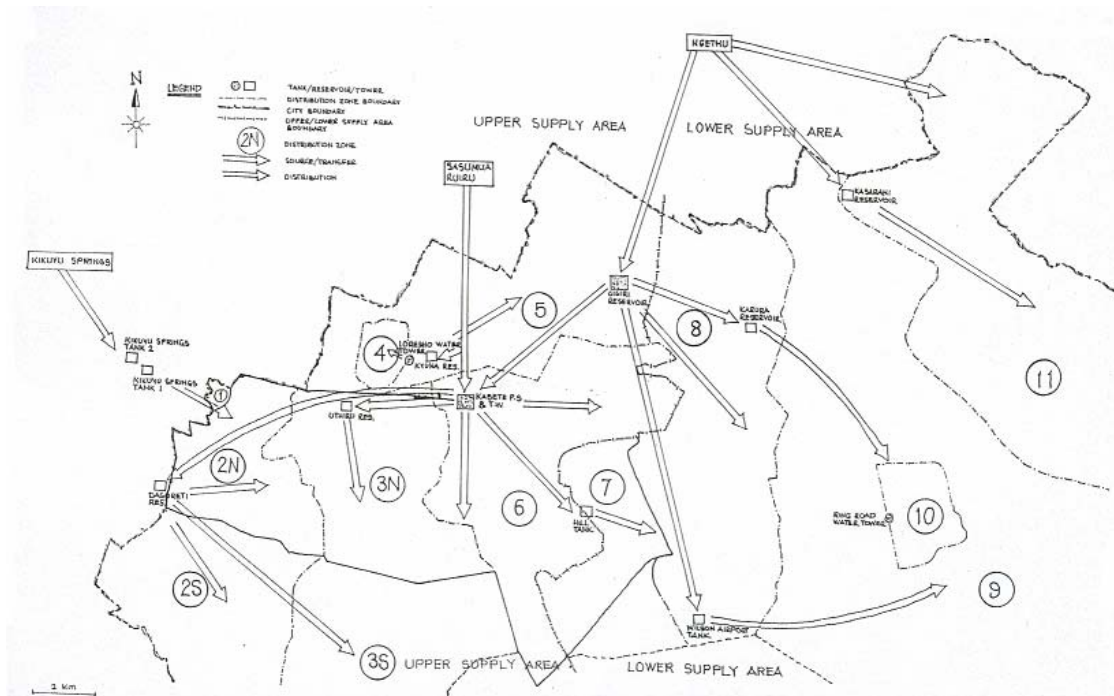


FIGURE 11.1-1 WATER SUPPLY SCHEME IN NAIROBI CITY

Sewerage Treatment Plan

The whole Nairobi City is not covered by the existing sewerage system managed by Nairobi City Water and Sewerage Company. Sewer mains are laid along the Nairobi River, Matari and Ruiruaka River, and Ngong River. Nearly 20 sewerage disposal plants are operated. Large scale sewerage disposal plants exists at Dandora and Kariobangi. Septic tank and latrines are used in those area where sewerage disposal system is not available.

Sewerage disposal plan up to 2020 was shown in "Nairobi Master Plan for Sewers, Sanitation and Drainage". According to the Plan, projected population in Nairobi City would be 4.09 million in 2020 and high population increase was assumed in Embakasi Division.

The planned sewerage disposal area was determined basically to accord to that of water supply. Local area sewerage disposal systems are proposed in Ngong and Ongata Rongai area to the southwest and Western Shamba Area to the northwest of Nairobi City (See Table 11.1-1 and Figure 11.1-2).

TABLE 11.1-1 PROJECTED POPULATION FOR SEWERAGE DISPOSAL BY DISTRICT

Location	Population	
	1999	2020
Nairobi	2,143,254	4,090,000
Central	234,942	295,000
Makadara	197,434	174,000
Karasani	338,925	670,000
Embakasi	434,884	1,165,000
Punwani	202,211	326,000
Westlands	207,610	409,000
Dagoretti	240,509	606,500
Kibera	286,739	444,500
Surrounding Area		
Ruiru		354,000
Kiambu/western Shamba		494,700
Ngong/Ongatta Rongai		255,000
Athi River		170,000
Syiokimau		130,000

Source: "Nairobi Master Plan for Sewer, Sanitation and Drainage
Third Nairobi Water Supply Project", 1998, Nairobi City Council

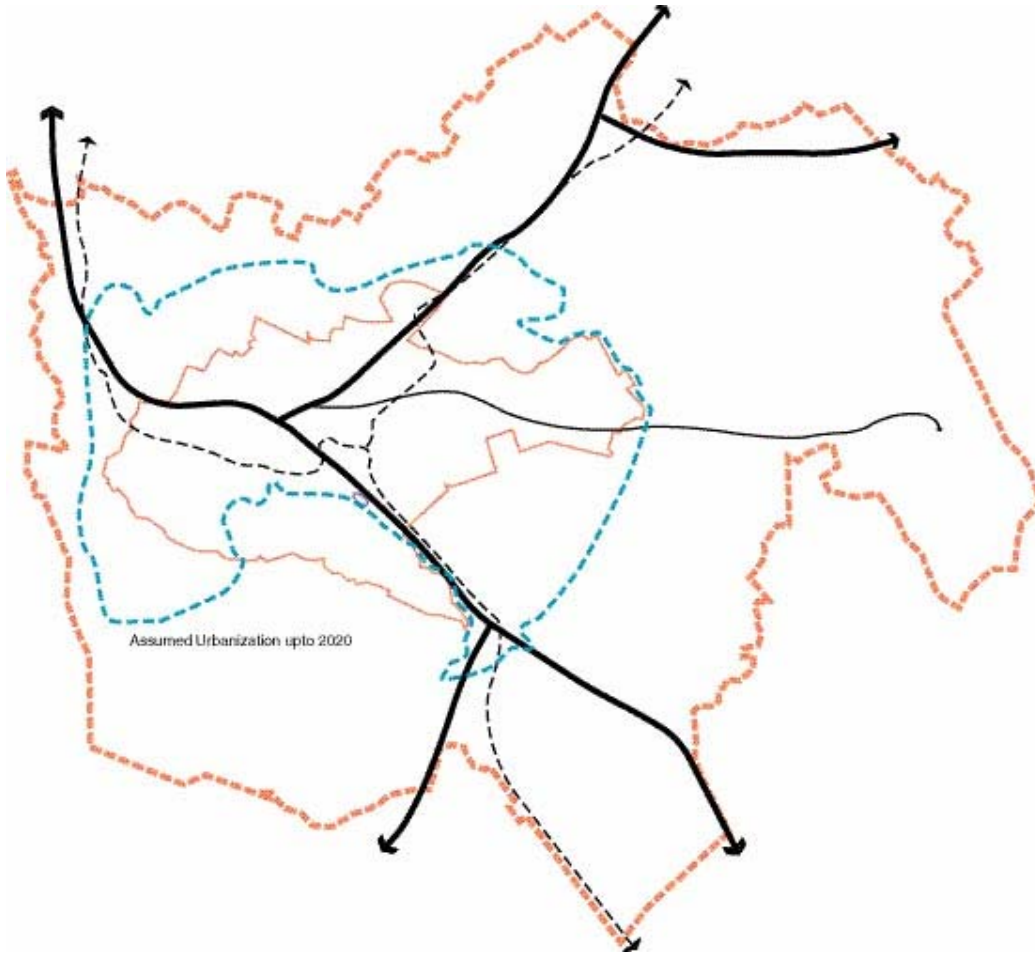


FIGURE 11.1-2 ASSUMED URBANIZED AREA UP TO 2020 FOR SEWERAGE DISPOSAL PLAN

11.2 URBAN LAND USE TYPES AND DISTRIBUTING PRINCIPLES

Commerce

Sub-centers, distribution areas and local commercial areas are proposed to avoid the excessive concentration caused by the incessant influx of urban functions to the central area in the future (Table 11.2-1).

TABLE 11.2-1 LAND USE TYPES AND DISTRIBUTION PRINCIPLES (COMMERCE)

Land use/function type	Future land use demand	Principle of distribution
Central business district: economic center (headquarters and central governments) as a center of the Nairobi Metropolitan Area and Kenya; high-level commercial function (shopping center, speciality stores and restaurants) serving the Nairobi Metropolitan Area	So-called CBD is usually confined within the walking radius of some 1km, therefore density of CBD will proceed. If plot size ratio regulation is applied, urban functions spilt over from the CBD will form subcenters.	Present CBD, the focal point of transport with good accessibility from the whole Nairobi Metropolitan Area
Subcenter: - public service functions, administrative functions to complement economic center; - shopping center, speciality stores and daily goods shops to complement economic center	Traffic congestion in the heart of the city is already problematic, and lowering the efficiency of business activities. Some business entities have already moved out of central area. Land use arrangement to take such spilt over urban functions will be necessary.	Nodal point of public transport and road network with core facilities in the ranged built-up areas (Dagoretti Corner, Westland)
Distribution area (industry-oriented): - distribution functions (truck terminals and warehouses) to work together with assembling and processing industries mainly composed of heavy industry	With the expansion of industrial producing power, distribution function grows. Planned allocation of distribution function will be necessary for the fluency of traffic.	Nodal point of inter-regional arteries (areas near present Industrial Area, Athi River Town, areas along Mombasa Road, areas adjacent to newly proposed industrial area)
Distribution area (commerce-oriented): - distribution function (distribution center and warehouses) to trade with other industrial areas in the Nairobi Metropolitan Area and transport goods and products to those areas	As the progress of economy and expansion of population, distribution function grows. Planned allocation of distribution function will be necessary for the fluency of traffic.	Nodal point of inter-regional artery in the outskirts of the urbanized area and intra-regional artery (areas along Jogoo Road, Outer Ring Road, and Juja Road)
Local commercial areas: - everyday goods stores and some speciality stores as a center of daily activities of the inhabitants (milieu)	As a center of daily activities of the inhabitants (milieu), future demand for area will depend on the future population size of the catchment area.	Present central areas of municipalities and townships and central areas of proposed new town (central area of Thika, Athi River, Kiambu, Limuru, Ruiru, Kikuyu, Tala/Kangundo, and proposed new town)

Industry

Large scale inland industrial area in new town, industrial area related to distribution, small scale inland industrial area corresponding to Jua Kali adjacent to housing zone, and agricultural produce processing industrial area are proposed as a main component of industry (Table 11.2-2).

TABLE 11.2-2 LAND USE TYPES AND DISTRIBUTION PRINCIPLES (INDUSTRY)

Land use/function type	Future land use demand	Principle of distribution
Large scale inland industrial area: - large scale assembling and processing industries to promote regional and economic development of the Nairobi Metropolitan Area and Kenya	As the driving force of the economic development, preparation for the future demand for land is necessary.	Areas convenient to utilize inter-regional arteries (present Industrial Area near Nairobi Station, Athi River EPZ, proposed new town)
Airport related industrial area: - high value-added industry (ex. cut flower industry)	Land demand depends on the scale of future high value-added industries. Currently cut flower industry exporting to Europe is regarded as almost only such industry. Not so much land demand is expected in the future.	Areas around Embakasi Airport (ex. Athi River EPZ)
Small scale inland industrial area: - small scale city oriented assembling and processing industry (food, furniture, etc.)	The area is for the existing assembling and processing industries in built-up area including a part of "Jua Kali" industry through group relocation to form new industrial area containing housing plots.	Vacant areas adjacent to the populous area with good accessibility to central area (area nearby Wilson Airport, eastern area of Karen Road, Danrora, Kassarani, Ruaraka)
Distribution related industrial area: - assembling and processing industry depending on the distribution function to support industrial production within the urbanized area	It will correlate to the extent of population and economy accumulated in the metropolitan area.	Nodal points of intra-regional arteries between CBD and freight transport hub (Embakasi Airport and Nairobi Station) (ex. areas along the proposed southern bypass)
Agricultural produce processing industrial area: industry to process local agricultural products (dairy, meat, tea, coffee, etc.)	Although expansion of agricultural producing power in the future is uncertain, expansion of value-added amount through processing will be expected.	Areas along inter-regional and intra-regional arteries adjacent to local center with high agricultural potential (Thika, Kiambu, Limuru, Tala/Kangundo, Kikuyu)
Industrial area in built-up area: - small scale city-oriented industry (food, printing, etc.)	The area is for the existing industries in built-up area including a part of "Jua Kali" industry through relocation. Total amount of land will be almost stable before and after.	Present industrial sites and available lands for relocation within built-up area (ex. railway yard)
Industrial area along trunk road: - city-oriented assembling and processing industry linked with distribution facilities	It will correlate to the extent of population and economy accumulated in the metropolitan area.	Areas along inter-regional artery or intra-regional artery (areas along Thika Road (Ruiru) and Mombasa Road)

Housing

Enhancement of housing density in existing built-up areas, housing development along transport corridors, long-range housing development in hilly areas, slum improvement of housing standard, new town development containing both housing and work places, restriction of housing development off the transport corridor are proposed as a main component of housing development (Table 11.2-2).

TABLE 11.2-3 LAND USE TYPES AND DISTRIBUTION PRINCIPLES (HOUSING)

Land use/function type	Future land use demand	Principle of distribution
Low standard housing area in built-up area:	Informal settlements and slum areas fall into this type. Improvement of living environment will be necessary. Further expansion of this housing type should be avoided. Housing and land demand outside of this housing area for emigrant will emerge due to the improvement of living standards.	Present low standard housing area (Spilt over population shall be absorbed in the other housing areas in the Nairobi Metropolitan Area.)
Old town around CBD (eastern): - areas where apartment houses are dominant	Housing demand is large because of the proximity to CBD. However, population density will not rise due to the present large number of dwelling units of apartment houses.	Areas adjacent to CBD and existing Industrial Area
Old town around CBD (western and northern): - areas where apartment houses and bungalows are dominant	Housing demand is large because of the proximity to CBD. Population density will be raised by construction of apartment houses.	Old City (within 1964 Nairobi city boundary) (Kilimani, Parklands, etc.)
Ranged built-up area in hilly areas: - areas where bungalows are dominant	Long-range land demand is expected because of the favorable living environment.	western and northern hilly areas of the Nairobi Metropolitan Area
Ranged built-up area in flat terrain: areas where apartment houses and bungalows are dominant	Large demand is expected because of the relatively low land cost.	Eastern flat terrain areas of the Nairobi Metropolitan Area
Urbanizing area along trunk road in flat terrain:	Housing demand for immigrants into the metropolitan area and existing low and middle income inhabitants will remain large.	Areas along Thika Road and Kangundo Road. (Housing development along Mombasa Road shall be restricted.)
Urbanizing area along trunk road in hilly area:	Continual housing demand for middle and high income people is expected in a long-range	Western and northern hilly areas of the Nairobi Metropolitan Area
Urbanizing area off the trunk road in flat terrain:	Despite insufficient public services (water supply, drainage and electricity) and infrastructure (road), large demand for land is expected owing to the relatively low land cost. (Subdivision and transfer of land tenure are proceeding.) In principle housing development shall be restricted.	Existing urbanizing area (ex. some part of Ruiru and Embakasi) (Access roads and other infrastructure will be improved in the current urbanizing area).
Urbanized center in the periphery	Housing and land demand depending on the existing public services and urban functions will remain.	Areas around urban core as a center of daily activities of the inhabitants (milieu) in the periphery (including built-up, urbanizing, new development areas) (Thika, Kiambu, Limuru, Tala/Kangundo and Kikuyu)
Peripheral area	Housing development will be restricted in the non-urbanized area (agricultural land, forest, etc.) far from road and out of the transport services	Non-urbanized area (agricultural land, forest, etc.) in the periphery far from road and out of the transport services

TABLE 11.2-4 HOUSEHOLD CAR OWNERSHIP RATE BY ANALYSIS ZONE

Zone No	Year 2004	Year 2010	Year 2015	Year 2025
1	60.3%	62.2%	65.6%	73.9%
2	60.3%	62.2%	65.6%	73.9%
3	26.2%	33.8%	45.5%	55.6%
4	11.1%	14.0%	19.2%	33.8%
5	8.8%	11.4%	15.6%	27.5%
6	32.9%	42.6%	53.5%	57.7%
7	1.3%	3.1%	6.3%	13.4%
8	36.8%	47.4%	54.5%	58.8%
9	7.3%	10.5%	14.0%	24.6%
10	2.7%	5.2%	9.5%	16.8%
11	33.6%	43.6%	53.5%	57.7%
12	4.3%	7.8%	11.4%	19.9%
13	0.8%	2.4%	4.9%	11.9%
14	20.1%	26.0%	34.7%	53.5%
15	12.2%	15.6%	20.5%	37.2%
16	2.1%	4.3%	8.2%	15.1%
17	53.9%	54.5%	56.7%	62.2%
18	15.1%	19.9%	26.0%	46.4%
19	7.0%	10.0%	13.4%	23.9%
20	12.6%	16.2%	21.8%	38.1%
21	34.0%	44.5%	53.5%	57.7%
22	11.5%	15.1%	19.9%	35.5%
23	0.7%	1.7%	4.3%	11.4%
24	2.7%	5.2%	9.5%	16.8%
25	29.8%	38.1%	51.4%	56.7%
26	20.2%	26.0%	34.7%	53.5%
27	11.4%	15.1%	19.9%	35.5%
28	14.9%	19.2%	25.3%	45.5%
29	1.5%	3.4%	7.0%	14.0%
30	31.1%	39.9%	53.5%	56.7%
31	2.8%	5.2%	9.5%	16.8%
32	60.0%	62.2%	65.6%	73.9%
33	98.8%	99.0%	99.0%	99.0%
34	82.9%	89.3%	89.3%	92.0%
35	18.9%	24.6%	33.0%	53.5%
36	74.4%	78.9%	85.3%	90.7%
37	86.3%	89.3%	90.7%	93.4%
38	24.7%	32.2%	43.6%	55.6%
39	14.3%	18.0%	24.6%	43.6%
40	13.8%	17.4%	23.2%	41.7%
41	8.0%	10.9%	14.5%	26.0%
42	13.9%	17.4%	23.2%	41.7%
43	47.7%	53.5%	55.6%	61.0%
44	75.7%	80.2%	86.7%	90.7%
45	4.6%	8.2%	11.4%	20.5%
46	31.5%	41.7%	53.5%	57.7%
47	61.9%	63.3%	66.7%	75.1%
48	50.9%	54.5%	56.7%	62.2%
49	40.7%	52.5%	54.5%	59.9%
50	11.3%	14.0%	19.2%	33.8%

APPENDIX 12

TRANSPORT DEMAND FORECAST

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APPENDIX 12 TRANSPORT DEMAND FORECAST

12.1 VERIFICATION OF TRIP GENERATION AND ATTRACTION MODELS

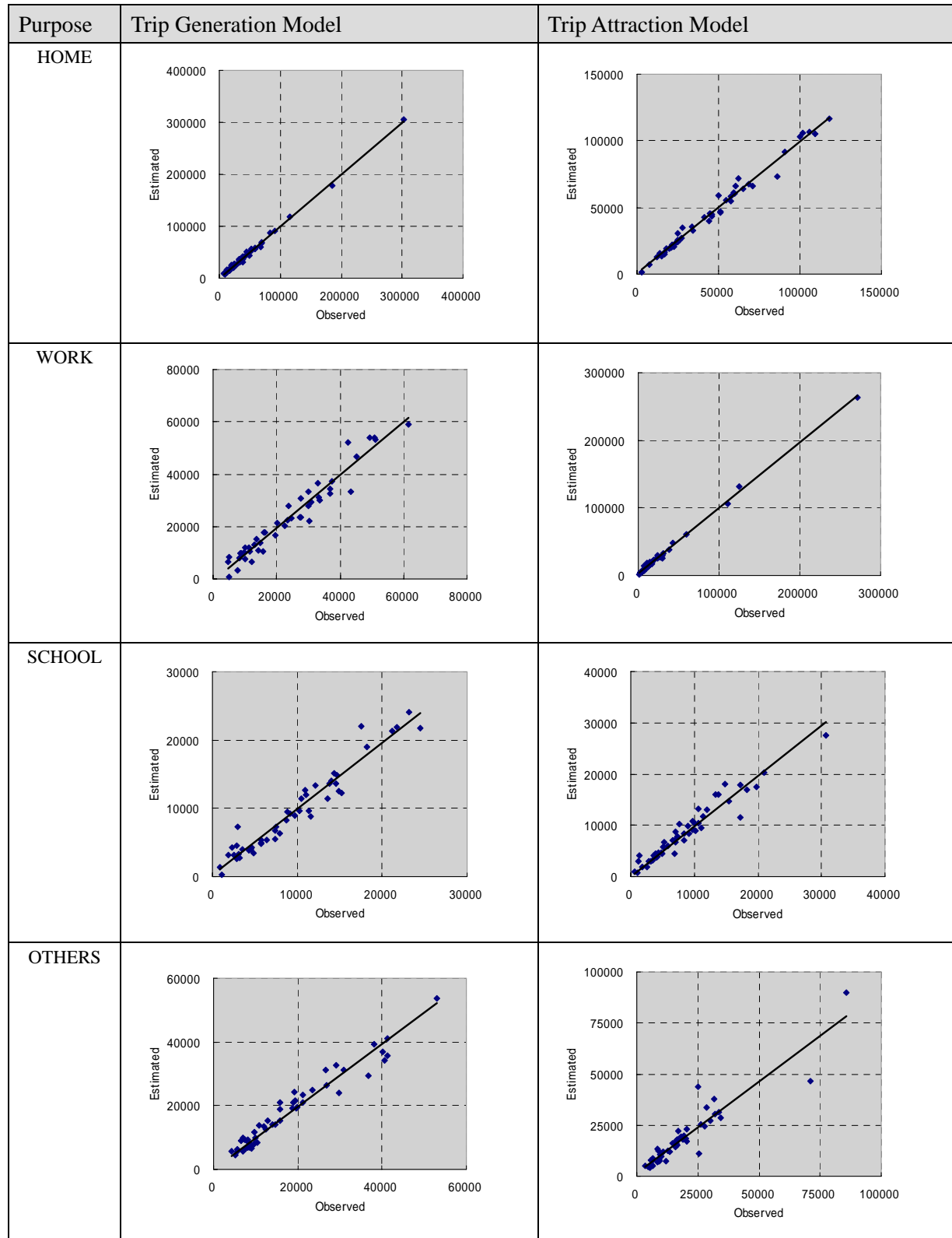


FIGURE 12.1-1 VERIFICATION OF TRIP GENERATION AND ATTRACTION MODEL

TABLE 12.1-1 ZONAL FRAMEWORK IN 2004 AND 2025

District	Location	TAZ	Zone Attribute in 2004			Zone Attribute in 2025		
			Pop5	Worker	Student	Pop5	Worker	Student
Central	Starehe	1	15,324	259,455	27,558	11,956	308,488	33,924
		2	15,324	129,767	31,500	11,956	168,643	33,450
	Kariokor	3	53,661	14,597	12,301	49,743	44,453	12,929
	Mathare	4	18,992	3,836	4,574	15,572	32,849	4,239
	Haruma	5	99,886	17,731	20,659	95,306	47,832	21,863
	Ngara	6	31,754	22,173	13,243	28,151	52,622	13,755
Makadara	Makongeni	7	23,179	5,491	5,348	20,730	22,395	5,448
	Makadara	8	63,897	18,378	18,241	60,887	36,792	19,974
	Maringo	9	29,436	4,415	6,655	26,900	21,194	6,861
	Viwandani	10	42,153	103,906	5,272	39,443	132,337	7,266
	Mukuru/Nyayo	11	38,769	11,255	7,547	36,105	28,834	7,987
Kasarani	Kariobangi	12	102,896	47,914	20,467	141,192	60,410	30,236
	Korogocho	13	12,188	4,040	3,413	38,242	12,285	11,810
	Kahama	14	43,245	10,282	8,296	73,490	19,132	14,965
	Githurai	15	24,962	10,798	7,608	52,740	19,698	16,319
	Ruaraka	16	102,076	27,055	23,149	140,261	37,530	33,263
	Roysambu	17	19,337	9,723	10,844	46,356	18,519	23,957
	Kasarani	18	34,221	10,531	8,849	63,248	19,404	16,414
	Embakasi	19	21,041	27,007	3,385	101,693	66,547	18,136
Embakasi	Mukurukwa	20	62,335	29,079	11,791	142,988	69,370	28,557
	Umoja	21	59,522	15,966	10,029	140,175	51,508	24,100
	Kayole	22	103,292	19,792	18,369	183,944	56,721	34,235
	Njiru	23	33,981	16,078	4,626	114,633	51,661	18,635
	Dandora	24	112,969	22,540	19,350	193,621	60,464	35,381
	Kariobangi S	25	18,903	1,990	3,371	99,555	32,473	18,599
	Ruai	26	22,841	7,610	5,113	103,494	40,127	24,051
	Pumwani	27	65,657	32,236	19,989	64,294	41,381	21,551
Pumwani	Eastleigh Nor.	28	71,103	10,805	11,760	69,707	18,327	12,988
	Punwani	29	6,576	28,613	891	5,561	37,484	1,163
	Bahati	30	44,285	7,785	7,989	43,048	15,079	8,578
	Kamukunji	31	14,590	13,024	3,578	13,529	20,715	3,481
	Westlands	32	1,375	28,036	5,125	23,131	57,194	17,539
	Kitisuru	33	14,941	5,111	2,166	38,556	29,770	6,932
Dagoretti	Highridge	34	45,097	37,087	11,944	72,846	68,020	19,862
	Kangemi	35	56,279	9,508	9,505	85,561	35,031	15,155
	Kilimani	36	63,795	60,475	16,766	94,107	95,995	25,823
	Lavington	37	26,123	6,642	10,372	51,272	31,602	20,990
	Waitthaka	38	25,014	7,964	5,052	50,111	22,502	10,155
	Mutuini	39	15,972	4,310	4,206	39,803	18,133	10,524
	Uthiru/Ruthmitu	40	18,338	4,477	4,404	42,500	18,333	10,900
	Kawangware	41	69,803	14,089	15,044	101,168	29,827	23,330
Kibera	Riruta	42	53,324	14,318	9,559	82,383	30,100	16,428
	Kenyatta	43	12,761	25,552	2,134	36,142	43,535	6,706
	Golf C	44	45,296	25,024	13,427	73,231	42,903	23,067
	Kibera	45	89,108	19,387	11,328	128,590	25,428	20,889
	Langata/Karen	46	20,211	13,726	7,980	49,885	19,322	20,260
	Mugumoini	47	20,112	3,558	1,152	49,771	8,354	8,225
	Nairobi West	48	57,348	16,572	10,227	92,308	22,392	18,073
	Laini Saba	49	41,119	5,099	6,899	73,769	10,016	12,990
Sera Ngombe	50	58,841	13,993	14,771	94,014	19,610	25,580	
Total			2,143,254	1,258,802	517,825	3,507,666	2,273,343	877,545

TABLE 12.1-2 TRIP GENERATION AND ATTRACTION BY PURPOSE IN 2004

TAZ	Trip Generation in 2004				Trip Attraction in 2004			
	HOME	WORK	SCHOOL	OTHERS	HOME	WORK	SCHOOL	OTHERS
1	302,179	36,741	3,079	53,027	19,255	271,615	36,639	85,706
2	185,514	31,958	12,022	36,806	39,907	125,108	30,728	71,115
3	31,942	23,718	13,593	19,744	54,816	11,528	9,664	14,749
4	11,812	8,705	4,522	8,958	20,990	3,178	3,646	6,654
5	52,449	42,655	21,205	40,584	100,240	10,869	14,906	30,222
6	43,755	19,555	7,338	14,586	34,441	19,288	17,201	15,933
7	17,032	11,385	5,744	9,648	25,232	5,051	4,851	8,667
8	44,117	30,180	13,743	21,207	60,542	16,425	13,331	19,297
9	12,800	13,558	7,912	6,892	24,921	4,000	5,148	5,686
10	115,960	30,373	9,668	29,084	45,825	110,881	4,365	25,065
11	27,415	22,656	8,718	13,875	43,897	8,408	6,986	13,388
12	82,730	49,353	21,681	41,319	101,535	43,429	17,159	31,752
13	10,457	4,688	2,813	5,157	12,423	2,061	3,155	5,461
14	26,879	23,458	9,141	15,736	45,649	9,606	7,086	12,627
15	20,805	13,126	5,743	9,874	26,251	8,770	5,259	9,080
16	69,492	51,161	24,479	40,175	109,168	23,622	20,962	31,983
17	24,511	9,709	4,545	8,888	20,094	8,054	11,036	8,926
18	24,504	16,390	7,500	12,335	33,735	8,668	7,399	9,564
19	32,756	14,423	2,869	9,788	21,336	27,440	2,819	8,627
20	53,255	37,002	12,152	23,514	65,117	29,827	10,110	20,509
21	35,751	33,415	10,914	19,296	59,077	13,388	7,029	18,845
22	58,637	50,853	17,553	41,289	105,643	13,951	13,792	34,247
23	19,353	16,095	2,925	11,932	28,017	10,806	1,350	8,781
24	67,342	61,665	23,179	38,106	117,919	18,845	18,223	33,719
25	7,255	8,889	3,488	5,616	18,106	1,659	1,213	4,709
26	17,546	10,004	5,738	10,352	23,957	5,394	4,951	9,452
27	69,602	36,930	13,981	26,898	68,448	31,247	19,758	27,719
28	35,718	37,603	14,385	29,742	86,120	9,752	7,660	19,943
29	39,128	7,874	937	9,350	7,488	24,364	1,025	25,560
30	23,682	24,782	8,836	12,956	44,796	7,424	6,571	10,813
31	22,532	10,086	2,569	8,631	16,762	12,304	3,410	12,142
32	36,689	5,175	1,052	4,210	3,026	28,032	6,877	10,033
33	8,228	8,242	1,833	5,735	14,207	4,275	1,861	3,617
34	59,380	27,487	10,266	18,961	50,878	37,588	10,614	16,823
35	30,481	31,003	10,999	19,524	57,379	8,319	8,436	16,758
36	91,228	43,381	14,583	26,515	70,672	60,094	15,394	28,649
37	19,741	14,987	7,367	7,447	27,223	6,699	9,690	6,421
38	16,590	13,149	6,423	8,134	24,867	5,813	3,909	9,339
39	12,085	4,986	4,901	6,930	16,648	2,381	4,056	5,578
40	13,369	9,256	4,310	7,641	19,690	4,083	4,173	6,106
41	38,939	32,980	14,620	19,099	62,367	12,646	10,693	18,004
42	35,522	30,000	10,479	18,761	57,652	11,062	9,202	16,343
43	34,274	12,068	3,198	8,083	15,347	29,646	2,507	10,017
44	48,141	27,517	11,409	15,686	51,369	23,436	11,450	16,415
45	49,565	45,204	18,220	30,917	90,671	16,115	8,967	26,361
46	25,150	15,763	2,282	6,628	21,690	12,655	8,415	6,700
47	9,715	11,544	4,679	8,170	22,401	2,378	651	6,285
48	38,885	33,672	15,266	15,785	50,001	17,149	10,161	16,271
49	18,755	20,112	11,549	10,756	41,122	4,609	5,780	9,690
50	40,841	27,579	14,934	21,306	59,921	7,264	12,047	20,649
Total	2,214,486	1,203,095	471,343	895,652	2,238,841	1,191,207	462,313	890,998

TABLE 12.1-3 TRIP GENERATION AND ATTRACTION BY PURPOSE IN 2025

TAZ	Trip Generation in 2025				Trip Attraction in 2025			
	HOME	WORK	SCHOOL	OTHERS	HOME	WORK	SCHOOL	OTHERS
1	407,271	8,242	3,233	68,952	14,942	329,225	42,895	120,373
2	248,151	8,242	3,233	36,670	14,942	164,663	49,240	61,729
3	46,962	28,860	11,322	18,932	52,320	18,522	14,666	17,276
4	14,878	10,215	4,007	6,370	18,518	4,867	5,185	5,513
5	66,938	53,721	21,076	32,891	97,389	22,499	22,113	27,889
6	58,181	17,078	6,700	14,572	30,961	28,135	16,768	16,344
7	18,458	12,504	4,905	8,186	22,668	7,939	5,211	7,454
8	67,687	34,468	13,522	23,484	62,487	26,571	21,977	22,219
9	21,514	15,879	6,229	9,669	28,786	6,383	7,808	8,148
10	167,797	22,739	8,921	41,523	41,223	150,227	6,102	61,947
11	32,191	20,913	8,205	14,278	37,913	16,272	7,600	13,535
12	124,678	99,835	39,167	65,645	180,988	64,854	26,239	60,041
13	14,540	11,826	4,639	7,341	21,438	5,468	4,407	6,323
14	39,777	41,958	16,461	24,972	76,064	13,918	11,717	20,480
15	34,418	24,220	9,502	15,706	43,907	14,616	9,743	14,168
16	104,586	99,039	38,855	59,684	179,545	36,621	31,989	49,685
17	39,913	18,762	7,361	12,527	34,013	13,161	14,761	11,630
18	38,194	33,203	13,026	20,397	60,192	14,254	11,423	17,361
19	87,451	26,319	10,325	27,527	47,713	69,205	7,574	34,398
20	130,438	77,972	30,590	55,950	141,354	74,516	25,915	55,397
21	88,229	74,454	29,209	47,493	134,975	40,912	21,415	42,120
22	135,799	129,203	50,689	78,440	234,229	50,718	39,404	65,866
23	64,822	42,505	16,675	30,613	77,056	41,199	9,760	30,404
24	149,589	141,307	55,437	86,237	256,172	57,760	42,279	72,853
25	19,111	23,645	9,276	13,535	42,865	5,100	6,295	10,564
26	42,511	28,571	11,209	18,971	51,796	19,499	11,233	17,517
27	87,447	36,915	14,483	27,518	66,923	40,521	25,161	28,095
28	43,111	39,977	15,684	23,856	72,474	13,582	14,263	19,628
29	39,695	3,697	1,451	9,015	6,703	35,967	1,343	14,185
30	28,516	24,899	9,768	15,119	45,139	9,786	9,075	12,698
31	24,107	8,203	3,218	7,560	14,872	16,372	3,752	8,869
32	64,231	1,342	527	10,646	2,434	50,641	7,596	18,543
33	17,033	14,587	5,723	9,544	26,445	9,231	3,242	8,685
34	102,882	44,030	17,274	36,481	79,821	66,989	16,935	40,159
35	47,211	54,948	21,557	32,497	99,614	17,174	12,932	26,446
36	159,475	62,287	24,436	54,446	112,918	109,233	23,365	61,967
37	39,942	25,505	10,006	15,874	46,238	11,998	14,822	13,710
38	30,386	24,632	9,664	15,877	44,655	14,373	7,298	14,233
39	19,237	15,728	6,170	9,863	28,513	7,778	5,468	8,590
40	20,678	18,058	7,084	11,158	32,737	8,080	5,939	9,559
41	70,486	68,737	26,967	41,425	124,611	25,428	20,860	34,487
42	55,690	52,510	20,600	32,904	95,193	25,840	12,921	28,632
43	54,645	12,566	4,930	15,707	22,780	46,115	3,271	21,082
44	82,997	44,604	17,499	32,504	80,861	45,162	18,491	32,593
45	67,910	88,370	34,669	51,677	160,204	24,630	17,659	41,466
46	41,268	20,044	7,864	14,046	36,337	17,439	12,694	13,629
47	10,947	19,945	7,825	11,460	36,158	4,520	1,883	8,989
48	56,649	56,873	22,312	34,278	103,103	21,054	16,189	28,540
49	30,490	40,779	15,998	22,888	73,927	6,478	10,800	17,392
50	63,785	58,354	22,893	34,421	105,788	17,778	22,700	27,921
Total	3,522,900	1,943,273	762,378	1,411,330	3,522,900	1,943,273	762,378	1,411,330

TABLE 12.1-4 INTRA ZONAL TRIP RATE

TAZ	Xii/Gi				Xjj/Aj			
	HOME	WORK	SCHOOL	OTHERS	HOME	WORK	SCHOOL	OTHERS
1	1.2%	54.9%	27.8%	55.2%	19.2%	7.4%	2.3%	34.2%
2	9.2%	33.3%	28.4%	48.7%	42.6%	8.5%	11.1%	25.2%
3	52.9%	13.1%	26.6%	54.0%	30.8%	27.0%	37.4%	72.2%
4	52.7%	5.8%	26.7%	54.9%	29.7%	15.8%	33.1%	74.0%
5	83.2%	16.7%	54.0%	64.5%	43.5%	65.6%	76.9%	86.6%
6	30.2%	16.1%	43.9%	59.6%	38.4%	16.3%	18.7%	54.6%
7	66.8%	15.3%	64.3%	69.1%	45.1%	34.5%	76.1%	76.9%
8	55.8%	20.1%	44.0%	70.3%	40.7%	37.0%	45.4%	77.3%
9	70.5%	11.4%	41.5%	68.6%	36.2%	38.7%	63.8%	83.2%
10	18.4%	54.6%	23.3%	47.6%	46.7%	14.9%	51.7%	55.2%
11	75.9%	18.6%	68.2%	86.5%	47.4%	50.0%	85.1%	89.6%
12	69.8%	41.4%	69.7%	69.6%	56.8%	47.1%	88.1%	90.6%
13	59.4%	15.0%	79.2%	65.9%	50.0%	34.1%	70.6%	62.2%
14	71.6%	24.8%	38.5%	69.6%	42.2%	60.7%	49.6%	86.8%
15	61.4%	25.9%	49.0%	70.0%	48.7%	38.8%	53.5%	76.2%
16	78.8%	27.7%	62.2%	71.6%	50.1%	59.9%	72.6%	89.9%
17	37.8%	14.5%	67.0%	60.5%	46.1%	17.5%	27.6%	60.2%
18	71.7%	23.6%	67.2%	65.6%	52.1%	44.6%	68.1%	84.5%
19	45.6%	66.0%	73.5%	66.2%	70.0%	34.7%	74.8%	75.1%
20	68.9%	38.6%	76.9%	78.4%	56.3%	47.8%	92.4%	89.9%
21	67.7%	17.5%	49.5%	76.3%	40.9%	43.8%	76.8%	78.1%
22	89.0%	19.5%	70.5%	76.0%	49.4%	71.0%	89.7%	91.7%
23	91.3%	59.5%	46.2%	65.1%	63.1%	88.6%	99.0%	88.5%
24	96.6%	27.6%	77.2%	83.3%	55.2%	90.2%	98.2%	94.1%
25	69.7%	5.1%	16.1%	78.0%	27.9%	27.1%	46.4%	93.0%
26	91.7%	41.6%	82.4%	84.8%	67.2%	77.2%	95.5%	92.9%
27	62.8%	49.5%	69.1%	75.8%	63.9%	58.5%	48.9%	73.5%
28	87.3%	17.5%	39.3%	60.5%	36.2%	67.4%	73.8%	90.2%
29	11.6%	32.7%	43.9%	43.2%	60.4%	10.6%	40.1%	15.8%
30	80.7%	22.4%	50.0%	77.8%	42.7%	74.9%	67.2%	93.2%
31	31.0%	13.3%	36.0%	58.5%	41.7%	10.9%	27.1%	41.6%
32	3.0%	17.7%	40.5%	42.9%	36.2%	3.3%	6.2%	18.0%
33	44.6%	11.1%	20.0%	41.6%	25.8%	21.4%	19.7%	65.9%
34	36.5%	27.0%	29.5%	63.5%	42.6%	19.8%	28.5%	71.6%
35	84.8%	21.6%	58.3%	76.1%	45.0%	80.4%	76.1%	88.6%
36	32.4%	22.9%	43.4%	68.3%	41.8%	16.5%	41.1%	63.2%
37	42.7%	6.9%	50.9%	66.9%	31.0%	15.5%	38.7%	77.5%
38	68.9%	18.0%	47.4%	82.2%	46.0%	40.7%	77.8%	71.6%
39	99.3%	45.8%	82.8%	78.0%	72.1%	95.8%	99.0%	97.0%
40	82.8%	25.7%	78.4%	75.2%	56.2%	58.3%	81.0%	94.1%
41	87.0%	30.2%	67.1%	85.0%	54.3%	78.9%	91.7%	90.1%
42	88.5%	30.7%	71.0%	83.8%	54.5%	83.3%	80.8%	96.2%
43	29.6%	61.8%	26.4%	57.7%	66.2%	25.2%	33.7%	46.6%
44	45.4%	20.1%	47.4%	76.3%	42.5%	23.6%	47.2%	72.9%
45	93.3%	32.2%	48.1%	80.1%	51.0%	90.2%	97.7%	93.9%
46	40.8%	30.4%	69.8%	72.5%	47.3%	37.9%	18.9%	71.7%
47	79.9%	15.5%	4.3%	65.8%	34.7%	75.5%	30.6%	85.6%
48	58.9%	16.3%	37.2%	61.3%	45.8%	31.9%	55.9%	59.5%
49	86.5%	16.3%	35.3%	81.5%	39.5%	71.3%	70.6%	90.5%
50	77.5%	14.4%	49.3%	91.6%	52.8%	54.8%	61.2%	94.5%

12.2 VERIFICATION OF MODAL SPLIT MODEL

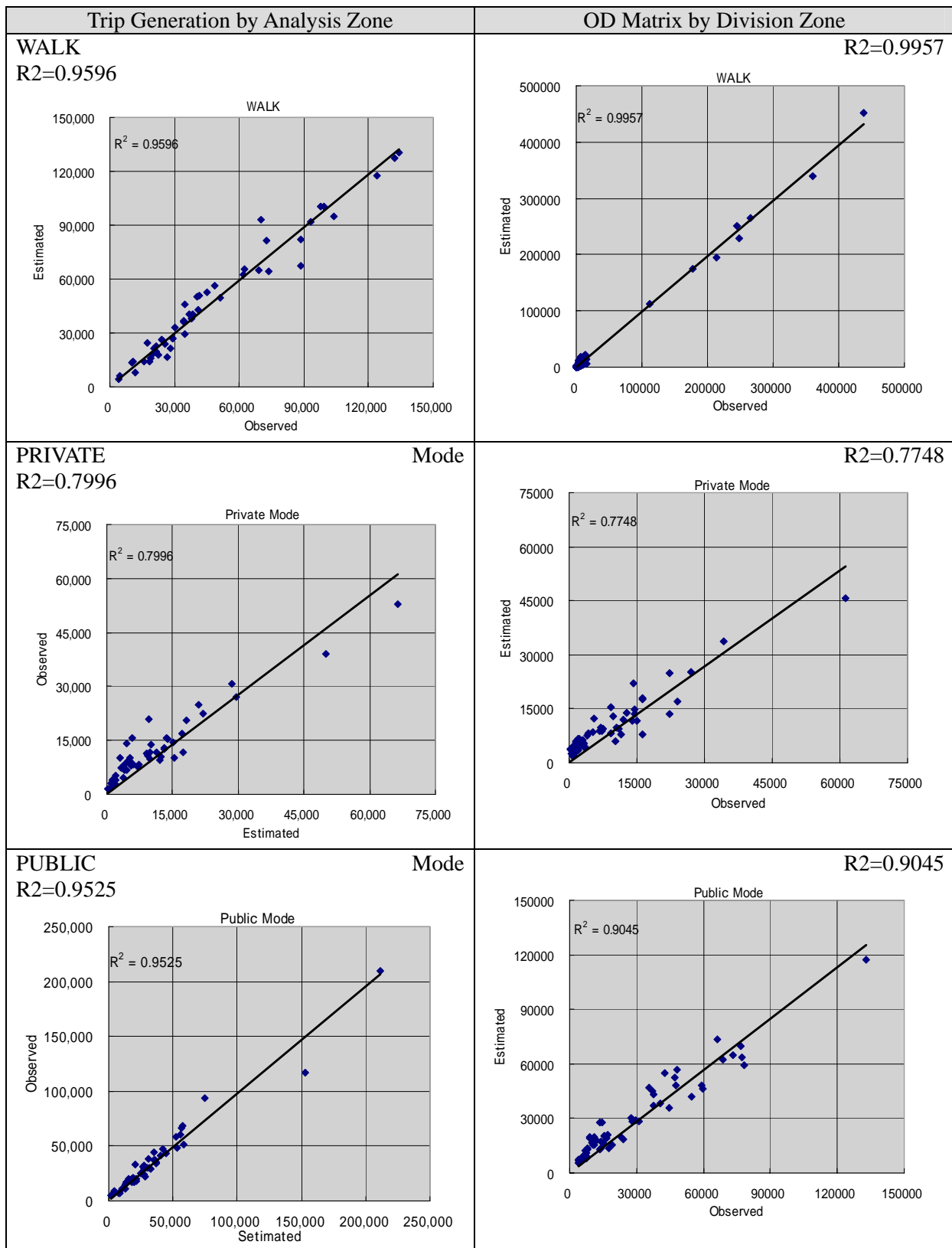


FIGURE 12.2-1 RELATIONSHIP BETWEEN INTRA ZONE PRIVATE MODE SHARE AND CAR OWNING RATE

TABLE 12.2-1 TRIP GENERATION BY MODE BY ANALYSIS ZONE

TAZ.	2004				2025			
	WALK	PRIVATE	PUBLIC	TOTAL	WALK	PRIVATE	PUBLIC	TOTAL
1	70,031	112,815	211,557	394,403	82,746	136,573	205,528	424,847
2	62,302	50,100	152,850	265,253	61,334	79,962	118,813	260,109
3	40,459	11,377	36,155	87,991	57,775	35,469	39,136	132,380
4	18,752	1,976	13,168	33,896	29,219	12,232	22,472	63,923
5	97,784	5,227	52,576	155,587	113,588	28,576	63,544	205,709
6	34,275	13,224	37,132	84,631	42,226	34,535	39,496	116,256
7	28,104	921	14,158	43,183	26,166	11,881	21,746	59,793
8	48,437	18,179	41,811	108,427	63,362	42,128	41,750	147,240
9	23,927	933	15,687	40,547	33,490	9,877	24,698	68,065
10	88,734	20,907	74,931	184,573	60,329	58,427	95,886	214,642
11	38,588	12,223	21,751	72,561	49,837	22,244	18,000	90,081
12	131,967	4,571	57,254	193,793	150,061	43,249	96,128	289,438
13	18,582	234	4,064	22,880	36,044	11,466	31,229	78,739
14	34,732	5,904	31,766	72,401	48,516	43,520	43,078	135,114
15	29,116	3,225	16,621	48,961	49,245	27,630	34,993	111,869
16	123,810	4,014	55,843	183,667	136,546	34,750	94,428	265,724
17	15,624	13,573	18,104	47,301	31,546	42,680	39,131	113,356
18	34,385	5,369	20,156	59,909	60,174	31,016	33,547	124,738
19	24,781	7,232	27,706	59,719	85,269	47,955	97,114	230,338
20	88,419	9,045	27,220	124,685	174,116	51,570	74,122	299,808
21	44,889	17,140	36,898	98,927	126,675	79,735	62,628	269,038
22	99,365	9,677	58,390	167,431	181,877	61,398	100,713	343,988
23	34,782	1,238	13,609	49,629	120,745	47,579	61,362	229,686
24	133,996	2,925	53,032	189,954	215,840	46,825	99,382	362,047
25	10,995	3,826	10,203	25,024	84,989	59,628	43,740	188,357
26	29,358	4,726	8,657	42,740	118,840	53,468	37,652	209,960
27	93,256	9,305	44,646	147,206	87,819	30,731	40,548	159,098
28	69,137	7,194	40,075	116,406	63,357	27,310	35,996	126,663
29	26,644	1,971	28,562	57,176	14,258	13,448	24,839	52,545
30	36,878	13,069	20,002	69,948	42,569	23,517	17,336	83,422
31	22,619	1,620	19,579	43,818	16,705	9,321	20,045	46,072
32	4,583	17,532	24,827	46,942	19,048	49,821	51,863	120,732
33	4,107	15,169	4,579	23,854	18,316	52,057	22,363	92,736
34	17,495	66,492	31,190	115,177	46,518	98,795	53,291	198,603
35	51,366	9,914	30,085	91,365	84,852	48,005	36,203	169,060
36	41,409	76,228	57,128	174,765	76,206	118,452	71,673	266,331
37	10,047	22,009	17,394	49,450	33,764	61,503	35,356	130,622
38	21,623	3,939	17,973	43,535	45,749	28,661	28,745	103,155
39	25,690	930	2,028	28,648	62,371	9,611	13,739	85,721
40	19,735	2,028	12,813	34,576	44,986	19,078	25,783	89,846
41	72,791	6,014	26,663	105,469	116,673	28,453	48,834	193,960
42	61,903	5,493	27,113	94,509	95,570	31,057	34,495	161,123
43	20,375	15,349	21,814	57,538	43,580	32,008	29,971	105,560
44	40,982	28,486	32,608	102,076	68,726	68,434	36,996	174,156
45	103,985	4,475	34,848	143,309	122,225	28,770	68,479	219,474
46	21,607	10,097	17,721	49,425	39,946	41,205	32,305	113,456
47	11,854	13,911	7,348	33,113	23,584	44,139	15,677	83,401
48	38,080	29,609	35,219	102,908	57,660	64,797	44,306	166,764
49	29,971	12,259	18,543	60,773	57,541	36,602	27,828	121,970
50	73,685	9,941	20,337	103,963	91,174	36,437	48,645	176,257
Total	2,326,021	723,614	1,704,392	4,754,027	3,613,754	2,156,583	2,505,633	8,275,969

APPENDIX 13

ENVIRONMENTAL IMPACT ASSESSMENT (EIA) AND STRATEGIC ENVIRONMENTAL ASSESSMENT (SEA)

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APPENDIX 13 ENVIRONMENTAL IMPACT ASSESSMENT (EIA) AND STRATEGIC ENVIRONMENTAL ASSESSMENT (SEA)

13.1 ENVIRONMENTAL IMPACT ASSESSMENT (EIA) OF GOK

13.1.1 Procedure of EIA

- All of the environmental impact assessment activities in Kenya should be carried out by “Lead Expert” registered with the National Environmental Management Authority;
- Lead expert entrusted by project proponents should elaborate a “Project Report” as a project proposal containing the outline of the project and identifying the potential environmental impacts and submit it to NEMA;
- NEMA examines the “Project Report” and it is required to comment on the report within 45 days;
- Based on NEMA’s comments on the “Project Report”, the proponent is to implement the project:
 - Without EIA study as it is exempt from full EIA but carry out monitoring of the conditions of approval;
 - Acceptance of proposal;
 - Advice for revisions; or
 - Rejection.
- If EIA study was requested to carry out, “Terms of Reference” which contains basic requirement of the EIA guidelines should be prepared by the project proponent and submitted to NEMA for approval. There is no fixed period for comment by NEMA but might take for 45 – 60 days in general;
- EIA report, which usually runs for 3 - 6 months depending on the covering area and intensity of study, the following should be covered by the registered lead experts of EIA in Kenya.
 - Sources of impact;
 - Project inputs;
 - Project activities;
 - Area of impacts on the natural and human environments;
 - Environmental impacts (General impacts on the natural and human environments);
 - Environmental guidelines and standards (National legislation, international guidelines, international conventions and treaties);
 - Mitigation measures;
 - Environmental management plan; and
 - Environmental Monitoring and Auditing.
- Upon receipt of EIA report, NEMA assesses it within 60 days for further comments unless otherwise EIA license issued.

13.2 STRATEGIC ENVIRONMENTAL ASSESSMENT (SEA) OF GOK

13.2.1 Procedure of SEA

- Proponent of a project shall in consultation with NEMA subject all proposals for public policy, plans and programmes for implementation to a strategic environmental assessment to determine which ones are the most environmentally friendly and cost effective when implemented individually or in combination with others;
- The assessment carried out under this regulation shall consider the effect of implementation of alternative policy actions taking into consideration of:
 - The use of natural resources;
 - The protection and conservation of biodiversity;
 - Human settlement and cultural issues;
 - Socio-economic factors; and
 - The protection, conservation of natural and physical surroundings of scenic beauty as well as protection and conservation of built-environment of historic or cultural significance.
- A strategic environmental impact report prepared under this regulations shall include the following information:
 - The title of the report;
 - A summary of the potential significant impacts of a proposed policy, programme or plan;
 - Potential opportunities to promote or enhance environmental conditions;
 - Recommendations for mitigating measures; and
 - Alternative policy, programme or plan options to ensure compliance with the EMCA of 1999.
- The proposed policy, programme or plan specified in this regulation shall state:
 - The purpose and rationale of the policy, programme or plan taking into consideration socio-economic, environmental and cultural issues;
 - Alternatives and strategies of the policy, programme or plans;
 - Areas and sectors affected by the policy, programme, plan or proposed activities;
 - An environmental analysis covering:
 - 1) Baseline information focusing on areas potentially affected;
 - 2) Relevant legislative framework and related policy documents;
 - 3) Summary of views of key stakeholders consulted;
 - 4) Predicted impacts of the policy, programme or plan;
 - 5) Alternative policy options and comparison against environmental indicators; and
 - 6) On-going projects and how they fit in the proposed policy, programme or plan;
 - Recommendations outlining:
 - 1) Suggested policy changes;
 - 2) Proposed mitigation measures; and
 - 3) Strategic environment assessment;
- Relevant technical appendices such as stakeholders meetings referred to in the assessment.

13.3 ENVIRONMENTAL MANAGEMENT SYSTEM OF GOK

13.3.1 Environmental Management System of Central Government

Ministry of Roads and Public Works (MORPW)

MORPW hold lands designated as road reserve for national highways and other roads. Any objectives within the road reserve, such as green belt and gardening in sidewalks and roundabout, and any objectives within the road reserve are maintained by MORPW.

Ministry of Land and Housing (MOLH)

MOLH is responsible for land acquisition of the national development projects. Details of the way land acquisition is carried out for development projects are explained in the Section 13.1.13. MOLH also takes care of slum area development. For instance, at present, Kibera Slum Upgrading Project is undertaken by the initiatives of MOLH in conjunction with the support of UN-Habitat.

Ministry of Environment and Natural Resources (MENR)

Forest Department of MENR maintains all of the forest reserves in Kenya. Within the study area, there are 12 gazetted forest reserves administered by the Forest Department of MENR. It holds a policy of forest area in relation to the road construction projects as follows:

- If the road construction projects are implemented for the purpose of public safety, public order, town and country planning or any other purposes to promote the public benefit, portions of forest reserve area are compelled to release;
- If such projects are subject to cause negative effect on the natural and social environment, it has to be subject to EIA study administered by NEMA; and
- Subject to NEMA's comments on EIA report, mitigation measures such as to provide wildlife corridor/tunnel, planting of trees, etc. should be provided in the case road construction projects disturb movement of wildlife, loss of plant species.

National Environmental Management Authority (NEMA)

NEMA is a sole organization in charge of environmental impact assessment of any private development works. Details of the role of NEMA to the master plan is explained in Section 13.1.1.

Kenya Wildlife Service (KWS)

KWS engages in wildlife conservation and tourism promotion throughout Kenya. Its activities expanding to water supply and education sector related to wildlife conservation. Within the jurisdiction of KWS, Nairobi National Park and Ol Donyo National Park within the study area are administered in terms of its geographical area as habitat for wildlife and fauna and flora within these national parks.

13.3.2 Environmental Management System of Local Government

Local governments in Kenya, such as cities, districts, municipalities and towns are essentially the executing agencies of various projects for the residents within. In most cases powers for decision making on alternation of the natural environment and social environment including public utility are vested with the central government.

City Council of Nairobi

City council of Nairobi maintains modern body of administration comparing to the district administration based on the Chief's Act. However, it is more of an organization executing to improve city facility. There are ten departments in the City Council of Nairobi and their role of the city affairs is as follows:

- **Environment Department**
This department deals with solid waste management and beautification of the city as a whole. Recently it is involved in the Globe Cinema Roundabout Beautification Project. It also deals with Nairobi's public park maintenance works, river bank protection as trees, grasses and flowers are planted. During the construction works that take place within Nairobi City, this department also takes care of construction debris.
- **Public Health Department**
By all means this is the department dealing with public hygiene conditions that are affected by the lack of proper solid waste, sewerage, potable water and food management.
- **Water and Sewerage Department**
This is the department dealing with the city's sewerage system, which is not quite extensively constructed at present. Any works improving the water and sewerage system is related to road construction works. Thus, this is the department executing the physical works in conjunction with the city planning and city engineer department.
- **Social Services Department**
Social services within Nairobi are extensive and complicated. Because of a large number of slums, unemployment, lack of public health management, AIDS epidemics, there are a large number of NGOs active on social services for up-grading slum area housing, provision of the street children's education, reduction of domestic violence, and enhancement of small business enterprises, which includes provision of bicycles. It also deals with disaster relief. All these activities are carried out in conjunction with various ministries and domestic and international NGOs.
- **City Planning and Architecture Department**
This department is in charge of general policy making and overall city planning including evaluation of land if it was in need of land acquisition.
- **City Engineers Department**
Road construction project including drainage system improvement and any other civil engineering works are carried out by this department in conjunction with other department such as water and sewerage department.

Kajiado District

There is no specific organization for environmental planning and conservation activities. Kajiado District is mainly occupied by Maasai tribesmen that are concerned with water supply for human, cattle and wildlife. Thus KWS carries out overall environmental protection and conservation activities while it provides watering points for Maasai tribesmen, cattle and Wildlife. Department of Forestry of MENR is another central government's organization actively carries out afforestation of Ngong Hill Forest, which is on the western border of the study area.

Machakos District

District Environmental Committee of Machakos functions to promote environmental issues such as the pollution of the water bodies in Athi River, sand harvesting from the river bed, tree planting, protection of catchment areas, and soil conservation of the district. Reclamation and regeneration of forest cover is one of the major concerns of the district.

Mavoko Municipal Council is one of the municipal councils as a sub-division of Machakos District. It overlooks water supply, sanitation including refuse collection, sewerage, roads and street lighting and other social services.

Kangundo Town Council is one of the municipal councils as a sub-division of Machakos District. Since the Kangundo Town Council started in recent years, no explicit administrative subdivisions have been established for environmental management.

Thika District

Thika District is a rapidly industrializing area. Most of the matters related to the physical development and environmental conservation is discussed by District Development Committee. There is District Forestry Office in charge of the forest area within Thika District. However, Forest Department of MENR is the major decision making body. District Roads Committee is the body dealing with road affairs, which in most cases depends on the decision making of MRPW.

Kiambu District

There is an organization called District Environmental Committee and this is the sole body of environmental management in the local government. The same as other districts within the study area, the Chief's Act of the district is administratively regulating the activities carried out in the district. Thus felling trees within the borders of Kiambu District is planned, District Environmental Committee is called for a decision making.

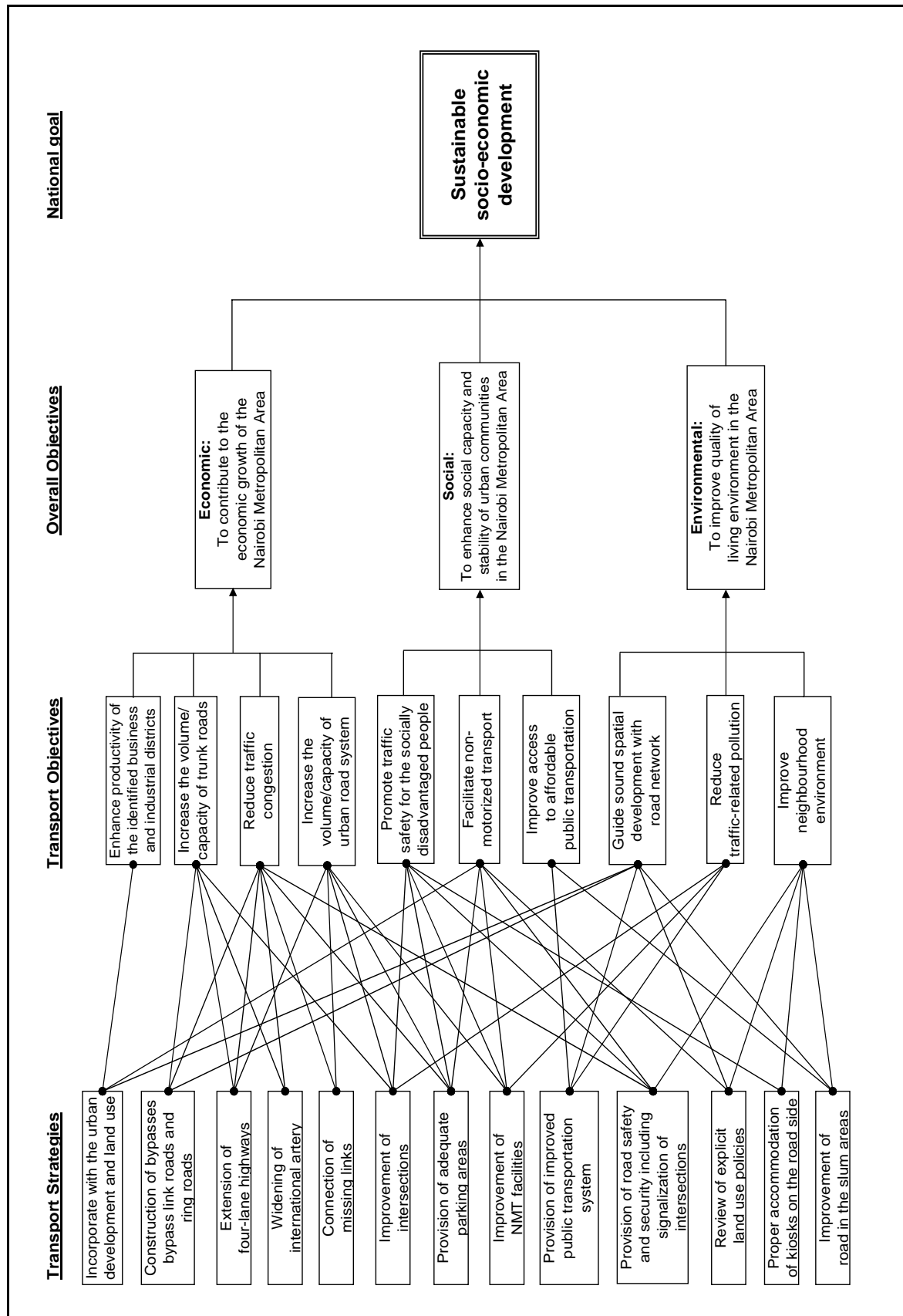


FIGURE 13.3-1 STRUCTURE OF OBJECTIVES AND STRATEGIES FOR SEA IN RELATION TO URBAN TRANSPORT IMPROVEMENT

13.4 ENVIRONMENTAL LAWS AND REGULATIONS OF GOK RELATED TO THE MASTER PLAN

13.4.1 The Land Acquisition Act

The Land Acquisition Act, Chapter 295 of the Laws of Kenya, Revised Edition 1983 (1970), promulgates compulsory acquisition of land and its compensation procedure. This act gives power to the government on compulsory acquisition of land for public utilities such as roads, hospitals, schools, dispensaries, etc. However, the act does not provide for the involvement of the land owners in determining the level and mode of compensation such as the way the value of land is evaluated. Procedure of land acquisition is illustrated in Figure 13.3.

Within the study area, City Council of Nairobi can evaluate the land area within the city borders. Districts, municipalities and townships in Kenya do not have legal power to evaluate the value of land, building and improvement within the borders of them. In either case, when land acquisition becomes necessary for development projects, it is a matter of decision made by the Commissioner of Land of the Ministry of Land and Housing. Whether the project is national development project or local development project, evaluation of land is carried out at the time of land acquisition and the prevailing market value of land, building and improvement on land should become the basis of evaluation.

13.4.2 Forest Act

Forest Act, Cap. 385 of the Laws of Kenya, gives the minister of MENR wide powers as follows:

- To declare any unalienated land to be a forest area;
- To declare the boundaries of forests and to alter those boundaries;
- To declare a nature reserve; and
- To declare that a forest areas shall cease to be a forest area.

The power is exercised within 28 days of gazette notice. The powers vested with the minister to degazette forest areas appear to have been used liberally according to the current discussions taking place for amendment of the Forest Act. In June 2004, amendment of it was voted out of parliament. Thus it would probably be passed into law in the year 2005 with much different views on the conservation and utilization of the existing forest areas.

13.4.3 Wildlife (Conservation and Management) Act

Wildlife (Conservation and Management) Act, Cap. 376 of the Laws of Kenya, is used to conserve and manage wildlife. To achieve this, the minister has the power as follows:

- To Declare any land to be a national part, nature reserve, local sanctuary; and

- To prohibit removal of minerals from the declared areas and hunting in prohibited areas except with a licence.

This act does not provide participatory management of the area with local residents who are seen as intruders rather than joint owners of the declared wildlife conservation area.

13.4.4 Agriculture Act

The Agricultural Act, Cap. 318 of the Laws of Kenya, defines agricultural land as “all land that is not within a township”. Unless otherwise declared for specific purposes such as for forest, national park, registered land as free hold/privately owned land etc. all land in Kenya is considered as agricultural land. Under this act, the minister has extensive power for making rules for soil conservation and other conservation measures necessary for enhancement of agriculture. The government therefore retains the powers to call back the land at any time for its own use of public utility such as roads, airport, research areas, etc.

13.4.5 Land Planning Act

The Land Planning Act, Cap. 303 of the Laws of Kenya, contains land planning regulations on all interim areas and any other areas that the President may specify. These land planning regulations appears to have no enforcement authority i.e. its authority and implications have not been fully exercised.

13.4.6 Water Act

The Water Act, Cap. 376 of the Laws of Kenya, mandates the minister to ensure that certain water catchment areas are protected and to declare such areas as water catchment areas. The minister is to ensure that owners/occupiers of land do not pollute water that is used for domestic purposes.

13.4.7 Public Health Act

Public Health Act, Cap. 242 of the Laws of Kenya, expresses that the road rehabilitation and maintenance works are likely to pollute the drinking water sources resulting from all oil spillages. On the other hand, it expresses the improved network of roads will facilitate steady movement to the health facilities.

13.4.8 Traffic Act

Traffic Act, Cap. 403 of the Laws of Kenya, expresses that it is illegal to erect any structure or interfere with road reserves. This is one of the issues that has been hampering the development of roads within Nairobi City.

13.4.9 Kenya Road Board Act

Kenya Road Board Act of 1999 encourages participation of all stakeholders in the road sector. It also expresses the ownership and sustainability of the roads is ensured and that it implies that the overall responsibilities of the environmental impacts will have to be shared amongst all stakeholders.

13.4.10 River Authorities Act

The River Authorities Act, Cap. 443 of the Laws of Kenya, empowers all the existing river authorities to construct any works necessary for the protection and utilization of the waters and soils of the area.

13.5 NEW JICA GUIDELINES FOR ENVIRONMENTAL AND SOCIAL CONSIDERATIONS

Preparation of the new JICA guidelines

JICA introduced its first guidelines for environmental considerations in 1990, and used them to conduct screening of its projects that may have significant impact on the environment and the regional community, and to identify areas or aspects of more significant impact (scoping). As concerns on environment have broadened and diversified, and needs are recognized to make development and environment-related decision-making more accountable and related information open to the public, the revision of the guidelines has been contemplated.

A committee to revise the guideline for environmental and social considerations was established in December 2002 with members from the academe, NGOs and other private organizations, and related government agencies. The committee prepared its recommendation through a series of highly open meetings, and submitted it to JICA in September 2003. New guidelines were drafted based on the recommendation and discussed by a follow-up committee since November 2003. At the same time, comments on the draft guidelines were invited during December 2003 – February 2004. The new guidelines were completed in March 2004, and made effective in April 2004.

The new JICA guidelines are applied to any technical cooperation and grant-in-aid projects undertaken by JICA, including development study projects. Through its projects, JICA will encourage any aid recipient government to effect environment and social considerations properly and provide necessary supports in line with the new guidelines.

Principle and essential conditions of the new JICA guidelines

The basic principle of environmental and social considerations, as stipulated in the new guidelines, is to ensure meaningful participation of a wide range of stakeholders and transparency of decision-making based on the regard for basic human rights and the democratic system of governance. It reflects the Japan's ODA policy to pursue equity in development through proper consideration on the socially weak or deprived, income and inter-regional disparities within a developing country, and impact of ODA projects on the environment and the society of the developing country.

Two essential conditions to reflect environmental and social considerations under the new JICA guidelines are (1) opening of related information to the public; and (2) public consultation with local stakeholders as follows:

- **Information disclosure**

The information related to environmental and social considerations for a JICA project should be made open to the public. The recipient government should take the initiative for it, and JICA supports the government through the project. The information to be made public includes the information on the project itself. JICA encourages the recipient government to provide the information on environmental and social considerations for the project to local stakeholders, and ensures sufficient time allowed for the information disclosure in case that consultation with local stakeholders is made jointly with the recipient government.
- **Public consultation**

JICA supports the recipient government through the project to conduct the public consultation with a widest practicable range of local stakeholders so that environmental and social considerations will reflect local conditions more properly and social consensus will be formed on the project among the stakeholders. The consultation with local stakeholders should be undertaken jointly by JICA and the recipient government from an early stage of the project identification of needs, analysis on environmental and social issues, and examination of alternatives. A series of consultative meetings should be held at least at the time of scoping, during the reflection of environmental and social considerations, and after the formulation of a draft plan and a draft project proposal, respectively.

Strategic environmental assessment

Strategic environmental assessment (SEA) is a systematic and comprehensive process to assess environmental impact of policies, plans and programs and to incorporate the environmental concerns into higher level decision-making than is possible by project-level EIA. The scope of SEA is generally broader than that of project-level EIA in terms of both geographic extent of possible impact and options to be considered including both structural and non-structural measures. SEA gives at least equal weight to environmental and social objectives as given to economic objectives in formulating any policy, plan or program.

Essential features of the SEA process are (1) to make all the information related to decision-making on any development initiative open to the public and based on it, (2) to cultivate social consensus on the development initiative through a series of meetings with a wide range of stakeholders in order to ensure transparency and accountability of the decision-making. The new JICA guidelines outlined above are generally in line with the SEA approach.

13.6 STRATEGIC SCHEDULING OF STAKEHOLDERS MEETING

13.6.1 Schedule of Stakeholders Meeting

The SEA process is effected through various tasks for the planning by the JICA Study Team in close collaboration with the Kenyan counterpart team and a series of stakeholders meeting with information disclosure. Planning tasks at each stage of the Study related more directly to SEA and the schedule of stakeholder meeting is listed below. Subjects for discussion and possible resolution at each meeting are summarized in Table 13.1.

Initial works (July – August 2004)

- Discussion with government agencies and other related organizations on study approach with SEA, methods, expected outcome etc.
- Problem structure analysis and establishment of objectives and basic strategy for the Master Plan
- Stakeholder analysis

Analysis on existing conditions (July-September 2004)

- Identification of issues related to natural and social environment

Master plan formulation (October 2004 – March 2005)

- Formulation of socioeconomic and spatial frameworks
- Establishment of transport sector objectives, targets and strategies
- Preparation of alternative scenarios
- Development of project ideas

Stakeholders meeting No. 1 (11th November, 2004)

- Evaluation of alternative scenarios
- Formulation of projects and institutional measures
- Initial environmental examination (IEE)

Stakeholders meeting No. 2 (3rd February, 2005)

- Finalization of IEE
- Elaboration on selected alternative
- Selection of priority projects
- Compilation of Interim Report

Stakeholders meeting No. 3 (3rd March, 2005)

- Compilation of Interim Report

Pre-feasibility study (May-July 2005)

- Supplemental survey for priority project
- Formulation and examination of alternative schemes for priority project

Stakeholders Meeting No. 4

- Evaluation of the alternatives

- Preliminary environmental impact assessment (pre-EIA)
- Drafting of implementation plan

Stakeholders Meeting No. 5

- Elaboration on the best alternative
- Compilation of pre-EIA
- Preparation of implementation plan

Stakeholders meeting No. 6

- Comprehensive evaluation of the priority project
- Compilation of Draft Final Report

13.6.2 Organization and Procedure for SEA Application

Organization for SEA application

All the members of the JICA Study Team as well as the Kenyan counterpart team will be involved in the application of SEA to the Study. The JICA Study Team adopts an open planning system for the Study to effect the SEA application. This will be ensured by the following:

- All the information related to the Study will be made open to the public; and
- All concerned with the Study will be welcome to participate in the Study.

The stakeholder meeting provides the main venue for all concerned to discuss on various issues involved in the Study, not only those issues related directly with IEE and pre-EIA but also those related to the master plan and the priority project. All the information necessary for discussion at each meeting shall be shared by participating stakeholders.

Procedure for stakeholders meeting

The Ministry of Roads and Public Works shall make a public announcement for each stakeholders meeting with relevant information on main subjects for discussion at least three weeks prior to the meeting and send the same information to identified stakeholders. A summary discussion paper shall be prepared by the JICA Study Team in cooperation with the Kenyan counterpart team and sent to the stakeholders responded to the announcement or the invitation a few days prior to the scheduled meeting.

At any meeting, the Kenyan counterpart team will make a presentation based on the discussion paper and ask the stakeholders for initial clarification. Group discussions will follow to discuss on those subjects raised by the discussion paper and the initial clarification, facilitated by the JICA Study Team and the Kenyan counterpart team. Participating stakeholders will report the outcomes of group discussions, and the JICA Study Team and the Kenyan counterpart team will make further clarifications as necessary.

APPENDIX 14

NATURAL ENVIRONMENT OF THE STUDY AREA

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APPENDIX 14 NATURAL ENVIRONMENT OF THE STUDY AREA

14.1 NATURAL ENVIRONMENT OF THE STUDY AREA

14.1.1 Natural Environment

(1) Physiographic Units of the Study Area

- Western portion to northern portion of the study area is relatively high ground, approximately 1700-1800 m above sea level in average altitude. In the west is the area featured by Ngong Hill, 2,460 m high. Faulting of the Rift Valley has been the governing factor of which Nairobi Metropolitan Area cannot be developed and expand to west. Northern portion of the study area is incised by a large number of small valleys rugged. Kiambu District laying from north to east of the study area is characterized by hills, plateaus and high level structural plains which make it fairly easy for the development of highland agricultural area. The altitude ranges between 1,600 m to 2,300 m above sea level; and
- Eastern portion to southern portion is generally low, approximately 1600 m above sea level and relatively flat. Thika District is the eastern most area of the study area and there is relatively flat area ranging from 1,390 m to 1,630 m above the sea level. In the south, Mavoko to Machakos District has a variety of topographical feature. The landscape is largely a plateau that rises from 1,400 m to 1,600 m above sea level while the highest is Ol Donyo Sabuk rising to 2,144 m above sea level in the centre of Machakos District. The area to the west is Kapitei and Athi plains and Athi River flows to southeast. Toward west is Kajiado District characterized by Athi Plain climbing to Ngong Hills, which is the source of Athi River. The river is fed by its major tributaries of Mbagathi and Kiserian River, both of which are permanent rivers.

(2) Geology

The rocks on the Nairobi area mainly comprise a succession of lavas and pyroclastics of Cainozoic age and overlying the foundation of folded Precambrian schists and gneisses of the Mozambique belt. The crystalline rocks are rarely exposed but occasionally fragments are found as agglomerates derived from former Ngong volcano. For the period between late Precambrian and tertiary time no geological records exist in central Kenya except that the area is known to have undergone peneplanation on more than one occasion.

Volcanicity is generally associated with tectonic movements attendant upon rifting. Doming, linear warping and erosion of the sub-Miocene erosion surface had taken place prior to the extrusion of the first lava flows which flooded the eastern plains during mid-Miocene time. Subsequently, volcanicity continued intermittently until recent times. The area covered by lavas and pyroclastics from fissure eruptions during the development of the Rift Valley. Two central volcanos, Ngong and Ol Esayeiti, were also active during one occasion. These rocks form part of the wider East Africa alkaline suite characterized by dominance of soda over

potash, which distinguishes them from the potash - rich alkaline rocks of the western Rift Valley. Strongly and mild alkaline series are recognized. The former series is represented by feldspathoid- bearing pholites. Basanites, tephrites and more basic varieties, while the later includes feldspathoid- free rocks containing soda-rich amphiboles and pyroxenes, both series shows an increase in silica contents with differentiation and include trachytes, rhyolites and obsidians. All formations are covered by deep soils and gravel of quaternary age. The geological features are shown in Figure 14.1-1.

(3) Rivers and Wetlands

Rivers

Most of large streams and rivers draining in Kikuyu Highlands in the northwest of the study area are perennial and there is no shortage of water in the northern and north-western portion of the study area. On the lower ground to the east and south, however, streams tend to dry up during dry season. The streams are frequently fed by springs that flow out of the forest belt of Kikuyu Land, which feed the headwaters of Nairobi River and Mbagathi River. Innumerable other small springs flow out from between lava flows with differing porosity and permeability.

In Nairobi City, water draining eastward from the hill area accumulating in the low-lying ground between parklands in the north and Nairobi south estate. The Kirichwa valley tuffs lying to the east of highway behave like a sponge and the contact between them and the underlying impermeable phonolite is thus a perfect aquifer that a number of channels containing water occur beneath Nairobi, hence the name of the place.

Kenyatta Avenue (formerly valley road) follows the direction of a stream course down which water flowed to debouch onto the plain, where majority of boreholes have been drilled for irrigation and water tanks for cattle herders.

The surface water in Kiambu District comprises many permanent rivers and springs such as Kamiti, Riara, Kiu, Ruiru and Komothai, all fairly well distributed in the Study Area. The rivers are originated in the highlands of Aberdare Range to the north of study area forming water catchment areas and a number of them flow towards the lowlands in Thika District. These rivers eventually form Tana River thus forming the Tana and Athi River drainage system.

The rivers in Machakos District that lay within the drainage basin of Athi River are seasonal and dry up during dry season. The Ngong Hills in Kajiado District are the catchments of the upper Athi River. These catchment areas cover 2,080 km². The rivers in this catchment area include Embakasi and Kitengela River. The Embakasi River constitutes of the only perennial water source in the upper Athi River area including Athi River Town. This river supplies water for domestic,

industrial and irrigation purposes around Athi River and Kitengela Township.

Wetlands

There are also some swamps such as Ondiri in Kikuyu. The reliability of both surface and sub-surface water in the study area is very high in terms of water supply for the local population as most of the rivers and springs are permanent. Most of the boreholes in the study area, especially those around the Ondiri swamp, have high yields and can be used for irrigation throughout the year.

(4) Soil Characteristics of the Study Area

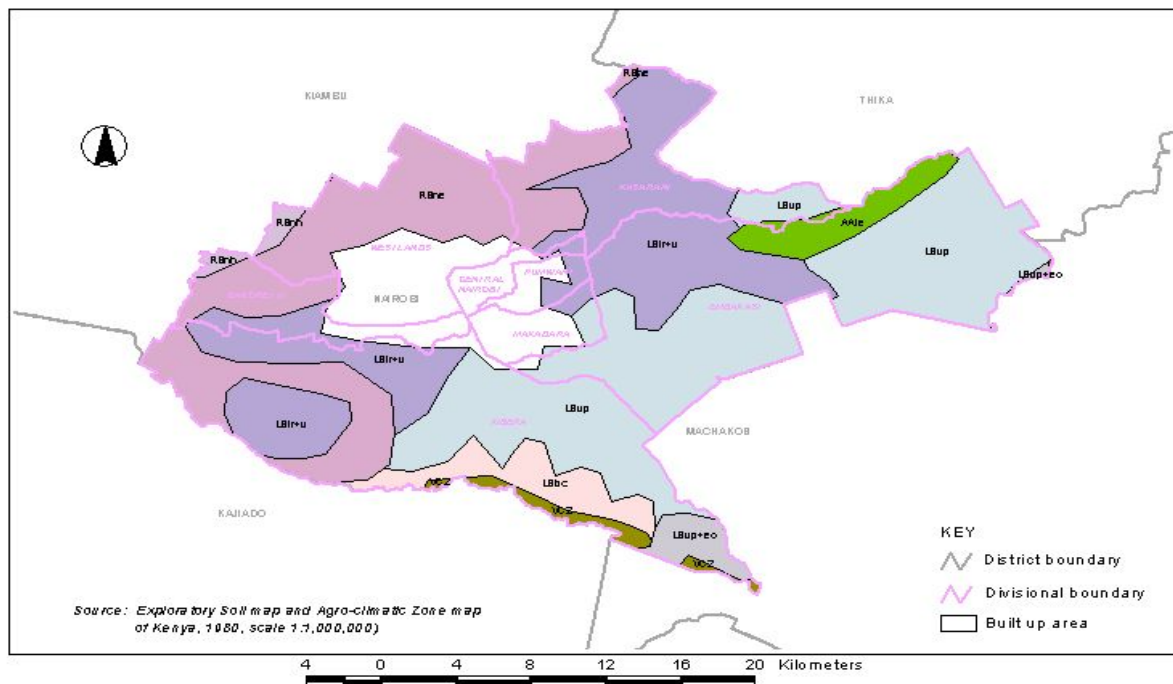
In the Ruiru-Kahawa-Nairobi, in the east of study area, the soils are shallow, yellow brown to yellow red, friable clays overlying a laterite horizon. They usually show a low humus layer overlying friable clay passing downwards into massive laterite and represent soil with slight seasonal impeded drainage.

Over the Athi Plains, the soils are black to dark grey clays (grumosolic) comprising black cotton soils with calcareous and non-calcareous variants. These soils mainly overlie the Nairobi and Kapiti phonolites, both lava-formed impermeable strata over which ill-drained soils in the Ngong area would also form under similar conditions due to poor drainage. Shallow stony soils with rock outcrops also characterise the area. Reddish-brown sandy clay loams occur in pockets and bands in the Athi River area overlying a tuff bed. Their distribution has been attributed to erosion of a former land surface or the presence of an old lake.

The soils in Kiambu District is characterized by soil on volcanic footridges. These are soils of moderate to high fertility and are found in parts of Kiambu Division and parts of Kikuyu and Limuru Divisions. They are well drained gray/red in color to dark brown friable clays. These soils cover the coffee zones where the major cash crops like coffee, tea and pyrethrum are grown. Crops such as cabbages, tomatoes and carrots are grown.

The soils in Machakos District are in general a moderate to high fertility while the dominant soils of the upland areas are relatively low fertility. Generally, the soils in this area have a variable fertility, especially on the hills. On the foot slopes of the hills, the soils have an increase in clay depth and have a moderate low fertility. The soils in Kajiado District including the Ngong Hill and Kitengela Game Conservation Area are composed of sediments from the tertiary volcanic rocks washed down the eastern slope of Rift Valley escarpment and relatively low fertility.

The soil map of the study area showing its different characteristics is shown in Figure 14.1-1 while Figure 14.1-2 shows its average temperature throughout the year.



- LEGEND**
- L PLATEAUS AND HIGH LEVEL STRUCTURAL PLAINS (flat to gently undulating; slopes in general less than 8%)
 - LB Soils developed on Tertiary basic igneous rocks (olivine basalts, nepheline phonolites; older, basic tuffs included)
 - LBbc well drained, shallow, brown, firm, gravelly clay, with a stony to bouldery surface (chromic CAMBISOLS, lithic and boulder-mantle phase)
 - LBvp imperfectly drained, very deep, dark grey to black, firm to very firm, bouldery and stony, cracking clay; in places with a calcareous, slightly saline deeper subsoil (pellic VERTISOLS, stony phase and partly saline phase)
 - LBvp+eo imperfectly drained, moderately deep to deep, very dark grey to black, firm to very firm, slightly calcareous, cracking clay; in many places with a gravelly, calcareous deeper subsoil (pellic VERTISOLS and orthic RENDZINAS)
 - LBir+v complex of:
 - moderately well drained, shallow, yellowish red to dark yellowish brown, friable, gravelly clay over petroplinthite or rock (50-70%), (IRONSTONE SOILS*; with LITHO SOILS)
 - poorly drained, deep to very deep, dark brown to very dark greyish brown, mottled, firm to very firm, cracking clay; in places moderately deep to very deep over petroplinthite (undifferentiated VERTISOLS and vertic* GLEYSOLS)
 - R VOLCANIC FOOTRIDGES (dissected lower slopes of major older volcanoes and mountains; undulating to hilly)
 - RB Soils developed on Tertiary basic igneous rocks (olivine basalts, nepheline phonolites; older, basic tuffs included)
 - RBnh well drained, extremely deep, dusky red to dark reddish brown, friable clay, with an acid humic topsoil (humic NITISOLS)
 - RBne well drained, extremely deep, dusky red to dark reddish brown, friable clay; with inclusions of well drained, moderately deep, dark red to dark reddish brown, friable clay over rock, pisolitic or petroferic material (eutric NITISOLS; with nito-chromic CAMBISOLS and chromic* ACRISOLS, partly pisolitic or petroferic phase)
 - A FLOOD PLAINS
 - AB soils developed on sediments from basic igneous rocks (basalts, etc.)
 - AAje complex of well drained to imperfectly drained, very deep, dark greyish brown to dark reddish brown, stratified soils of varying consistence and texture (eutric FLUVISOLS)
 - V MINOR VALLEYS
 - VC2 complex of well drained to imperfectly drained, shallow to moderately deep, dark reddish brown to very dark greyish brown, firm, slightly to moderately calcareous, rocky stony, or gravelly clay

FIGURE 14.1-1 SOIL MAP OF KENYA

(5) Climatic Conditions of the Study Area

Over most of the country there are two rainy seasons. The short rain season is from late October through November and the long rains from March through to early June. In the western Rift Valley, western Kenya, and the Lake Victoria regions there is really no dry season although rainfall is lowest in January and February. July and August are the coolest months and are often overcast especially in the mornings. The climatic conditions of Nairobi follow the country's trend and it is summarized as follows:

- The highest rainfall is experienced between March and May and the short rainfall in October to December. The mean annual rainfall ranges between 850mm-1050mm. Temperatures are usually low between July and August in the average of 23⁰C and high in the average of 32⁰C in January and February. The mean annual daily temperature ranges between 12⁰C to 26⁰C. The mean monthly relative humidity varies between 36% and 55%.
- Thika District has a bi-modal rainfall patterns with long rains occurring in the months of March and May and short-rains in the months of October and November. The eastern part of the Study Area is semi-arid region and receives low rainfall ranging from 116 mm to 965 mm. Thika District has a mean temperature of 20 0C with coldest months being June, July and August. The hottest months are February, March and April. Temperatures also vary during the year with a mean minimum of 8 0C and a mean maximum of 300C.
- In Kiambu District, altitude is the single most important factor influencing climate. With regard to rainfall, the amount received is 845 mm at the point situated at 1,555 m above sea level. The rainfall regime is bimodal, with the long rains occurring between April and May while the short rains fall from October to November. Temperatures are also determined by altitude. Average temperature is 34 0C in the lower land of Karai in Kikuyu Division. July and August are the months during which the lowest temperatures are experienced. The hottest months are January through March.
- In Machakos District, the short rain season starts at the end of October and lasts till December while the long rain season starts at the end of March and continues up to May. The annual average rainfall ranges between 500mm in lowland area to 1,300mm in the high altitude areas of Matunulu, Kangundo and Central Divisions.
- In the Kajiado District, short rains fall between October and December while the long rains fall between March and May. Heavy rains occur around the Ngong Hill. The coolest period is between July and August while the hottest months are from November to April.

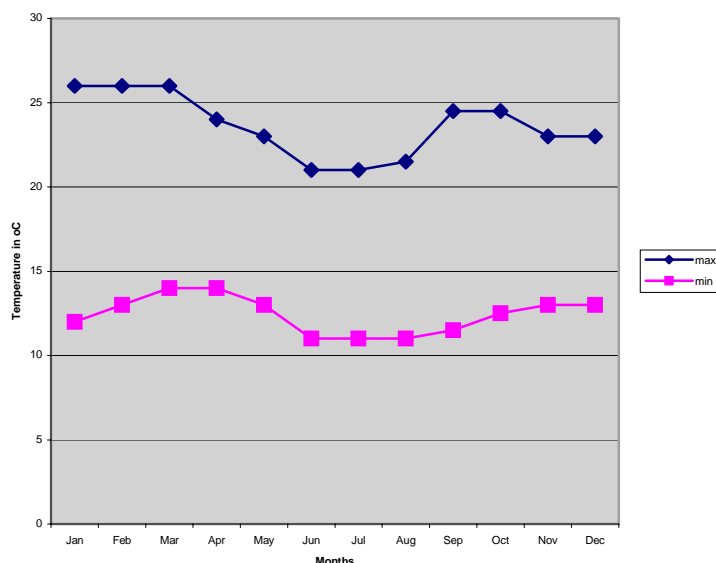


FIGURE 14.1-2 AVERAGE DAILY MAXIMUM AND MINIMUM TEMPERATURE FOR NAIROBI AREA (SOURCE: STATISTICAL ABSTRACT 2003)

14.1.2 STANDARD OF AIR AND WATER QUALITY

(1) Ambient Air Quality of Other Countries

Kenya has no ambient air quality standards. The ambient air quality standards of other countries are shown in Table 14.1-1 for a reference.

TABLE 14.1-1 AMBIENT AIR QUALITY STANDARDS

Pollutant	Average Time	Time Weighed Average			
		WHO (Unit: $\mu\text{g}/\text{m}^3$)	Strategy for UK ¹⁾	U.S. A.	Japan
Sulpha Dioxide	10 min.	500	-	-	-
	15 min.	-	0.1ppm	-	-
	1 hour	0.61ppm (350 $\mu\text{g}/\text{m}^3$)	-	-	0.1ppm
	24 hour	100-150	-	80 $\mu\text{g}/\text{m}^3$	0.04ppm
	1 year	40-60	-	0.03ppm	-
Lead	24 hour	150-230	-	-	-
	3 month	-	-	1.5 $\mu\text{g}/\text{m}^3$	-
	1 year	0.5-1.0	0.25 $\mu\text{g}/\text{m}^3$	-	-
Particles (PM ₁₀)	24 hour	70	50 $\mu\text{g}/\text{m}^3$	150 $\mu\text{g}/\text{m}^3$	100 $\mu\text{g}/\text{m}^3$
	1 year	60-90	-	50 $\mu\text{g}/\text{m}^3$	-
Nitrogen Dioxide	1 hour	0.212ppm (400 $\mu\text{g}/\text{m}^3$)	0.15ppm (287 $\mu\text{g}/\text{m}^3$)	-	-
	24 hours	0.079ppm (150 $\mu\text{g}/\text{m}^3$)	-	-	0.04~0.06ppm
	1 year	-	-	0.053ppm (100 $\mu\text{g}/\text{m}^3$)	-
Carbon Monoxide	1 hour	27ppm (30 mg/m^3)	-	35ppm (40 mg/m^3)	-
	8 hour	9ppm (10 mg/m^3)	10ppm (11.6 mg/m^3)	9ppm (10 mg/m^3)	20ppm

Note: 1) Air Quality Strategy for England, Scotland, Wales and Northern Ireland. Department for the Environment, Food and Rural Affairs in partnership with the Scottish Executive, The National Assembly for Wales and the Department of the Environment for Northern Ireland, 2000.

(2) Conditions of Ambient Air Quality in the Study Area

In the past two centuries, human activities have greatly increased the release of gases into the atmosphere. Gaseous emissions are primarily generated by the industrial and the transportation sectors, through the burning of fossil fuel such as oil, petrol, diesel, coal, natural gas and liquefied petroleum gases and the production and use of chemicals. This phenomenon is observed in the city of Nairobi's industrial area. Emissions from burning fossil fuels in internal combustion engines such as vehicles cause localized pollution in urban centers.

Particulate matters in the city of Nairobi mainly the anthropogenic particulate mainly comprising soot and dust from industries, fuel combustion and motor vehicle emissions. Industrial particulate matter may include toxic trace metals such as arsenic, lead, cadmium and mercury. The most important source of lead in Kenya is the transportation industry where lead is added to petrol as tetra ethyl to enhance performance and increase fuel economy. The situation of ambient air quality in the Nairobi area is shown in Tables 14.1-2 – 14.1-7.

**TABLE 14.1-2 PHOTOCHEMICAL SMOG-AMOUNTS
(CONCENTRATIONS) OF POLLUTANTS IN NAIROBI: CASE STUDIES**

Site	Amount of Pollutant/ m ³ (Conc.)	Source	Year of Study
City Center & Industrial Area	TSP: 35-128 µg/ m ³	UNEP	1977/78
Industrial Area	SPM: 252 µg/ m ³	Ngugi	1983
Industrial Area	TSP: 398 µg/ m ³	Karue	1992
Sub-Urban	PM ₁₀ : 30-80 µg/ m ³	Gatebe	1994
Sub-Urban/slum	SPM: 78-160 µg/ m ³	Gitari	1990

**TABLE 14.1-3 NUMBER OF CARS IN NAIROBI AND AMOUNT OF LEAD
ON THE ROAD SIDE (2.5M AWAY)**

Station	S1	S2	S3	S4	S5
Cars/H	14.12	1198	1213	1440	898
Lead (ppm)					
Soil	156±24	181±7	42.0±0.5	109±7	56±0.7
Plant	8.0±0.2 1	30.0±0.5	6±4	69±0.1	24±0.5

Note: S1-Embakasi Road, S2-Uhuru Highway, S3-Waiyuki Way, S4-Thika Road, S5-Ngong Road No. of cars per hour in 1990

TABLE 14.1-4 SULPHUR DIOXIDE CONCENTRATION AT VARIOUS SITES

Sampling Site	Mean STD (µg/m ³)	Range (µg/m ³)
Industrial area	85 ±51.9	19-245
Chiromo	13.8 ± 4.9	9-18
Thika	82.9 ± 26.3	57-137
Nderi, Kikuyu	63.7 ± 11.2	45-83
Muguga, Kikuyu	16.5 ± 5.2	10.3-21
Magadi	1374 ± 1093	24-3397
Gilgi	2278 ± 1543	635-4967

TABLE 14.1-5 SULPHUR DIOXIDE CONCENTRATION IN OTHER CITIES

City	SO ₂ (µg/m ³)	City	SO ₂ (µg/m ³)
Bangkok	10-30	Beijing	10-70
Bombay	20-50	London	30-60
Sao Paulo	30-130	Shanghai	10-110
Tehran	30-180	Tokyo	20-50
Zagreb	40-120	Wroclaw	25-70
Athens	25-90	Caracas	25-50
Christchurch	10-50	Hong Kong	20-70
Los Angeles	5-30	Madrid	5-60
New York	30-65	Toronto	5-30

TABLE 14.1-6 LEVELS OF AMMONIA

Sampling Site	Mean STD(µg/m ³)	Range (µg/m ³)
Industrial area ¹⁾	449+160	194-833
Chiromo	67.7=33	17.4-105
Kasarani	22.4+8.5	17.4-34.8
Thika	94+21.6	72.8-127
Nderi, Kikuyu	96.3+24.9	50.9-136
Muguga, Kikuyu	23.4+8.8	17-34
Magadi	235+67	157-313

Note: 1) Embakasi Road in Nairobi

TABLE 14.1-7 LEVELS OF HYDROGEN CHLORIDE

Sampling Site	Mean STD (µg/m ³)	Range (µg/m ³)
Industrial area	2426±1191	1175-5413
Chiromo	559±100	422-703
Kasarani	386±24.8	3514.1.0
Thika	476±80	3514.1.0
Nderi, Kikuyu	717±216	469-1172
Muguga, Kikuyu	392±83.9	205-469
Magadi	235+67	157-313

Water quality Standards for Surface Water

Kenya has no water quality standard for surface water. The water quality guideline and standards of other countries are shown in Table 14.1-8 for a reference.

TABLE 14.1-8 SURFACE WATER ABSTRACTION DIRECTIVE-SUMMARY OF GUIDELINE STANDARDS FOR CLASS A1 AND A2 IN UK AND WATER QUALITY STANDARDS IN JAPAN

Country	Level	pH	BOD (mg/l)	SS (mg/l)	DO	Faecal coliforms (No/100ml)
UK	A1	6.5 – 8.5	<3	-	>70% Satn	<20MPN
	Guideline	A2	5.5 – 9.0	<5	-	>50% Satn
Japan	AA	6.5 – 8.5	<1	<25	>7.5 mg/l	<50MPN
Japan	A	6.5 – 8.5	<2	<25	>7.5 mg/l	<1,000MPN
	B	6.5 – 8.5	<3	<25	>5 mg/l	<5,000MPN
	C	6.5 – 8.5	<5	<50	>5 mg/l	-
	D	6.5 – 8.5	<8	<100	>2 mg/l	-
	E	6.5 – 8.5	<10	No Rubbish	>2 mg/l	-

Note:

A1: Regulated by the Environment Agency

A2: Regulated by Local Authorities

AA: Water quality for the drinking at first level and protection of natural environment

A: Water quality for the drinking at second level, the fishery at first level and the bathing

B: Water quality for the drinking at third level and the fishery at second level

C: Water quality for the fishery at third level and the industry at second level

D: Water quality for the industry at second level and the agriculture.

E: Water quality for the industry at third level.

Source: U.K. [Environment Agency of England and Wales] and Ministry of the Environment in Japan

Conditions of Surface water Quality in the Study Area

Water resources in Kenya are increasingly being polluted by organic, inorganic and microbial matter. For example, nitrate pollution of groundwater from agricultural practices has been observed. The use of pesticide has increased considerably since the 1960s and 1970s, especially herbicides and fungicides. All pesticide compounds pose environmental health hazard, as they are toxic.

Municipal solid and liquid wastes can be major sources of surface water and groundwater contamination if they are not well treated. Solid wastes in Nairobi city are mainly made up of garbage, wastepaper, plastics, textile, glass, remains of food and wood. Sludge from wastewater treatment plants is also regarded as solid waste. It may contain high concentrations of pathogenic bacteria, which may render it hazardous during handling as well as containing toxic heavy metals. Disposal in sanitary and safe manner is therefore necessary to avoid polluting surface and groundwater.

Activities that have been identified as the major sources of pollution leading to poor water quality include agricultural activities, industrial activities and urbanization. In addition to producing wastewater, which is characterized by high BOD levels, discharges from the tanneries, textiles and pulp and paper industries are highly contaminated with various chemicals. Mining and metallurgical industries within the city are also other sources of chemical pollution.

Many indicators such as moderate BOD values, pathogenic microorganisms, suspended matter, oil and grease, detergents and other chemical substances normally characterize municipal domestic waste. Polluted water has a very strong impact on human beings and other living organisms and the environment in general. Generally the impact of pollution on water resources is manifested through the deterioration of water quality, toxicity to mammals and aquatic life, environmental health effects and loss of aesthetic values. High cost of water supply, eutrofication, deoxygenation, acid rain and habitat modification are other impacts on the environment.

Surface water quality in Kenya has been declining since the 1960s as evidenced by high colour, turbidity and presence of pathogens. The quality of water in Kenya is the responsibility of various government bodies, which operate under various statutes. These statutes include Public Health (Act Cap 242); water Act (Cap 372); the chiefs Authority (Act Cap128); EMCA 1999) and the Standard Act (Cap 496) of the laws of Kenya.

The Ministry of Water Management and Development (MWRMD) implements the water effluent guidelines through the development and implementation of water effluent discharge standards, monitoring of water quality of rivers, lakes and boreholes through the natural water quality control the monitoring programs, classification of water bodies, development of water quality standards by the Kenya Bureau of Standard (KEBS) and monitoring of water quality by the provincial water committee under the supervision of KEBS. The implementation of EMCA (1999) should enhance these existing efforts.

KEBS has been implementing the drinking water standards. They have also been sensitizing the public on water quality issues. KEBS has also been coordinating provincial water committees made up of representatives of Ministry of Health, MWRMD and the Ministry of Local Government, the provincial administrations and the National Water Corporation in matters pertaining to water quality in the provinces. The committee ensures that community water is treated to kill microorganisms before supply. This has ensured that drinking water is safe and of acceptable quality.

14.1.3 STANDARD OF NOISE

(1) Standard of Noise of Other Countries

Kenya has no noise standards. The noise standard of the Ministry of Environment in Japan is shown for a reference (Table 14.1-9 and 10).

TABLE 14.1-9 NOISE STANDARDS OF MINISTRY OF ENVIRONMENT IN JAPAN

Area	Standards	
	Daytime	Nighttime
Areas where it faces road that has more than two lanes in A area	<60 dB(A)	<55dB(A)
Areas where it faces road that has more than two lanes in B area, and that has a lane in C areas	<65 dB(A)	<60 dB(A)

Note: A: All areas for residence, B: Most of areas for residence, C: Areas for residence, commerce and industry.
Daytime: 6:00 – 22:00, Nighttime: 22:00 – 6:00

TABLE 14.1-10 NOISE STANDARD OF THE AREAS FACING HIGHWAY IN JAPAN

Standards	
Daytime	Nighttime
<70 dB(A)	<65dB(A)

Note: A area: All areas for residence
B area: Most of areas for residence
C area: Areas for residence, commerce and industry.
Daytime: 6:00 – 22:00, Nighttime: 22:00 – 6:00

(2) Conditions of Urban Noise in the Study Area

Urban noise is usually caused by combination of machinery in factories, Juke-boxes and discotheques, loudspeakers, including those in passenger vehicles, matatu touts shouting, motor traffic, aircraft and quarrying and mining. Noise pollution is associated with industrial and urban development. Kenya's pace of industrialization and the increase in traffic volume has worsened the noise problem. The problem with noise pollution is the fact that there is no policy or legislation on management and control of noise in industry, transport, commerce and even individual premises, and little public awareness on the dangers of noise pollution. However, there is increased concern about the problem. The city also lacks an inventory on sources and levels of noise pollution from various human activities.

14.1.4 NATURAL CONSERVATION AREAS WITHIN THE STUDY AREA

(1) Conservation Areas

The locations of conservation areas are shown in Figure 14.1-2.

(2) Nairobi National Park

The Nairobi National Park was gazetted in 1946 as the Kenya's first national park. The park covers an area of 117km². It is the only national park in the world within a capital city.

The park is situated 10 km south of Nairobi city center. It lies between 2° 18' - 2° 20' south and 36° 23' - 36° 28' east at an altitude of 1780m above sea level. The park borders Wilson airport to the north, the Mombasa road to the east, the Langata road to the west and the Kitengela conservation area to the south (KWS, 2004-2009, *NNP Ecosystem Management Plan*). Administratively the park is in Nairobi Province. It borders Kajiado District to the South and Machakos District to the east. Features delineating the boundary of the park are the Mbagathi River to the south and southeast and the Mombasa railway line to the north and east.

Access to the park is through five gates, three gates are on the Nairobi city center to the Langata – Magadi road and two are on Mombasa Namanga road:

Langata road -main gate

Mombasa road-Namanga road cheetah gate

Mombasa road –East gate

Langata road-Magadi road –Langata gate, and

Langata road- Magadi road –Masaai gate.

The Nairobi National Park falls within the highland wet zone of Ngong and Nairobi area. The area has a bimodal rainfall pattern similar to most parts of Nairobi and receives a mean annual rainfall of between 762mm (east side) and 911mm (west side) in two rainy seasons. Long rains occur between mid-March and May, while short rains occur between October and December. The mean number of rain days in the ecosystem is 85, with daily annual averages of 6.9 sunshine hours a day and 147.6km for wind run.

The park has annual evaporation rate of 1721mm based on the record at the Wilson airport. The Nairobi National Park also experiences cool climate with minimum temperature ranging between 12.3°C and 13.1°C and maximum temperature ranging between 24.8°C and 25.4°C. These meteorological characteristics give the Park a sub humid climate with seasonal dry periods.

The Park has gently undulating with the highest point being to the northwest at the altitude of

1790m above sea level. Along the Mbagathi river, there are deep rocky valleys and gorges covered by shrubs and long grass.

The Makoyeti system forms the tributary into the Mbagathi river, and drains the upper reaches of the Nairobi National Park. Other small tributaries that drain the lower reaches of the Park are the Sosian, the Donga and the Boma. With the exception of the Mbagathi River, which borders the Park to the south, most of the rivers inside the Park dry up during droughts or during short dry spells between rains. For this reason, up to 15 dams have been constructed in order to augment water supply during dry seasons.

The Mbagathi river basin consists of moderate to high slopes that allow good drainage. It has permanent flows in the upper reaches, and use of its waters is very competitive along its course before the river enters the Park. Its water is used for domestic purpose, horticultural irrigation and fish farming, mainly in the Karen and Ongata Rongai areas. The river becomes seasonal in some years when the rainfall falls below the average.

Most part of the Park has volcanic rocks formed in the middle and upper tertiary periods. The southern part of the park has got tertiary sediments, while calcareous and non-calcareous clay loam derived from colluvium cover most of the park. Other areas of the Park have dark brown calcareous clay loams, which are associated with old lacustrine deposits.

The vegetation of Nairobi National Park may be divided into eight vegetation communities, which include close dwarf tree grassland, open low shrubs land, grassland, scattered low –tall tree grassland, open dwarf tree grassland, open tall riverine woodland, forest glades and dense tall forest. The Park conserves samples of two major ecosystems, highland dry forest and savanna, and has rare plant species, *Eurphobia brevitata*, *Crassular* sp and *Drimia* sp.

Nairobi National Park is a rhino sanctuary for feeding and restocking other parks. It has over 400 bird species, of which 20 are seasonal European migrants. The park is home to over 100 mammals species, of which four are the big five (lion, rhino, leopard and buffalo) and has spectacular wildebeest and zebra migration. The location of Nairobi National Park is shown in Figure 14.1-3.

(3) Ngong Road Forest

The Ngong Road Forest is a remnant of dry upland forest that was once part of the Nairobi area. It has an area of about 1,274 ha. The Forest has an area of 638.4 ha under the Ngong Forest Sanctuary. It is jointly managed by the Ngong Road Forest Sanctuary Trust established in 1993, the Forest Department and the Kenya Wildlife Service. The Ngong Road Forest has also had several excisions from the Gazeted Forest Area between 1963 and 1994.

Forest Excisions 1963 – 1994

<u>Date</u>	<u>Legal Notice No.</u>	<u>Gazette Notice No.</u>	<u>Area (ha)</u>
12/11/64	359	-	4.47
16/2/65	46	-	4.47
1/2/66	35	1694	9.44
30/8/66	261	2353	0.76
3/2/67	31	4666	0.37
7/11/67	240	3042	17.60
13/1/78	3	2920	3.74
17/3/78	51	818	0.31
28/1/94	*	352	40.47

For entries where there is no legal notice, excision has been proposed but not yet legalized.

The Forest has both exotic and indigenous vegetation which include 148 ha. under Eucalyptus species, 2.7 ha with pines, 6.8 ha Cyprus species and 11.3 ha under croton and cordial species. The indigenous trees and grass in the sanctuary cover an area of 504 ha. The sanctuary is estimated to be home to over 120 bird species, over 35 mammals including Suni, leopard and various monkeys and numerous reptiles, insects and amphibians. Comprehensive checklists of the biodiversity are to be compiled through the initiatives of the Sanctuary Management. The location of Ngong Road Forest is shown in Figure 14.1-4.

(4) Karura Forest

The Karura forest is a gazetted forest as per 1932 proclamation legal notice (Proc. 44,1939), which led to the establishment of 1,062.7 ha and it has been reduced to 956.1 ha today. The forest is managed by the Forest Department. It is an example of the dry upland forest that once covered what is now Nairobi. The forest serves as the water catchment for rivers Thigiri, Karura, Ruaraka and Gitathuru. There have been changes on the size of the forest over the years. The historical changes in the area of Karura forest based on proclamation and legal notices are given in Table 14.1-11.

The forest provides an ideal habitat for the unique indigenous vegetation species which also support the bulk of the fauna and flora found in the forest. The forest has its area under plantation, indigenous vegetation and grass. The plantations provide the timber necessary for industry while the indigenous forest cover is the source of the highly valued hardwood used for domestic furniture and wood carving for the tourism industry. Flora and fauna commonly seen in Ololua Forest is shown in the Table 14.1-12. The location of Karura Forest is shown in Figure 14.1-5.

(5) Ololua Forest

The Olo Lua Forest is one of the remnants of the remaining dry forests that once flourished around the Nairobi area. A quarter of the Ololua forest is pristine indigenous forest and is protected as a nature reserve. It has an area of 667.7 ha of both exotic and indigenous forest in trust Land. In 1979 and 1986, the Government allocated to National Museums of Kenya a total of 250 acres of this forest. The National Museums of Kenya has constructed nature trails on this land for public education and awareness creation. For many years, mining activities have threatened the survival of this forest. However, mining activities have since been stopped by the government following representation by stakeholders through the Kenya Forest Working Group and the East African Wildlife Society. The location of Ololua Forest is shown in Figure 14.1-4.

(6) Embakasi Forest

Embakasi forest covers an area of approximately 573 ha and is located in Kajiado District based on the 1996 data made by the District Forest Department of Kajiado. It is in the neighbourhood of the Metropolitan Nairobi and is also a remnant of the dry forest areas. The forest is under Trust Land and has both indigenous and exotic vegetation. It is under the management of the District Forest Department. Other stakeholders include research Institutions such as KEFRI, KARI, Institute of Primate Research, universities in Nairobi area, civil society organisations, the Government of Kenya, local community members, conservation groups, and the local authority, and the National Museums of Kenya. Table 14.1-14 shows Flora and Fauna of Embakasi Forest. The location of Embakasi Forest is shown in Figure 14.1-4.

(7) Ngong Hill Forest

Ngong Hill forest covers an area of approximately 3,077 ha and is located in Kajiado District based on the 1996 data made by the District Forest Department of Kajiado. It is on the hill-top of Ngong Hill and it is a gazetted forest area with indigenous and exotic varieties with large tract of area covered with grassland. The location of Ngong Road Forest is shown in Figure 14.1-6.

(8) Nairobi Arboretum

Nairobi Arboretum covers some 25 ha of “green space” in Nairobi. It is situated between the State House and the Kirichwa river in Kileleshwa. It was established in 1907 by Mr. Battiscombe of the Forest Department. The Arboretum was used for trials of introduced trees in the early years. Later, a number of ornamental trees from all over the tropical world especially Australia were introduced. Nairobi Arboretum is managed by the Forest Department of the Ministry of Environment and Natural Resources. The Friends of the Nairobi Arboretum (FONA) is collaborating with the Forest Department to oversee the sustainable management of the Nairobi Arboretum. Fauna and Flora of

Nairobi Arboretum is shown in Table 14.1-15. The location of Nairobi Arboretum Forest is shown in Figure 14.1-7.

(9) Nairobi City Park

The park is located between the Limuru road and the Forest road in Nairobi. The park is managed by the Nairobi City Council. The Park is one of the forest patches that were preserved when the City was being built. It was once one forest block with Karura, Ngong Road, Ololua and the Nairobi Arboretum.

Part of the City park was landscaped with ornamental trees, lawns and flower gardens with a stream canalized through the parks. The rest of the land remained as a remnant of the forest providing a habitat for many plant and animals.

The indigenous plant species are similar to those found in Nairobi Arboretum. It is also home to several animal species including monkeys, butterflies and birds. About 100 bird species are found in the park, including Hadadaibis, weaverbird and hornbills.

There are a number of initiatives to conserve the City park through the Friends of the City Park, which was formed to bring together people who enjoyed the goods and services of the City Park and wish to keep it for posterity. The location of Nairobi City Park is shown in Figure 14.1-7.

(10) Other Forest and Conservation Areas

In Thika District there is no forest and National Park.

- In Machakos District, there is Ol Doniyo National Park in Mtungulu Division and three forest reserves of Metetani Muisuni Forest, Kithatani Forest, and Ngulini Forest in Kangundo Division. The locations of these Forests are shown in Figure 14.1-8 and Figure 14.1-9.
- In Kiambu District there are four forest reserves of Kamiti Forest, Kiambu Forest, Muguga Forest and Dagoretti Forest. There is no National Park in this district. The locations of these Forests are shown in Figure 14.1-5 and Figure 14.1-10.

TABLE 14.1-11 CHANGES IN THE AREA OF KARURA FOREST

Year	Proclamation/ Legal Notice	Action	Area Affected	Total Area
1932	Proc. 44/1932	Establishment of Karura Forest Reserve	2626 acres	2626 acres 1062.7 ha
1951	Proc 15/1951	Excision	-4 acres	2622 acres 1061 ha
1954	Proc. 30/1954	Addition	+ 4 acres	2626 acres 1062.7 ha
1956	L.N. 289/1956	Excision	- 46 acres	2580 acres 1044.1 ha
1964	L.N. 174/1964	Declare central forest excision	-	-
1986	L.N. 30/5.12.1986	Excision	- 2.78 acres	2573.1 acres 1041.3 ha
1993	L.N. 30/24.9.1993	Excision Addition	- 5.86 + 5.63	2572.8 acres 1041.2 ha
1997	LN 97/13.6.1997	Excision	- 85 ha	2362.8 acres 956.2 ha

TABLE 14.1-12 FLORA IN KARURA FOREST

a. Flora: Common indigenous vegetation in the Karuran Forest

Scientific Name	Local Name
1 Brachylaena huillensis	Muhugu
2 Warburgia ugandensis	Muthiga
3 Croton megalocarpus	Mukinduri
4 Olea europeae variety africana	Matumaiyu
5 Uvaridendron anisatum	Mutonga

Note: There is no English names for the local plants.

b. Fauna

Scientific Name	English name
1 Hystrix galeata	Porcupines
2 Galogo senegalensis	Bush baby
3 Cercopithecus species	Monkeys
4 Rhynchotragus species	Dik dik
5 Epomophorus wahlbergi	Epauletted bat
6 Civettictis civetta	African Civet
7 Genetta species	Genets
8 Tragelaphus scriptus	Bush Bucks
9 Potamochoerus porcus	Bush pigs
10 Cephalophus (species)	Duikers (Many species)

TABLE 14.1-13 FLORA IN EMBAKASI FOREST

a. Flora

Scientific Name	Local Name
1 Warburgia ugandensis	-
2 Olea africana	-
3 Croton megalocarpus	-
4 Branchylaena species	-

b. Fauna

Scientific Name	Local Name
1 Baboon	
1) Papio anubis	Olive Baboon
2) Papio cynocephalus	Yellow Baboon
2 Syncerus caffer	Buffalo
3 Porcupines (Hystrix galeata),	Porcupines
4 Galago senegalensis	Bush baby
5 Cercopithecus species	Monkeys
6 Rhynchotragus species	Dik dik
7 Epomophorus wahlbergi	Epauletted bat
8 Civettictis civetta	African Civet
9 Genetta species	Genets
10 Tragelaphus scriptus	Bush Bucks
11 Potamochoerus porcus	Bush pigs
12 Cephalophus species	Duikers



Source: Geological Map of the NAIROBI Area (1991), Geological Map of the North MACHAKOS-THIKA Area (1963)
FIGURE 14.1-3 GEOLOGICAL FEATURES OF NAIROBI

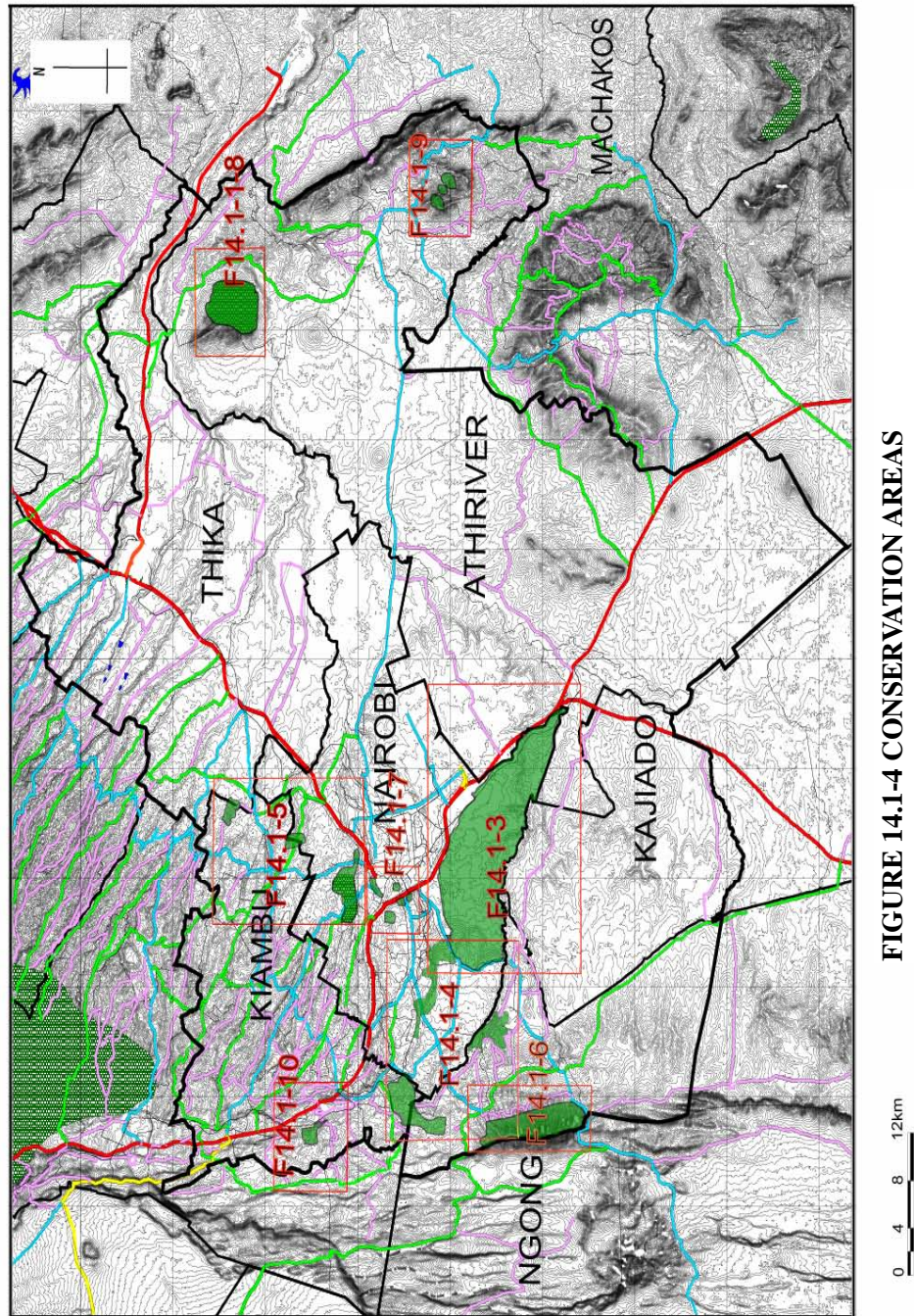


FIGURE 14.1-4 CONSERVATION AREAS

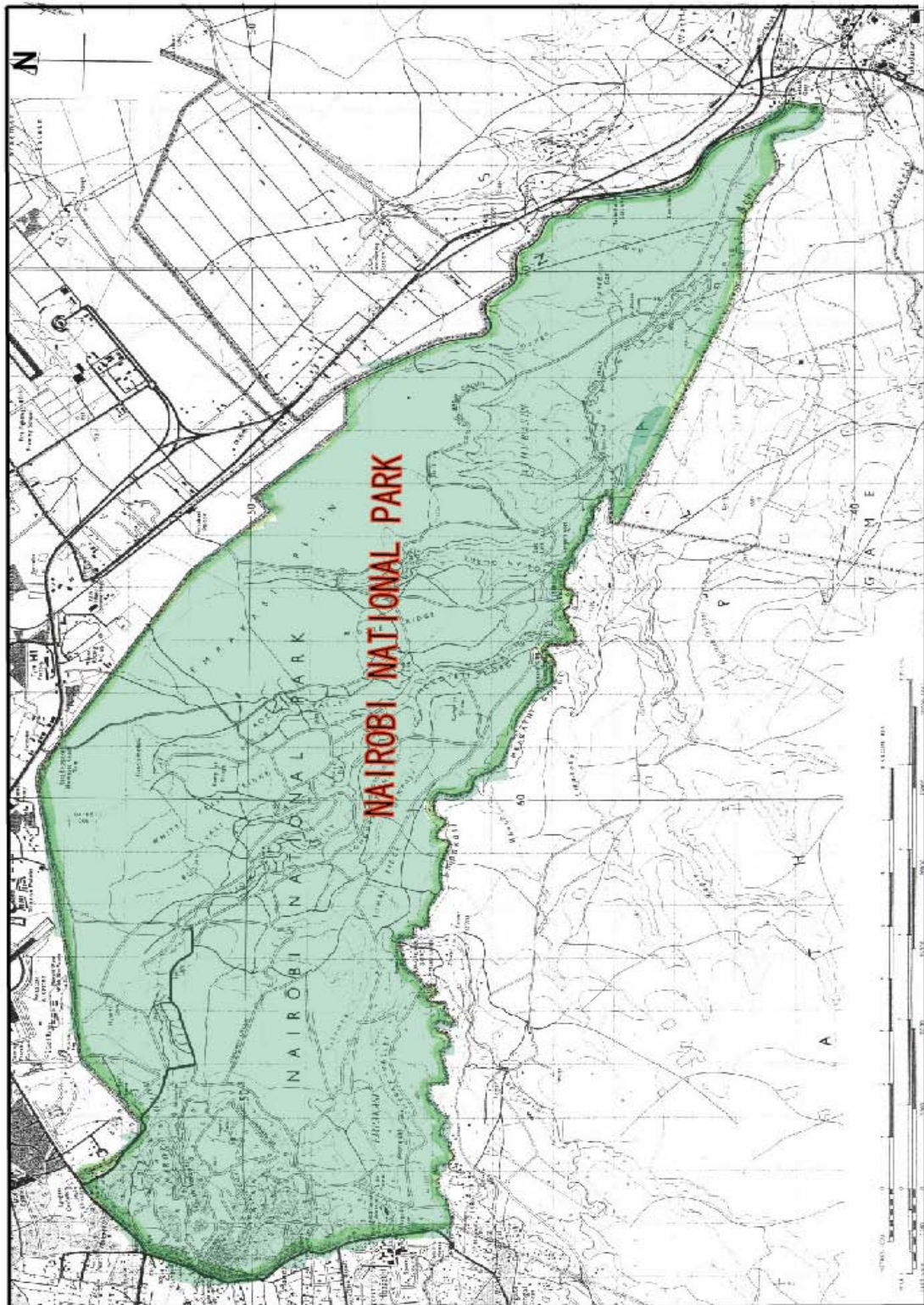


FIGURE 14.1-5 NAIROBI NATIONAL PARK

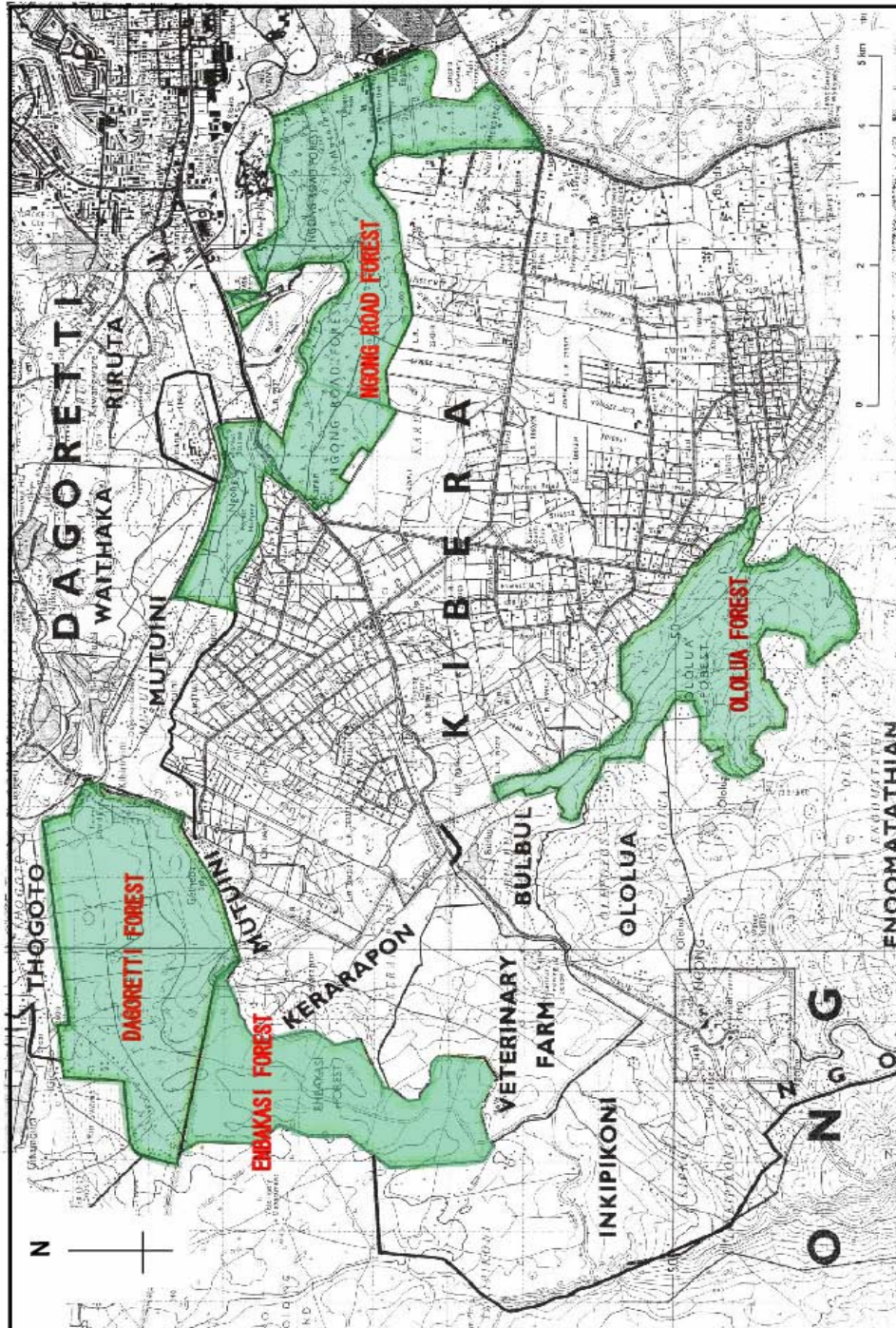


FIGURE 14.1-6 FOREST AREAS IN THE WEST OF STUDY ARE

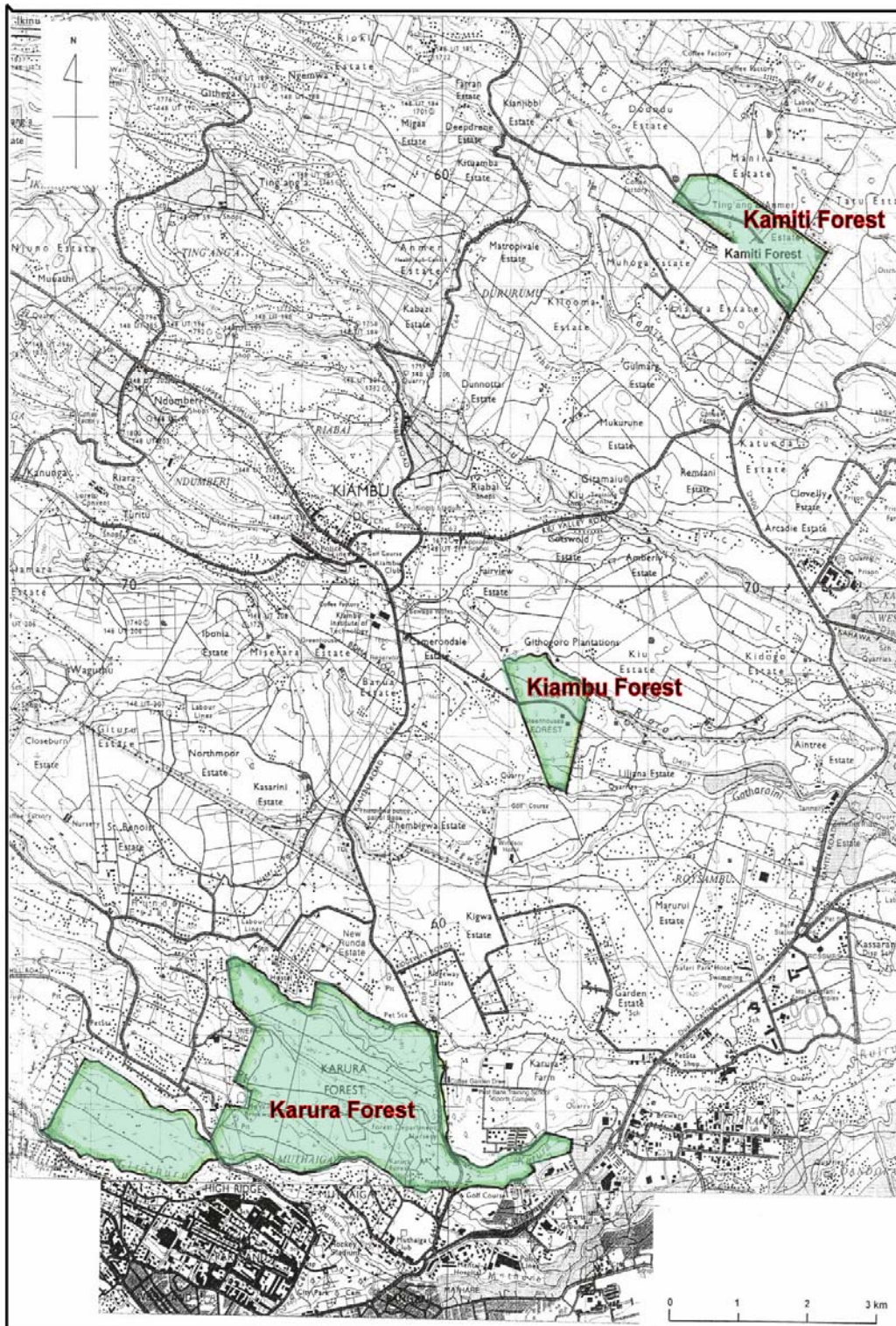


FIGURE 14.1-7 FOREST AREAS IN THE NORTH OF STUDY AREA

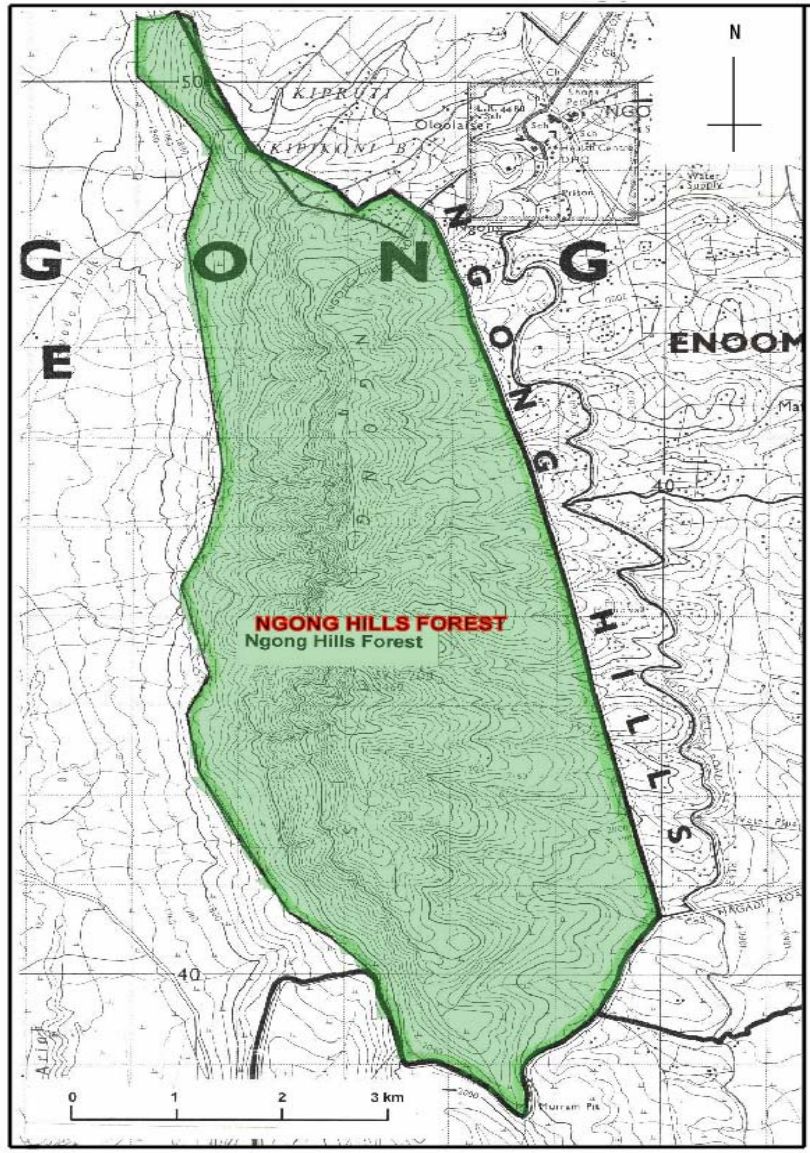


FIGURE 14.1-8 NGONG HILLS FOREST

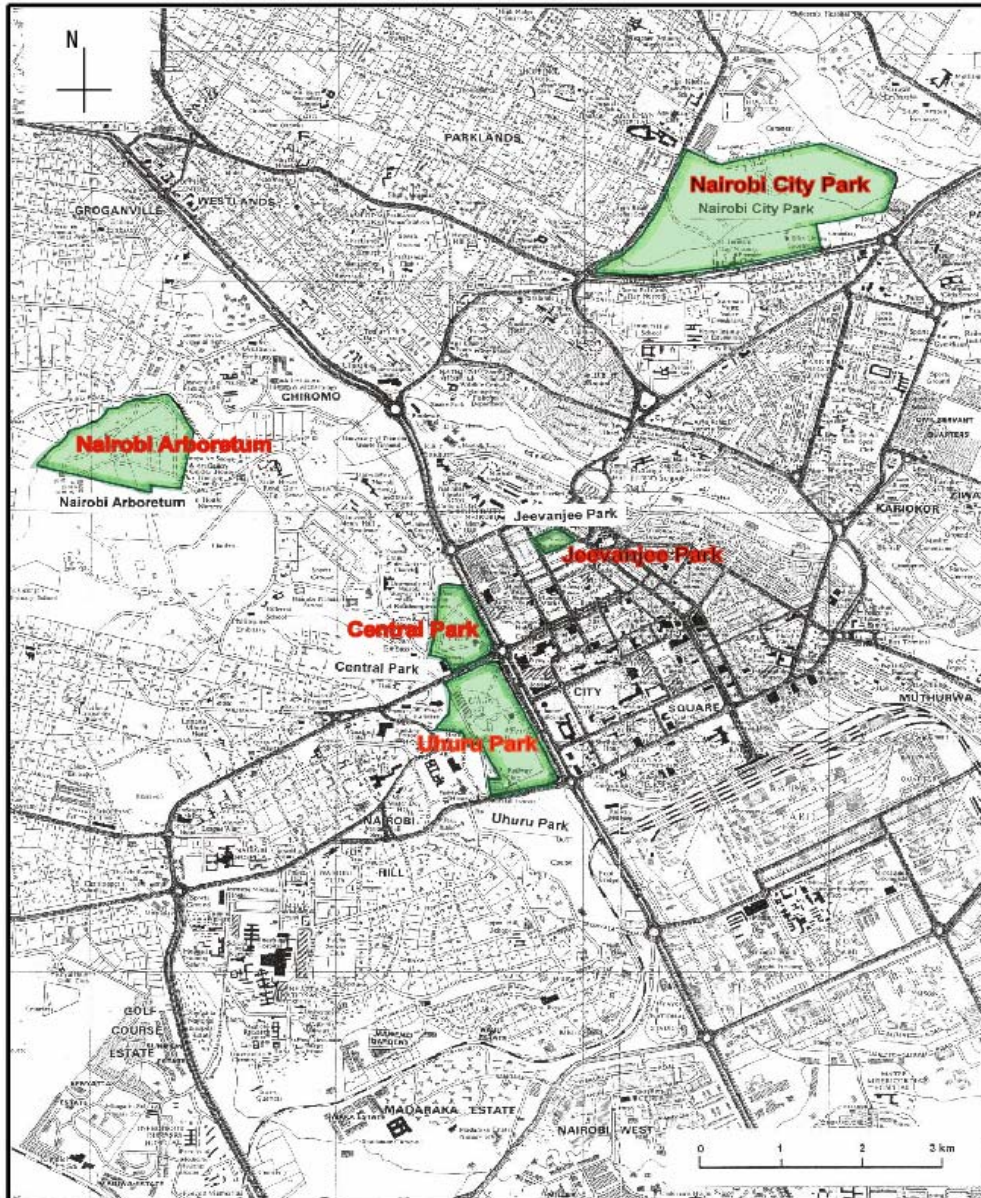


FIGURE 14.1-9 FOREST AREAS IN THE NORTH OF STUDY AREA

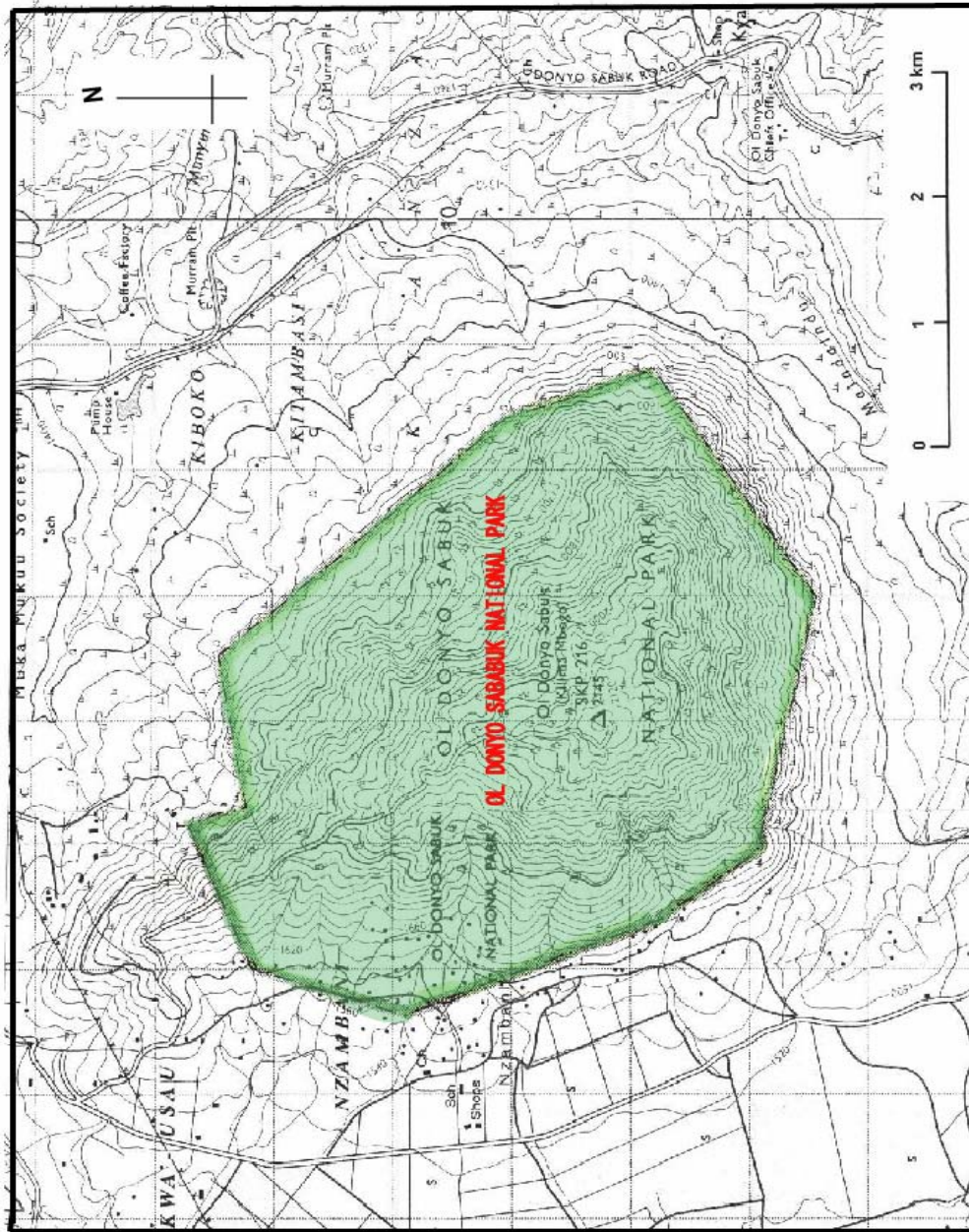


FIGURE 14.1-10 OL DONYO SABUK NATIONAL PARK

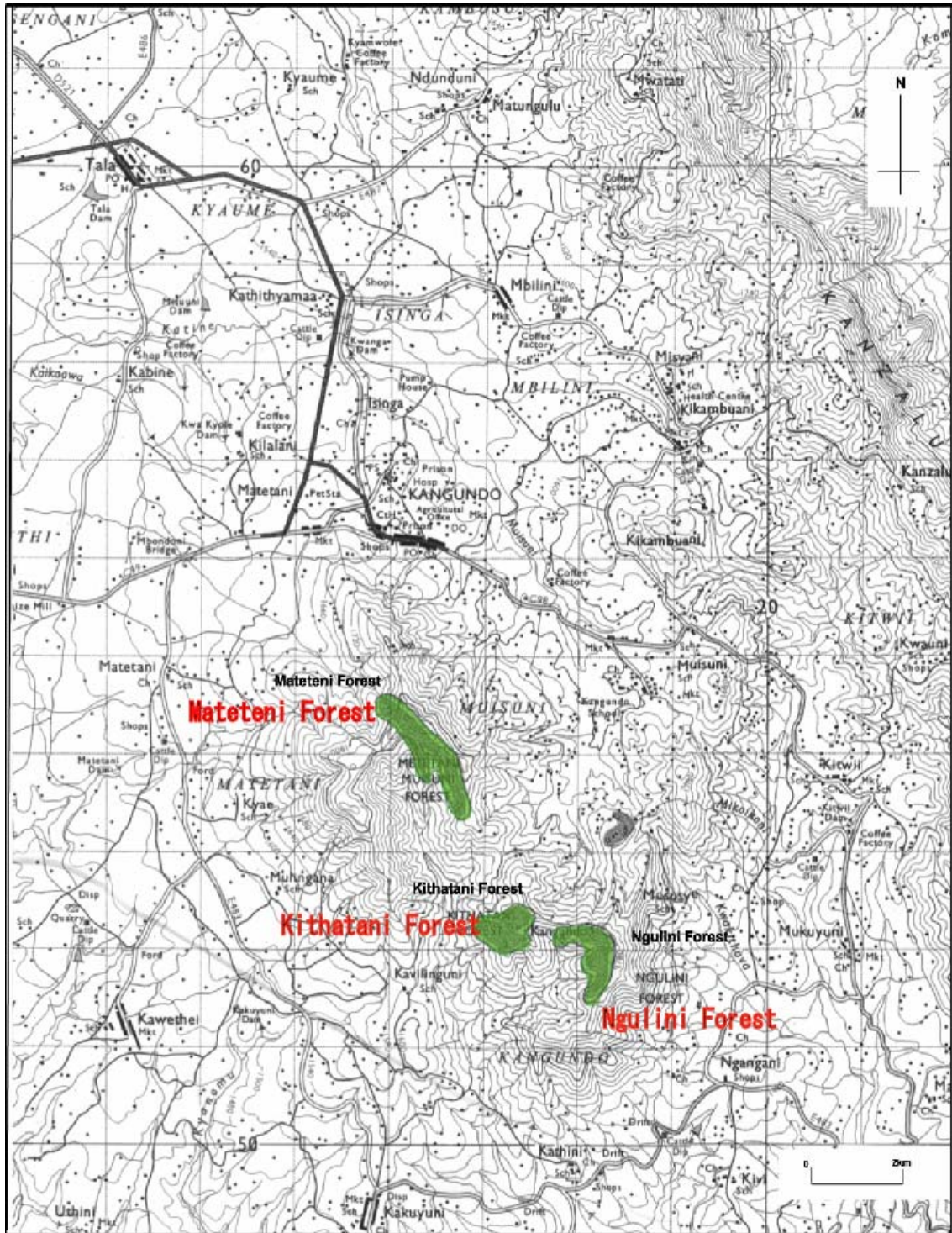


FIGURE 14.1-11 FOREST AREAS IN THE KANGUNDO

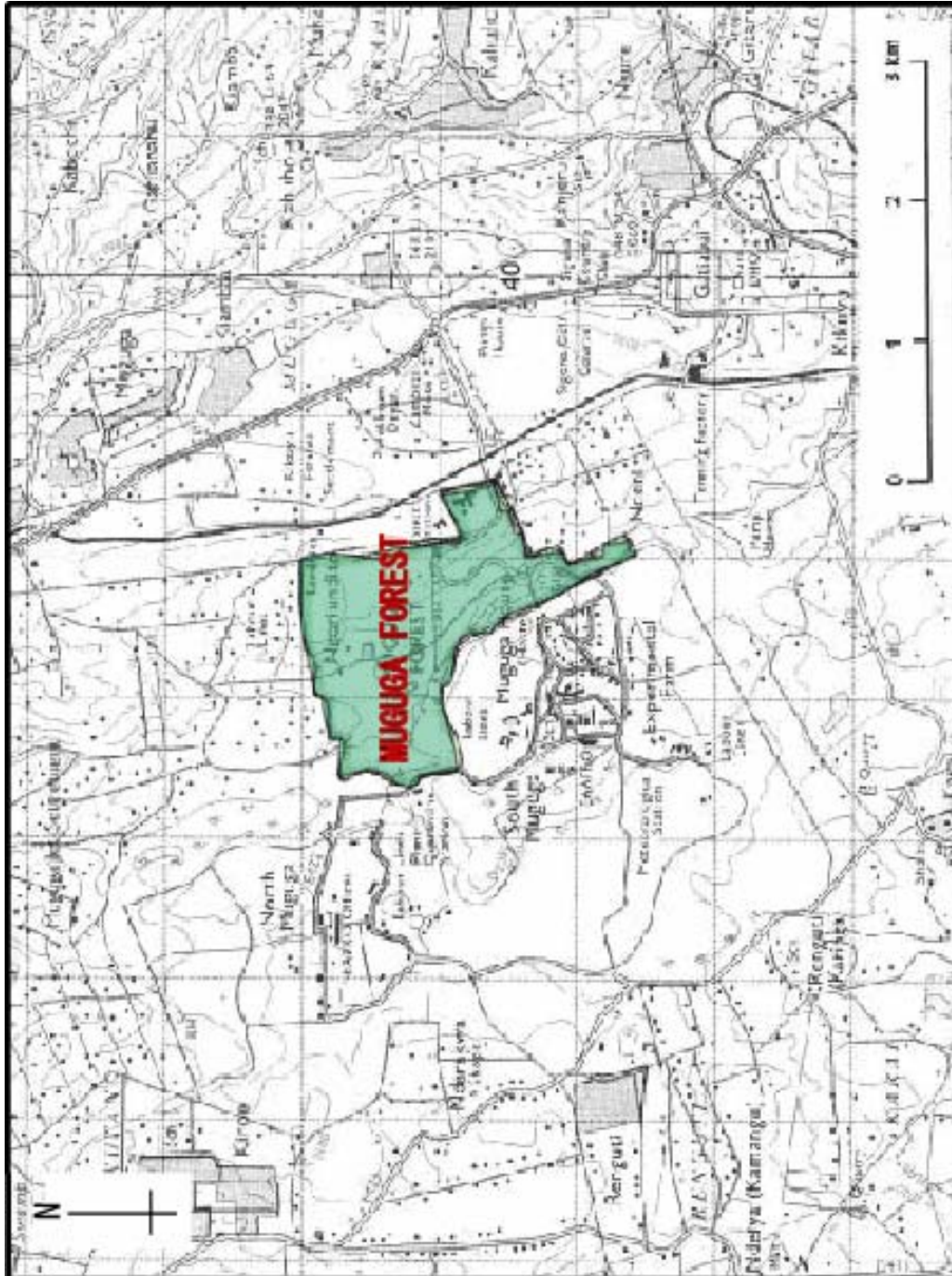


FIGURE 14.1-12 MUGUGA FOREST

14.2 SOCIAL ENVIRONMENT OF THE STUDY AREA

14.2.1 Housing Characteristics of the Study Area

In low income areas there is a mixture of make-shift iron sheets for roofing with mud, concrete blocks, sun-baked bricks, iron sheets, plunks, or plastic sheets for walls. Floor is usually soil, or concrete depending on the level of income. These houses appear to be concentrated in the areas generally to the south of Ngong Road, a few scattered spots among the high-income residential areas to the west of Uhuru Highway, often occupying road reserves. They are more concentrated in the area to the east of Uhuru Highway in general. Among them are the apartment buildings that middle income households can afford to stay. Table 14.2-1 shows numbers of households with roofing materials as indicator of the characteristics of housing conditions.

TABLE 14.2-1 HOUSING UNITS BY ROOFING MATERIALS IN NAIROBI

Roofing Materials	Number of Households	Percentage (%)
Iron sheets	434,542	66.91
Tiles	78,216	12.04
Concrete	107,477	16.55
Asbestos	21,640	3.33
Grass	455	0.07
Makuti	677	0.10
Tin(Flattened can)	3,005	0.46
Others	3,424	0.53
Total	649,426	100%

Table 14.2-1 shows that iron sheets, tiles and concrete combined are the most commonly used roofing material in the city of Nairobi. Other roofing materials such as asbestos, grass, makuti, tin and others take only 4.5% of the total roofing materials in the city. Iron sheets are the most commonly used roofing material. This is an indication of how much low income households are occupying in Nairobi's residential areas. In Table 14.2-2, numbers of households with roofing materials as indicator of the characteristics of housing conditions are shown.

TABLE 14.2-2 HOUSING UNITS BY WALL MATERIALS IN NAIROBI

Wall Material	Number of Households	Percentage (%)
Stone	267,022	41.12
Brick/Block	93,132	14.34
Mud/Wood	64,415	9.92
Mud / Cement	51,155	7.88
Wood Only	35,899	5.53
Iron Sheets	128,876	19.84
Grass/ Reeds	1,785	0.27
Tin	4,568	0.70
Other	2,574	0.40
Total	649,426	100

As above, the wall materials used by residents of Nairobi are stone followed by iron sheets. This is an indicator that the low-income and middle-income households are spending more money on the wall before they use roofing tiles as compared to the iron sheets as roofing material being the top of list in Table 14.2-1. This is further compared to the floor materials among the households of Nairobi as is shown in Table 14.2-3. Cement would mean soil ground is covered with mortar in many cases. Thus it indicates the characteristics of housing how many of them are low to medium-low income households.

TABLE 14.2-3 HOUSING UNITS BY FLOOR MATERIALS IN NAIROBI

Floor Material	Number Of Households	Percentage (%)
Cement	500,984	77.14
Tiles	33,905	5.22
Wood	13,124	2.02
Earth	99,550	15.33
Others	1,863	0.29
Total	649,426	100%

14.2.2 Drainage and Waste Management

Sewerage System and Effluent Management

Nairobi has in the recent past been hit by a surging and nagging problem of vast amounts of solid waste and liquid wastes that are generated and dumped into the environment untreated due to poor treatment works. Unplanned development of small-scale enterprises known as Jua Kali Project has increased discharge of pollutants including petroleum product wastes into the rivers.

In Nairobi, industrial effluents are discharged from food, textiles, paper, petroleum, and chemical industries. In slum areas such as Mauro, Oronoco, Mathare, Vicarage and a host of other isolated shanty town in the city, cholera, typhoid and dysentery have been known to intermittently breakout because of poor disposal of wastes that lead to germ development and spread to other areas.

The legislations relating to effluent management are contained in the Water Act, the Public Health Act, the Pest Control Products Act, the Radiation Protection Act, the Mining Act and the Factories and Other Places of Work Act. Some of the constraints to effective solid waste management include lack of discharge standards and methods of measuring the quality of effluents. The lack of adequate sewerage network and treatment facility, and the lack of incentives to adopt recycling technologies are also contributing to the poor management of industrial effluent. Wastewater management is not widely adopted by the industries in Nairobi because of the high cost involved in it. Thus achievement of high productivity of industrial sector is the key to the management in treatment of industrial effluent.

Solid Waste Management

Quantities of wastes that are collected in Nairobi have shown a downward trend during the last 25 years according to the National Environmental Action Plan. In 1973, generated refuse in the city was 165,222 tonnes of which 162,429 tonnes were collected by the city council. This represented a collection of 98.32%. The percentage of solid garbage pile-up continued increasing in Nairobi over the years and had risen to 79 percent in 1988. Of all the 365,675 tonnes of refuse that was generated in Nairobi. In 1998 only 78,785 tonnes was collected by the city council, leaving out 190,000 tonnes of the city to pose a health threat to the city residents.

Solid waste disposed off in open dumps, crude sanitary landfills pose health ailment to the low-income households in Nairobi comparing to the incineration. In low-income areas of Nairobi, solid waster collection is very poor where the commonest mode of disposal is dumping along streets, vacant fields or between houses and any other areas not occupied by humans. The only waste disposal site of Nairobi is located in Dandora, which is already filled in to its capacity.

Thus infrastructure requirements for both transportation and disposal of sewage are the environmental concern in Nairobi. There is a need to develop a comprehensive policy and appropriate legislation to cater for Nairobi's sanitation and public health.

14.2.3 Gender and Household Headship

Most male-headed households comprised three or less persons, as are female-headed ones as is shown in Table 14.2-4. Most households lived in rented houses. About three-quarters of all households headed by women use firewood, while those headed by males predominantly use firewood, charcoal and paraffin as shown in Table 14.2-5. About 57% of the male population aged 12 years and above are married compared to 48.5% of females as shown in Table 14.2-6.

TABLE 14.2-4A HOUSEHOLD SIZE OF MALE HEADED AND FEMALE-HEADED IN NAIROBI

Family Size	Male Headed				Female Headed			
	1-3	4-6	7-9	10<	1-3	4-6	7-9	10<
Percentage (%)	63.6	28.3	6.8	1.3	62.1	29.9	6.6	1.4

TABLE 14.2-4B PERCENTAGE DISTRIBUTION OF HOUSEHOLD HEAD STATUS IN NAIROBI.

Status of tenure	Female headed	Male headed
Owner occupied	19.2	17.5
Rented	80.8	82.5

TABLE 14.2.5 DISTRIBUTION OF HOUSEHOLDS BY TYPE OF COOKING FUEL AND GENDER OF HOUSEHOLD HEAD.

Type of cooking fuel	Female Headed	Male Headed
Electricity/Gas	2.9	16.3
Paraffin/ charcoal	21.5	80.6
Firewood	74.9	63.7

TABLE 14.2.6 MARITAL STATUS OF POPULATION AGED 12 AND ABOVE BY GENDER IN NAIROBI

Marital status	Male (%)	Female (%)
Single	41	46.4
Married	57	48.5
Widowed	0.4	2.2
Divorced/Separated	0.8	2.9

14.2.4 Public Health

Morbidity in 1998, 1999 and 2000 are presented in Table 14.2-7 and in Figure 14.2-1. Respiratory diseases and malaria are the two most prevalent diseases. Accidents are another significant health problem followed by infections and diarrhoea. In 1999 and 2000 accident cases increased to 41,151 and 37,177 respectively taking the 3rd position in both years. Mortality rates for children are shown in Table 14.2-8.

TABLE 14.2-7 TEN MAJOR CAUSES OF MORTALITY IN NAIROBI (1998- 2000):

	1998	1999 (Average report rate 9%)		2000 (for Nairobi average report rate not indicated)	
1	Respiratory symptoms (161,765)	1	Diseases of respiratory systems (79,123)	1	Diseases of Respiratory symptoms (135,225)
2	Malaria (100,362)	2	Malaria (54,436)	2	Malaria (84,225)
3	Skin disease (62,389)	3	Accidents (41,151)	3	Accidents (37,177)
4	Diarrhoea (40,365)	4	Ear infections (27,129)	4	Diarrhea (35,177)
5	Urinary tract disease (20,362)	5	Diarrhoea (24,247)	5	Ear infections (31,040)
6	Intestinal Worms (18,542)	6	Eye infections (23,187)	6	Skin disease (28,392)
7	Disease of puerperium and childbirth (17,562)	7	Disease of puerpenum and child birth (21,108)	7	Eye infections (24,785)
8	Eye infections (14,786)	8	Skin disease (19,190)	8	Urinary tract infection (21,975)
9	Pneumonia (18,089)	9	Pneumonia (18,349)	9	Pneumonia (20,747)
10	Disease of circulatory system (17,001)	10	Disease of circulatory system (17,380)	10	Disease of circulatory system (20,312)

Source: Statistical abstract (CBS, 2003 pg. 233-238)

TABLE 14.2-8 EARLY CHILDHOOD MORTALITY RATES IN NAIROBI

NM	PNM	IM	CM	UFM
32	35	67	30	95

Note: NM – Neonatal Mortality, PNM– Post Neo Natal Mortality, IM- Infant Mortality, CM - Child Mortality (491), UFM- Under -Five Mortality

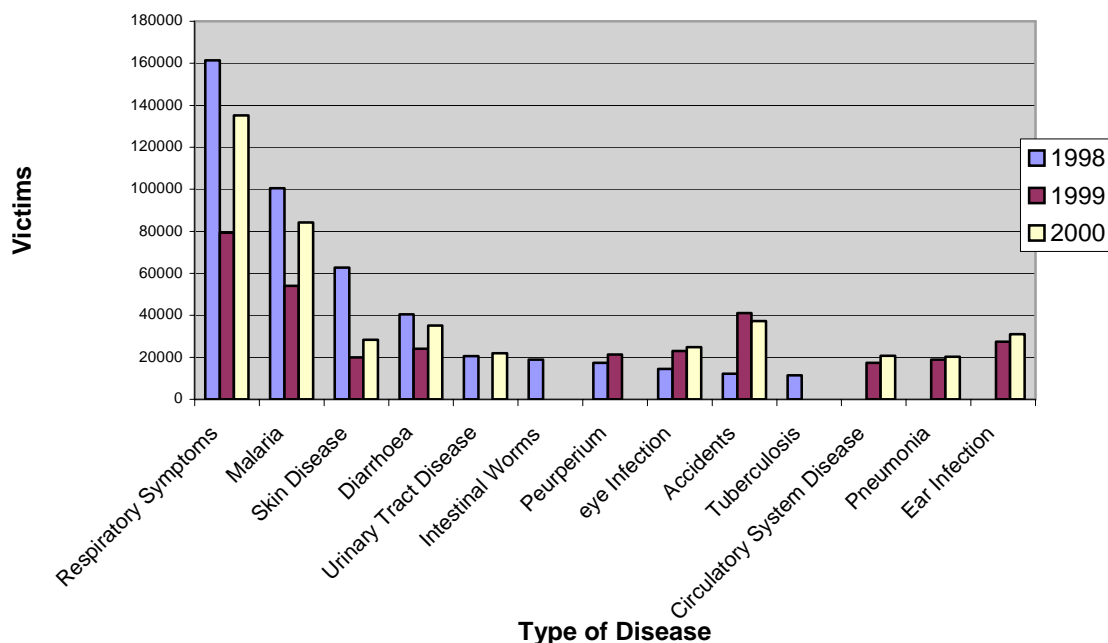


FIGURE 14.2-1 TRENDS IN MORBIDITY FOR 1998,1999,2000

14.2.5 Education

Education is an important indicator of available skills and knowledge within a population or community. Table 14.2-9, 14.2-10 and Figure 14.2-2 show school attendance among the population of Nairobi from pre-school to secondary school level. There is a clear indication that the present young population do not attend schools and non-attendance of schools by female are on the increase.

TABLE 14.2-9A PRIMARY SCHOOL ENROLMENT IN NAIROBI CITY
(1997-2002)

Year	1997	1998	1999	2000	2001	2002
No. Of Pupils	153,640	155,834	159,897	164,289	171,231	193,298

Source: Statistical Abstract 2003

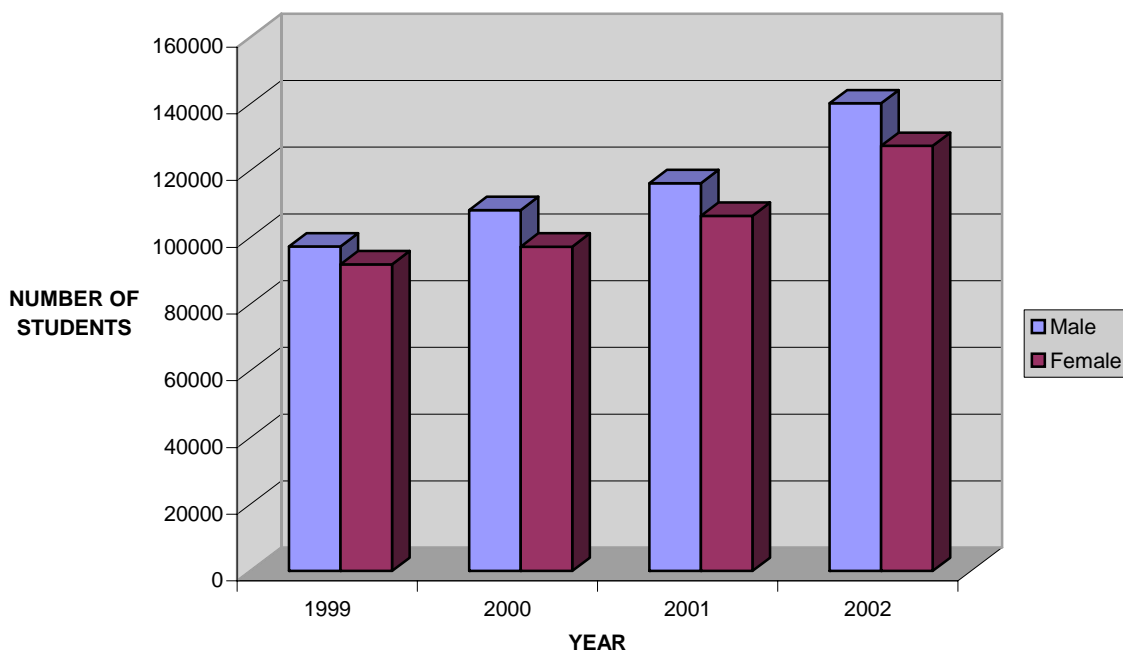
TABLE 14.2-9B SECONDARY SCHOOL ENROLMENT IN NAIROBI CITY

YEAR	1999		2000		2001		2002	
Gender	M	F	M	F	M	F	M	F
No. Of Pupils	97,231	91,888	108,116	97,196	116,174	106,425	140,145	127,367

TABLE 14.2-10 POPULATION BY GENDER, 10-YEAR AGE GROUPS AND SCHOOL ATTENDANCE

Age groups in years Gender	At school	Left school	Not started/never attended
5-10			
Male	144384	12279	19991
Female	149483	17106	22366
15-24			
Male	57819	186608	12558
Female	54860	218979	16033
25-34			
Male	7503	269210	11739
Female	4220	188661	10989
35-44			
Male	2226	134726	6219
Female	1312	74289	8412
45-54			
Male	877	65611	5275
Female	452	28234	6710
55+			
Male	631	26430	10199
Female	580	12306	13525
Age n/a			
Male	65	543	149
Female	77	399	151

Source: 1999 Population Census, CBS Vol. II (2001)

**FIGURE 14.2-2 TRENDS OF SECONDARY SCHOOL ENROLMENT BY GENDER IN THE CITY OF NAIROBI (1999-2002)**

14.2.5 Income and Employment

Over the last one decade the job creation rate in the informal sector, including the low income Jua kali sub-sector, has almost trebled that of the formal sector. Significantly, combined formal and informal sector employment growth in Nairobi during 1989-1997 was 2.3% per annum, less than half that of the rate of population growth.

The main formal employment zones in Nairobi are the Central Business District and the Industrial Area, along Jogoo/Mombasa road, Ruaraka/Thika road and Dandora. Although there have been efforts to de-centralize employment concentration from the central areas to satellite centres, the CBD and the central industrial area (Jogoo/Mombasa road) still remain the core employment zones. It is for this reason that the city is often described as being a mono-polar centre. It is estimated that 45-59% of Nairobi's labour force work in informal sector whose activities spread throughout the city. The sector continues to play an important role in the Kenyan economy by providing job opportunities. Informal employment in the Nairobi metropolitan areas was 896,000, 998,900, 1,114,000, 1,228,700 and 1,343,100 in the year 1999, 2000, 2001, 2002 and 2003 respectively.

Additionally, about 20-30% of the adult population was engaged in some crop and animal husbandry within Nairobi [Freeman 1991, Mboganie-Mwangie and Foeken 1996]. Plots tend to be extremely small averaging 13 square meters, significantly smaller than agricultural plots in other Kenyan cities. Many cultivate in backyard gardens, but large numbers simply farm on vacant land, especially road railway reserves and drainage ditches. Such cultivation is in fact illegal, but nonetheless has gained significance over the last two decades. Women are most prevalent in the cultivation work. The desire to farm is both culturally and economically inspired; seen as a productive form of physical exercise that many middle class people enjoy, and as a vital supplement to household income in poor households.

All definitions and indices indicate that poverty in Nairobi sharply increased during 1994-1997. The overall absolute urban poverty level in Kenya has increased from 29% in 1994 to 49.2% of the population in 1997, an increase of 20.3 percentage points. Nairobi had 51% of its population living in absolute poverty in 1997. Furthermore, in 1992 the bottom 40% of the population in Kenya had only 11.1%, and the bottom 60% and only 20.8% of the income or consumption. In contrast the top 10% consumed almost 48% of the income or consumption. Thus, because of its very unequal income distribution a significant proportion of population is not very much better off than those living in absolute poverty. It seems clear that in Nairobi poverty is not the condition of a minority or even sizable pockets of the population. It is quite simply a city dominated by the number, but not the influence of the poor.

14.2.6 Views of the People in Nairobi on the Traffic Issues

(1) Unpaved road shoulders:

These are not well protected. This inhibits vehicles from pulling off the road safely. Thus, the road spaces are used as bus stops or parking areas. This contributes to the slowing down or stoppage of the ongoing traffic that causes further traffic congestion.

(2) Outdated roads designs:

Most of the roads in Nairobi were designed during the colonial Era and no major modifications have taken place since then to take care of the increased number of motor vehicles and population. Such concerns are of the size of the roads e.g. Ngong Road that is very narrow and roundabouts that are no longer effectively functional especially in the absence of traffic policemen.

(3) Small bus stops:

Bus-stops are too small to accommodate full lengths of buses when they pull off the road to drop or pick passengers. As such, an excessive number of buses and matatus are parked on the side of the road. This consequently contributes to traffic congestion.

(4) Inadequate pedestrian facilities:

In most road intersections pedestrian crossing ways and traffic signals as well as pedestrian bridges should be provided. One of the examples is the intersection of Lang'ata and Mbagathi Road largely ignoring the safety of pedestrians. However, it has lately been observed that the City Communities have started paying attention to some road issues. An example is the Nakumatt chain of Stores who have included provision of pedestrian facilities at the Dagorretti corner roundabout at the junction of Ngong Road and Naivasha Road. In a few sections there are safe pedestrian walkways protected from vehicle encroachment.

(5) Lack of sidewalk:

Except for very few places within Nairobi, such as the area around State House and Kenyatta Avenue, Dagorretti roundabout, there are no sidewalks exist for the pedestrians in most parts of the city. This leaves the pedestrians sharing the road space with motorists, which is dangerous. Sidewalks should be wide enough for a lot of people comfortably and safely walk with joy. It should also provide areas for street activities not only for selling things at a number of kiosks but also for cultural activities. Further, malfunction of the drainage system in the city causing flooding. When it rains the flooding is so serious that some vehicles stall in the middle of the road causing serious traffic jams.

(6) No provision for parking outside the CBD:

Currently all motorists are allowed to drive to city or through it. There is no provision of convenient and safe parking outside the city. This resulted to traffic congestion as motorists rush in and out of town in the morning and evening.

(7) Encroachment by non-motorised transport systems:

Bicycles and man-driven carts also compete for road space. This is a contributor to traffic congestion in addition to endangering human life, as accidents are likely to occur when being overtaken by motorists.

(8) Insecurity:

City of Nairobi is very unsafe especially at night due to lack and or absence of street lighting, which contribute a great deal to this insecurity. Insecurity has also been cited as a cause of traffic congestion especially in the evenings because motorists rush to be at their homes before dark to avoid attacks by gangsters at night. In safer situations, people would generally work late in their offices. This would greatly reduce the traffic congestion.

(9) Railway

The Mombasa train that passes through the city environs carries people to and from the city on its way to from Mombasa. Another Kisumu bound train carry people from or to Kikuyu on its way from or to Kisumu. There are no trains that serve the city commuters per se.

(10) Non-motorized transport:

The most prevalent non-motorized transport modes in East and central Africa are walking, cycling and handcarts. In the city of Nairobi this transport system includes the handcarts, commonly known as mkokoteni, bicycles, wheel chairs and walking. During this study the authors noticed a large population of handcarts (mikokoten) within the city centre. These are largely means of transporting goods from the famous farmers market commonly known as “marigiti” on Haile Sellassie Avenue, and from other smaller ones like Hawkers Market on Limuru Road. They are also seen ferrying goods of one kind or the other within the central business district.

The mkokoteni are mainly for transporting goods while bicycles in Nairobi are usually one-man transport system unlike in other cities for example Kisumu where they are used like “taxis”. Wheel chairs used by physically handicapped are also common in the city. Walking is also a common mode of transport especially for the working poor who cannot

afford fare to their working places. In the morning and evening long queues of walking workers to and from industrial area are very conspicuous along the main roads of the city.

Handcarts have two important functions as a source of employment and as means of transport for personal or occupational reasons. In Nairobi 65% of handcarts serve the main central markets, 24% a round bus terminus and the remaining 12% on the streets.

It is worth noting that all the non-motorized transport system competes for space with the motorized transport system. Since they are pushed and pulled by man, they move at a very slow speed hence causing traffic congestion because they compete for road space with vehicles since there is in no provision for non-motorized transport in this city. Non-motorized transport needs to be taken into consideration in planning to increase the mobility levels of the majority of rising urban populations as follows:

- a) Improvement of urban traffic management and infrastructure facility.
- b) A change of the transport user attitudes towards non- motorised transport
- c) More research in non-motorised transport which is scarcely documented.

14.3 LIST OF INVITATION

TABLE 14.3-I (1/5) LIST OF INVITATION

No.	Code	Organization Name	Representative Name	Sex	Occupation	Contact Address					Street	Comment
						Telephone	Facsimile	E-Mail	P.O.Box	Building		
1	CG	MRPW	Mr. Kirinya Mukira	M	PS	2723101			30260-00100 Nairobi			
2	CG	MRPW	Eng. F. G. Ngachu	M	PSE (D)	2723101			30260-00100 Nairobi			
3	CG	MRPW	Eng. S. M. Ngare	M	CSE (D)	2723101		simngare@roadsnet.go.ke	30260-00100 Nairobi			
4	CG	MRPW	Eng. P. Amiani	M	Engineer	2723101			30260-00100 Nairobi			
5	CG	MRPW	Mrs. E. Mbey	F	Environmentalist	2723101			30260-00100 Nairobi			
6	CG	MRPW	Ms Regina Ombam	F	Economist	2723101			30260-00100 Nairobi			
7	CG	MRPW	Mr. Kimani	M	Economist	2723101			30260-00100 Nairobi			
8	CG	MRPW	Eng. Chere	M	Engineer	2723101			30260-00100 Nairobi			
9	CG	MRPW	Eng. C. F. Kiranga	M	Engineer-in-Chief	2723101			30260-00100 Nairobi			
10	CG	MRPW	Eng. J.N. Nkadyo	M	Principal Superintendent Engineer (Planning)	2723101			30260-00100 Nairobi			
11	CG	MRPW	Eng. P. M. Muzi	M	Chief Superintendent Engineer (Construction)	2723101			30260-00100 Nairobi			
12	CG	MRPW	Eng. L.K. Tonui	M	Head, Road Works Inspectorate	2723101			30260-00100 Nairobi			
13	CG	MRPW	Eng. H.M. Gakuo	M	Chief Superintendent Engineer (Planning)	2723101			30260-00100 Nairobi			
14	CG	MRPW	Eng. F.D. Karenja	M	Chief Superintendent Engineer (Maintenance)	2723101			30260-00100 Nairobi			
15	CG	MRPW	Eng. M. O. Bajaber	M	Chief Superintendent Engineer (Bridge)	2723101			30260-00100 Nairobi			
16	CG	MRPW	Eng. G. M. Kiru	M	Senior Superintendent Engineer (Design)	2723101			30260-00100 Nairobi			
17	CG	MRPW	Mr. Z. O. Ogonjo	M	Permanent Secretary	230031			30004 Nairobi			
18	CG	WOLG	Eng. B. G. Ariga	M	Director	230031			30004 Nairobi			
19	CG	WOLG	Eng. N. N. Nyanki	M	AD	230031			30004 Nairobi			
20	CG	WOLG	Eng. J. W. Theuri	M	Engineer	230031			30004 Nairobi			
21	CG	WOLG	Eng. Muriini	M	Engineer	230031			30004 Nairobi			
22	CG	NCC	Dick Wathika	M	Mayor	230031			30004 Nairobi			
23	CG	NCC	John Gakuo	M	Town Clerk	230031			30004 Nairobi			
24	CG	NCC	Eng. C.M. Chiuri	M	City Engineer	224281			30075-00100 Nairobi			
25	CG	NCC	Eng. S. K. Mburu	M	DCE	224281			30075-00100 Nairobi			
26	CG	NCC	Mr. Ndereva	M	City Planner	224281			30075-00100 Nairobi			
27	CG	NCC	Mr. J. K. Mbareh	M		224281			30075-00100 Nairobi			
28	CG	NCC	Eng. John Mwangi	M	Engineer	224281			30075-00100 Nairobi			
29	CG	NCC	Mr. G. M. Waitua	M	Engineer	224281			30075-00100 Nairobi			
30	CG	MLSH	Eng. E. K. Mwangera	M	PS	272-9800			30450 Nairobi			
31	CG	MLSH	Mr. T. Naborongo	M	Planner	272-9800			30450 Nairobi			
32	CG	MLSH	Mr. J. K. Oguya	M	Planner	272-9800			30450 Nairobi			

TABLE 14.3-I (2/5) LIST OF INVITATION

No.	Code	Organization Name	Representative Name	Sex	Occupation	Contact Address				Street	Comment
						Telephone	Facsimile	E-Mail	P.O.Box		
33	CG	MENR	Mrs. Rachel Arunga	F	PS	2724543			49720 Nairobi		
34	CG	MENR	Mr. E. F. Oiyuna	M		2714543			49720 Nairobi		
35	CG	MOF	Mr. Joseph Kinyua	M	PS	338111			30007 Nairobi		
36	CG	MOF	Ms. A. Oluibendi	F		338111			30007 Nairobi		
37	CG	MOF	Ms. S. Kiambati	F		338111			30007 Nairobi		
38	CG	MOT	Mr. Gerrishon Njara	M	PS	2729200			52692 Nairobi		
39	CG	MOT	Mr. A. M. Kiblo	M	Economist	2729200			52692 Nairobi		
40	CG	Min. of Planning and National Development			Permanent Secretary	338111			30007 Nairobi		
41	CG	MOTW			Permanent Secretary	333555/313010			30027 Nairobi		
42	CG	KRB	Eng. I. K. W. Mutonyi	M	Exc. Director	2722865			73718-00100 Nairobi		
43	CG	KRB	Dr. S. N. Nyangaga	M	GM	2722865			73718-00100 Nairobi		
44	CG	KRB	Eng. S. K. Kamau	M	Engineer	2722865			73718-00100 Nairobi		
45	CG	KRB	Eng. Kihumba	M	Engineer	2722865			73718-00100 Nairobi		
46	CG	KRB	Mr. Eric Goss	M	R2000 Technical Advisor			eric@kroadsboard.go.ke	73718-00100 Nairobi		I wish to participate both in my professional capacity and in the capacity as a resident of Nairobi
47	CG	NEMA	Prof. Ralemo W. Mchicha	M	Director General	605522		gdnema@swiftkenya.com	67839 Nairobi		
48	CG	NEMA	Mr. Mbegera	M	Dir. Planning	605522			67839 Nairobi		
49	CG	Traffic Police	Ins. Stephen Oduor	M	Road Safety	0733-901939					
50	CG	Kenya Wildlife Service	Dr. Imre Loeffler	M	Chairman	602345		kws@kws.com	40241-00100 Nairobi		
51	LG	Central Province	Mr. Peter Raburu	M	Provincial Commissioner						
52	LG	Thika Municipality	Mr. Peter Kibinda	M	Town Planner	0722-788044			240 Thika		
53	LG	Thika Municipality	Mr. Aluanga	M	Town Engineer	0721-601772			240 Thika		
54	LG	Limuru Municipality	Ms. Esther Mbugua	F	Town Engineer	0733-7488896			281 Limuru		
55	LG	Mavoko Municipality	Eng. Mugambi	M	Town Engineer	0720-785736			11 Athi River		
56	LG	Mavoko Municipality	Mr. Gideon M. Mundi	M	Town Clerk	0733-754718			11 Athi River		
57	LG	Kajiado Town Council	Mr. Muturi	M	Council Eng.	0721-885482			94 Kajiado		
58	LG	Kajiado Town Council	Mr. Abdi	M	County Clerk	0721-570570			94 Kajiado		
59	LG	Kangundo Town Council	Mr. Kuria	M	Town Clerk	0733-822556			56 Tala		
60	LG	Kangundo Town Council	Mr. David Mubinda Kyalo	M	Town Surveyor	0734-415651			56 Tala		
61	PA	Kenya Railways	Mr. James Kimuyu	M	Economist	340049			30121-00100 Nairobi		
62	PA	Kenya Bus Services			Director	229707 / 210227	240939		41001-00100 Nairobi		
63	CSO	National Road Safety Organization			Director						
64	INS	Kenya Institute for Public Policy Research & Analysis	Dr. Eric Maggolo AUGULA			2719833-4			56445 Nairobi		

TABLE 14.3-1 (3/5) LIST OF INVITATION

No.	Code	Organization Name	Representative Name	Sex	Occupation	Contact Address					Comment	
						Telephone	Facsimile	E-Mail	P.O.Box	Building		Street
65	IO	UNEP			Director	520230						
66	IO	UNDP			Director	621234	624489	fo.ken@undp.org				
67	IO	UN Habitat	Mr. Brian Williams	M	Urban Communities Officer and Technical Coordinator, Land and Tenure Section, Shelter Branch	623916	623588	brian.williams@unhabitat.org	P.O. Box 30030-00100 Nairobi			
68	IO	UN Habitat	Mr. Ulrik Westman	M	Land and Tenure Section, Shelter Branch	62 31 16	62 34 43	ulrik.westman@unhabitat.org	P.O. Box 30030-00100 Nairobi			
69	IO	World Bank	Mr. Josphat Sasia	M		3226000						
70	IO	European Union	Mr. Andrew Gbonga	M		2713020						
71	IO	USAID			Director	570706/570775						
72	IO	CIDA			Director	581200/581144	581278		63005 Nairobi			
73	IO	SIDA			Director							
74	IO	GTZ			Director	275524						
75	IO	JICA	Mr. Y. Kano	M	Resident Representative	2724121/2/3/4	2718202		59572-00200 Nairobi	Rahimulia Tower 10th & 11th Floor		
76	IO	JICA	Mr. J. Inamura	M	Deputy Resident Representative	2724121/2/3/4	2718202		59572-00200 Nairobi	Rahimulia Tower 10th & 11th Floor		
77	NGO	Intermediate Technology Development Group (ITDG)	Ms. Rahab Mundara	F	Representative	020-271-3540, C/P-0722-823158		itdnea@itd.org	39493-00623 Nairobi	AAAYMCA		
78	CSO	Matatu Welfare Association	Mr. Mbugua	M	Chairman	0722-870996			8337-00100 Nairobi	Development Hse 10th Fl.		
79	CSO	Matatu Welfare Association	Mr. Waweru	M	Secretary	0722-891814			8337-00100 Nairobi	Development Hse 10th Fl.		
80	CSO	Automobile Association of Kenya			Chairman	825060						
81	CSO	Nairobi CBD Association			Chairman	219412	340296	nbcda@africaonline.co.ke		International Life Hse 5th Fl		
82	NGO	National Organization of NGOs			Secretary	574657	574655					
83	CSO	Central Organization of Trade Unions	Mr. Atwoli	M	Secretary	761375/7						
84	CSO	Kenya Private Sector Advisory Group			Chairman							
85	CSO	Kenya Association of Manufacturers			Chairman	3746005/21	3746028/746030	kam@icconnect.co.ke	30225-00100 Nairobi			
86	CSO	Kenya Association of Tour Operators			Chairman	2713348/86	2719226	info@katokenya.org	48461-00100 Nairobi			
87	IO	German Development Service	Mr. Samuel Muthui Ikima	M	Transport & Logistics Of.		564041	ikimamuthui@yahoo.com	47136 Nairobi			A good opportunity to contribute towards a better service in the sector.
88	INS	JKUAT/ICAD	Dr. Josphat K. Z. Mwatelah	M	Lecturer / Administrator	067-52059		mwatelah@aicad.or.ke	46179-00100 Nairobi			Conducted research in the field of transportation planning in Nairobi.
89	CSO	Commuters Welfare Association	Mr. Robert Nzioki	M	Executive Director	020-316965	020-316965		41162-00100 Nairobi	Coffee Plaza		We most sincerely thank you for the study you are carrying out and wish to inform you that we are ready to make our contribution in the study as soon as you request stakeholders to do so.
90	CSO	Inter Religious Council of Kenya	Mr. Said Ahman	M	Employee		561397	gednac@justice.com	16910-00100 Nairobi			Concerned on impact of the project to social economic lives of Nairobians.
91	CSO	Inter Religious Council of Kenya	Ms. Gamaria Ali	F	Employee		561397	interreligiouscouncilkenya@today.co.ke	56352-00100 Nairobi			Need to contribute to how to enhance project objectives to city residents.
92	CSO	Institute of Engineers of Kenya Association for Safe International Road Travel	Eng. C.M. Ndonga	M	Consultant Engineer	219225/242011 0722-527277	020-218418	ndonga@kenyaweb.com	54400-00100 Nairobi	Hughes building		
93	CSO	Association for Safe International Road Travel	Ms. Jo Leyland	F	Community Transport Specialist	580198583418 020-202-444	020-212532	joeyland@nbiiskenya.com	43799-00100 Nairobi			
94	CSO	Westlands Association	Ms. Majda Povodien-Ngijira	F		563404, 581709	3740687	westlands@pipal.com				
95	CSO	Muthaiga Residents Association	Mrs. B. Robin	F	Vice Chairman	020-374-7651, 0753-620-823	020-374-9801	gbrubin@africaonline.co.ke	63212-00619 Nairobi			

TABLE 14.3-1 (4/5) LIST OF INVITATION

No.	Code	Organization Name	Representative Name	Sex	Occupation	Contact Address					Street	Comment
						Telephone	Facsimile	E-Mail	P.O.Box	Building		
96	NGO	Kenya Forests Working Group	Mr. Michael Gachanja	M	Coordinator	571335	571335		20110 Nairobi			
97	PC	Flash Development Planners Ltd.	Mr. Joseph O. Achola Badia	M	P. A.	072-2927753, 219794		ibadia@yahoo.com	76484-00508 Nairobi			This is a good initiative and hence our 1st meeting since its an issue that we must address urgently.
98	PC	Interlink Care	Mr. M. Khayundi	M	Businessman	310123	310123		1357-00575 Nairobi			Interested in issues of security along the highways.
99	INS	University of Nairobi	Mr. Victor Onunga Ombina	M	Architect Student			vtoronunga@yahoo.com	30197-00100 Nairobi			The opportunity to plan our city of Nairobi is no longer in the hands of the colonial masters. This is the responsibility and a noble duty of all its citizens. I look forward to participate in the study to make our city a better place to live and work in.
100	INS	University of Nairobi	Dr. Mbaabu Mathire	M	Forestry				3659 GPO Nairobi			
101	INS	Kenya Forestry Research Institute	Mr. Joram K. Kagombe	M	Forestry	066-32891	066-32844	jakagombe@yahoo.com	20412 Nairobi			
102	PP		Stephen Maira Kiama	M	Forestry							
103	PP		David Kuria	M	Forestry			davekenyo@hotmail.com	P.O.Box 49-00221 Matatia			
104	PP	Nackenhurst Environmental Programme	Francis Githaigah	M	Forestry	066-73037, 73115, Cell:0734663418			P.O.Box 32 Limuru Nairobi			
105	PP		Mr. Frank Msaliri	M	Forestry			frmsaliri@yahoo.com	30332-00100 Nairobi			
106	PP		Mr. Solomon Stallone Akanga	M	Anthropologist	0721-932514	2716315	maosekanga@yahoo.com	3662-00100 Nairobi			This is a great idea which aims to involve the stakeholders of this city in a master plan. As such program is aimed to benefit which is hallmark of what anthropology stands for enhances the receptability of such a program.
107	PP		Eng. J. N. Karuki	M	Engineer			inrakalia@insightkenya.com	29758 -00202 Nairobi			Good idea
108	PP		Mr. Onyango Wilson Apollo	M	Research Analyst			andrewwilsonvarao@yahoo.com				Good
109	PP		Mr. Walter Ogutu	M	Telecomms Eng.			wogutu@yahoo.com				I wish to be involved in the Master Plan because I believe I can offer a solution to the above immediately with attendant benefits to both the govt of Japan and Kenya if given the support and opportunity to do so.
110	PP		Eng. Meshack O-A Ochieng	M	Transport Engineer			ochiengchieng@yahoo.com				A very important component of modern transportation planning
111	NGO	Shelter Forum	Eric Makokha	M				shelter@shelterforum.or.ke				
112	NGO	Pamoja Trust	Jane Weu	F		571 504		janetjie@africaonline.co.ke				
113	NGO	Kenya Land Alliance	Odena Lumumba	M		3741203		kal@africaonline.co.ke				
114	NGO	Environment Liaison Centre International	Mr. John Scully	M	Ag. Director	570425		mazinist@misuminet.com	14550-00800 Nairobi			
115	NGO	Mazingira Institute	Mr. Davinder Lamba	M	Executive Director	444321926/29,	4444643	uvumbuzi@swifkenya.com	10788 Nairobi			
116	NGO	Uvumbuzi Club			Coordinator	743615/751607						
117	NGO	EcoNews Africa			Executive Director	2721076/89						
118	INS	Institute of Policy Analysis and Research	Dr. Thomas Nzioki Kibua		Executive Director	251179			76406 Nairobi			
119	NGO	Forest Action Network	Dr. Dominic Waulubengo		Director	891035			Nairobi GPO	Norfolk Towers		
120	INS	Africa Nazarene University			Secretary General	24190 Ongata Rongai	24352 Ongata Rongai	anu@mail.org	21428 Nairobi	House 38		
121	INS	African Virtual University			Secretary General	803309			53067 GPO			

TABLE 14.3-1 (5/5) LIST OF INVITATION

No.	Code	Organization Name	Representative Name	Sex	Occupation	Contact Address					Comment	
						Telephone	Facsimile	E-Mail	P.O.Box	Building		Street
122	INS	American World University			Secretary General	2718736/0635					Nyaku Hse, 1st Flr., Argwings Kothek Suite No.14	
123	INS	Catholic University of Eastern Africa			Secretary General	891601-6	891084	admin@cuaa.edu	62157 Nairobi City Square		Off Langata Rd.	
124	INS	Daystar University			Secretary General	2723002/3/4	2728338		44400 GPO		Ngong/Valley Rd.	
125	INS	Egerton University			Secretary General	62277 Nakuru	62527 Nakuru	eu-cs@net2000ke.com	536 Njoro		Njoro/Nakuru Rd.	
126	INS	Jomo Kenyatta University of Agriculture & Technology			Secretary General	52711 Thika	52164 Thika	users@hkuat.ac.ke	62000 Nairobi City Square		Off Thika Rd., Juja Town	
127	INS	Kenya University			Secretary General	810901-5	811573	kuvc@honet.co.ke	43844 GPO		Off Thika Rd.	
128	INS	United States International University			Secretary General	3606000	3606100/1	admit@usiu.ac.ke	14634-00800 Nairobi		Off Thika Rd., Kasarani	
129	INS	University of Nairobi			Secretary General	334244	336885		30197 GPO		University Way	
130	NGO	Mikono International	Mr. A.Hijikata	M	Director	046-2388	246-2388	mikono@mikononep.org	753 Garissa			
131	NGO	Save the Children Center	Ms. T.Kikumoto	F	Director	2721170	2727907	sc@afrioonline.co.ke	67395 Nairobi			
132	NGO	Moyo Children Center	Ms. T.Matsushita	F	Director	067-22329	067-22329	moyo@afrioonline.co.ke	2712 Thika			
133	NGO	Assoc. of Medical Doctors of Asia	Ms. Y.Tokucka	F	Director	575188	575188	amda@connect.co.ke	10453-00100 Nairobi			
134	NGO	Community Action Development Organization	Mr. T.Nagaoka	M	Director	574223	574223	kanob@kenyaweb.com	25619 Livington			
135	NGO	Africa Children Education Fund	Mr. Y.Shiojiri	M	Director			acsf-kenya@ban796.com				
136	NGO	Saidia Furaha	Mr. K.Arakawa	M	Director	045-22343	045-22343					
137	NGO	Upepo	Ms. C.Hayakawa	F	Director	2724089	2728801	ecotour@pol.com	75735-00100 Nairobi			
138	NGO	Friends for the Society of Kenyan Children	Mr. N.Kishida	M	Director	4442840		sknva@kenyaweb.com			May Apartment	
139	NGO	Fellowship for Africa	Mr. S.Kambe	M	Director			kambe@hotmail.com				
140	NGO	Institute for Cultural Affaires, Japan	Ms. A.Sato	F	Director	2724314	2720666	caakui@wanaiichi.com				
141	NGO	International Medical Collaboration Unit	Mr. Miyata	M	Director			imcu@ishinnka.or.jp				
142	NGO	Future Kids Project	Mr. Ishikawa	M	Director			ish@afrioonline.co.ke				
143	NGO	Ki Kenya	Mr. K.Arhara	M	Director			Kolathara@hotmail.com				
144	CSO	Mai-a-thee Residents Association	Samuel Njoroge	M	Principal, Language Institute				47429 -00100 Nairobi		Enterprise Road	
145	INS	Regional Centre for Mapping of Resources for Development	Mr. Erick Khamala	M		8033202/9	861673/8027/67	romr@romrd.org	18118-00500 Nairobi			
146	CG	Ministry of Roads and Public Works	Mr. Masahiko TAKEUCHI	M	JICA Expert to MRPW	2723101	2724878	mahmtakeuchi@afrioonline.co.ke	50572-00100 Nairobi			
147	CG	Ministry of Lands and Housing / Survey of Kenya	Mr. Junichi KANEKO	M	JICA Expert to MoL/H/S&KISM	2718050 Exl.4089	861021 (KISM)		50572-00100 Nairobi			
148	IO	Japan Bank for International Cooperation	Mr. Nobuhito IKURO	M	Chief Representative	221420/637	221569	n-ikuro@jpic.go.jp	49526-00100 Nairobi		8th Flr., International House	Mama Ngrina St.
149	IO	Embassy of Japan	Mr. Masanori YUZAWA	M	First Secretary (Economic Cooperation)	332955	216530	masanori.yuzawa@mofa.go.jp	60202-00100 Nairobi City Square			
150	IO	UNICEF			Director							
151	INS	Kenya Polytechnic			Secretary General							
152	NGO	Actionaid Kenya			Director	4440440 / 4440449	4445843	coastaak@afrioonline.co.ke	42814 Nairobi		AACC	Waiyaki way
153	IO	JETRO	Mr. M. Ida	M	Director	226941		jetronbi@afrioonline.co.ke	59739 Nairobi		6th Flr., International House	
154	CSO	Mataau Owners Association (MOA)	John Kibue	M	Executive Officer	0721- 423199		moaknva2003@yahoo.co.uk	3669-00100 Nairobi		Tumaini house	Moi Avenue
155	NGO	National Environmental Council						admin@necouncil.org	P.O.Box 48278-00100 GPO			Kindamura Road, Off Rose Avenue

Code: CG/Central Government, LG/Local Government, PA/Parastatal, INS/Institute, IO/International Organization, NGO/Non Governmental Organization, CSO/Civil Society Organization, PC/Private Company, PI/Private Individual

14.4 PROGRAMME OF THE STAKEHOLDERS MEETINGS

14.4.1 Programme of the First Stakeholder Meeting

PROGRAMME

Time and Date: 11th November, 2004
Venue: Kenya School of Monetary Studies

Agenda

8:30 – 9:00	Registration	MRPW
9:00 – 9:30	Opening Ceremony Chairman, Eng. C.F. Kiranga Opening remarks	Engineer-in-Chief, MORPW Mayor, MOLG
Session I	Chairman, Mr.Z.Ogongo	PS, MOLG
9:30 – 9:45	Present issues of Transport in Nairobi Metropolitan Area	Town Clerk, NCC
9:45 – 9:50	Role of JICA	Mr. Inamura, JICA

9:50 – 10:20 Tea Break

10:20 – 10:30	Kenya: Role of Environment Impact Assessment	Director General, NEMA
10:30 – 10:40	JICA: Role of Environmental Impact Assessment	Mr. S.Minato, Study Team
10:40 – 11:40	Observation of Transport Problems: Outline of JICA Study - Urban Development - Road Network - Public Transport - Traffic Management - Urban Environment	Mr. T.Bekki, Study Team
11:40 – 11:50	Pilot Project – Intersection Improvement at Westland	Mr. K. Isomoto, Study Team
11:50 – 13:00	Plenary Discussions on Traffic Issues Major points are: - Discussion on Transport Problems - Proposals on Problem Solutions - Social Consideration in Project Implementation	All Participants

13:00 – 14:00 Lunch Break

Session II	Chairman, Eng. E.M.Mwogera	PS, MOLS&H
14:00 – 15:00	Group Discussions on Traffic Issues - Group 1 : Nairobi - Ruiru and Thika Area - Group 2 : Nairobi - Kangundo & Mavoko - Group 3 : Nairobi City Centre to Ngong Hill - Group 4 : Nairobi - Kikuyu, Limuru & Kiambu	Coordinators Planner Ndorongo, MOLS&H Dr. Nyangaga - KRB Eng. Mburu - City Council Eng. F.G.Ngachu - MORPW

15:00 – 15:30 Tea Break

15:30 – 16:30	Wrap-up of Group Discussions	
16:30 – 17:00	Closing Remarks	Minister of Local Government

14.4.2 Programme of the Second Stakeholder Meeting

Master Plan Scenario and Proposed Projects

PROGRAMME

Time and Date:	3rd February, 2005
Venue:	Kenya School of Monetary Studies

Agenda

8:30 – 9:00	Registration	
9:00 – 9:45	Opening Ceremony	Town Clerk of Nairobi City Council
	Introduction of Participants	
	Opening remarks	

Session I

9:45 – 10:00	Recapitulation of the Issues of the 1st Stakeholder Meeting	Chief Engineer (Road), MORPW
10:00 – 10:30	Findings of the Traffic Issues	JICA Study Team
	- Result of Traffic Analysis	Mr.K.Isomoto/Mr.A.Nakamura
	- IEE: Method of IEE and Anticipated Impacts	Mr.S.Minato

10:30 – 11:00 Tea Break

Session II

11:00 – 12:00	Transport Master Plan Scenario	JICA Study Team, Mr. T.Bekki
12:00 – 13:00	Proposed Projects	JICA Study Team
	- Roads	Mr.T. Toda
	- Pedestrian/Bicycle/Cart	ditto
	- Problem Areas	ditto
	- Bus	Mr. M. Koto
	- Matatu	ditto
	- Railway	ditto
	- Traffic Management	ditto
	- Funding for the Urban Transport Development	Dr. T. Hashimoto

13:00 – 14:00 Lunch Break

Session III

14:00 – 15:30	Plenary Discussions on Proposed Projects	Coordinators: MORPW/MOLG/MOLH
	- Group 1 : Road and Non-motorised Transportation	Eng. Ngare, MORPW
	- Group 2 : Public Transportation (Bus, Matatu and Railway)	Planner Ndorongo, MOLG
	- Group 3 : Traffic Management	Eng. Mburu, DCE, Nairobi City Council

15:30 - 16:00 Tea Break

16:00 – 16:30	Wrap-up of Plenary Discussions	City Engineer, Nairobi City Council
16:30 – 17:00	Closing Remarks	Director of Urban Planning, MOLG

14.4.3 Programme of the Third Stakeholder Meeting

PROGRAMME

Time and Date:	3rd March, 2005
Venue:	Kenya School of Monetary Studies

Agenda

8:30 – 9:00	Registration	
9:00 – 9:45	Opening Ceremony	Town Clerk, NCC
	Introduction of Participants	
	Opening remarks	Eng. Ariga, MOLG

Session I

9:45 – 10:00	Recapitulation of the Issues of the 2nd Stakeholder Meeting	Engineer-in-Chief, MORPW
10:00 – 10:30	1) Overall Implementation Programme	Mr. T. Bekki & Mr. K. Isomoto
	2) High Priority Projects	
	- Road Network	Mr. T. Toda
	- Non-motorised Transportation	ditto
	- Public Transportation (Bus, matatu and railway)	Mr. M. Koto
	- Traffic management	ditto
	3) Result of IEE	Mr. S. Minato

10:30 – 11:00 Tea Break

Session II

11:00 – 12:00	Plenary Discussions on Priority Projects	Coordinators: MORPW/MOLG
12:00 – 13:00	- Group 1 : Road and Non-motorised Transportation	Eng. Ngare, MORPW
	- Group 2 : Public Transportation (Bus, matatu and railway)	Planner Ndorongo, MOLG
	- Group 3 : Traffic management	Eng. Mburu, DCE, Nairobi City Council

13:00 – 14:00 Lunch Break

Session III

14:00 – 15:00	- Group 1 : Road and Non-motorised Transportation	Eng. Ngare, MORPW
	- Group 2 : Public Transportation (Bus, matatu and railway)	Planner Ndorongo, MOLG
	- Group 3 : Traffic management	Eng. Mburu, DCE, Nairobi City Council

15:00 – 15:30 Tea Break

15:30 – 16:30	Wrap-up of Plenary Discussions	MORPW
16:30 – 17:00	Closing Remarks	Director of Physical Planning, MOLH

TABLE 14.4-1 LIST OF REGISTERED PARTICIPANTS

No.	Code	Representative Name	Organization	Sex	Occupation	Contact Address			Telephone
						P.O.Box	E-Mail		
1	CG	Eng. L. K. Tonui	MRPW	M	-	30260-00100	Nairobi	lktionui@roadsnet.go.ke	2723101
2	CG	Eng. F. G. Ngachau	MRPW	M	PSE (D)	"	"	fnngachau@roadsnet.go.ke	2723101
3	CG	Eng. S. M. Ngare	Eng. S. M. Ngare	M	CSE (D)	"	"	smngare@roadsnet.go.ke	2723101
4	CG	Eng. P. Amiani	MRPW	M	Engineer	"	"	pamiani@2001.yahoo.com	2723101
5	CG	Mrs. E. Mibey	MRPW	F	Environmentalist	"	"	eemibey@kenya.ke	2723101
6	CG	Ms. Elizabeth Thumbi	MRPW	F	-	"	"	enlgathogo@yahoo.com	2723101
7	CG	Mr. Orege O. C.	MRPW	M	-	"	"	oregeoc@roadsnet.go.ke	2723101
8	CG	Eng. G. M. Kiiru	MRPW	M	Engineer	"	"	gmkiru@roadsnet.go.ke	2723101
9	CG	Eng. C. F. Kiranga	MRPW	M	Engineer-in-Chief	"	"	cikiranga@roadsnet.go.ke	2723101
10	CG	Eng. F. D. Karanja	MRPW	M	-	"	"	fdkaranja@roadsnet.go.ke	
11	CG	Eng. J.N. Maina	MRPW	M	-	"	"	jnmaine@roadsnet.go.ke	
12	CG	Maurice Chore	MRPW					mauricechore@yahoo.com	
13	CG	Eng. B. G. Ariga	MOLG	M	Director	"	"	bgariga@africaonline.co.ke	230031
14	CG	Eng. N. N. Nyariki	MOLG	M	AD	"	"		230031
15	CG	Eng. J. W. Theuri	MOLG	M	Engineer	"	"	jwtheuri@yahoo.com	230031
16	LG	Eng. C. M. Chiuri	CCN	M	City Engineer	30075 00100			224281
17	LG	Eng. S. K. Mburu	CCN	M	DCE	"	"		224281
18	LG	Mr. S. M. Muthama	CCN	M	-	"	"	mwanziasam@yahoo.com	224281
19	LG	Mr. J. K. Barreh	CCN	M	City Planning Dept.	"	"	barrehk@yahoo.com	224281
20	LG	Eng. J. K. Mwangi	CCN	M	Engineer	"	"		224281
21	LG	Mr. L. K. Abdalla	CCN	M	City Planning Dept.	"	"	LKA@yahoo.com	224281
22	LG	Eng. Christine A. Ogut	CCN	M		"	"	tirana@excite.com	224281
23	CG	Mr. T. Ndorongo	MOLH	M	Planner	P.O.Box 45025	Nairobi		2729800

TABLE 14.4-1 LIST OF REGISTERED PARTICIPANTS

No.	Code	Representative Name	Organization	Sex	Occupation	Contact Address			Telephone
						P.O.Box	E-Mail		
24	CG	Mr. J. K. O. Oguya	MOLH	M	Planner	P.O.Box 14752-00100	Nairobi	kenoguya@yahoo.com	2729800
25	CG	Mr. J. K. Mathenge	MOLH	M	-	P.O.Box 30450	Nairobi		
26	CG	Mr. E. F. Onyuna	MENR	M		P.O.Box 30521	Nairobi		2714543
27	CG	Ms. A. Olubendi	MOF	F		"		aolubendi@yahoo.com	338111
28	CG	Mr. A. M. Kitolo	MOT	M	Economist	"		akmulwa@yahoo.com	2729200
29	CG	Mr. Joram K. Kagombe	KEFRI	M	-	P.O.Box 20412	Nairobi	jokagombe@yahoo.com	
30	CG	Eng. S. K. Kamau	KRB	M	Engineer	73718 00200		skkamau@roadsboard.go.ke	2722865
31	CG	Mr. L.M. Katawa	Traffic Police	M	Nairobi Area	P.O.Box 46782	Nairobi		0733-901939
32	LG	Mr. Peter M. Kibinda	Thika Municipal Council	M	Town Planner	P.O.Box 240	Thika	kibinda@ardkenya.com	0722-788044
33	LG	Ms. Esther Mbugua	Limuru Municipality	F	Town Engineer	P.O.Box 2814	Limuru		0733-7488896
34	LG	Mr. R. K. Mugambi	Mavoko Municipality Council	M	Town Engineer	P.O.Box 11	Athi River		0720-785736
35	LG	Mr. Samuel P. N. Kuria	Kangundo Town Council	M	Town Clerk	P.O.Box 56	Tala		0733-822556
36	PA	Dr. S.N. Oresi	Kenya Railways	M	-	P.O.Box 30121 00200	Nairobi	snvaguchaoresi@yahoo.com	340049
37	IO	Mr. Brian Williams	UN-Habitat	M					625001
38	IO	Mr. Andrew Gitonga	European Union	M	Representative	P.O.Box 45119	Nairobi	andrew.gitonga@cec.eu.int	2713020
39	IO	Mr. M. Takeuchi	MoRPW	M	JICA Expert	c/o JICA Kenya Office			
40	IO	Mr. M. Ishizuka	JICA Kenya Office	M		50572 00200	Nairobi		
41	IO	Mr. J. Inamura	JICA Kenya Office	M		50572 00200	Nairobi		
42	IO	Mr. S. Muthui	DED	M		P.O.Box 47136	Nairobi	ken@Ded.de	
43	IO	Mr. Erick Khamala	RCMRD	M		P.O.Box 18118	Nairobi	ekhamala@rcmr.org	
44	INS	Mr. Calvine Kayi	Dept. of Geography, Kenyatta University	M	-	P.O.Box 43844	Nairobi	ckayi@justice.com	
45	INS	Mr. Fred Owegi	KIPPRA	M	-	P.O.Box 56445	Nairobi	fowegi@kippra.or.ke	
46	INS	Mr. C. M. Ndonga	IEK	M	-	P.O.Box 54400	Nairobi	ndonga@kenyaweb.com	

TABLE 14.4-1 LIST OF REGISTERED PARTICIPANTS

No.	Code	Representative Name	Organization	Sex	Occupation	Contact Address			Telephone
						P.O.Box	E-Mail		
47	INS	Ms. Pauline N. Mwangi	IPAR	M	-		pmwangi@ipar.or.ke		
48	INS	Prof. M. Koech	Kenyatta University	M	-	P.O.Box 30943 Nairobi	amiacted@yahoo.com		
49	INS	Ms. Marry Kinoti		F			mkinoti@comhlith.ac.ke		
50	INS	Mr. Aggrey Okinda		M			aggreyokinda@yahoo.com		
51	NGO	Mr. Shumpei Kambe	Fellowship for Africa	M	Representative	P.O.Box 9549-00100 GPO	Kambe@africaonline.co.ke		
52	NGO	Mr. Enock Kanyanya	Kenya Forest Working Group	M	-	P.O.Box 20110 Nairobi	ekanyanya@kenyaforest.org		
53	NGO	Mr. Frank Msafiri	Kenya Forest Working Group	M	-	P.O.Box 30332-00100 Nairobi	bfmsafiri@yahoo.com		
54	NGO	Ms. Chiaki Hayakawa	Upepo	F	Representative	P.O.Box 78735 Nairobi	ecotour@gol.com		
55	NGO	Mr. Francis Githaigah	Brackenhurst Environmental Program	M	-	P.O.Box 32 Limuru	kvherbflora@yahoo.com		
56	NGO	Mr. John Kibui	Matatu Owners Association	M	-	P.O.Box 3669-00100 GPO	moakanya2003@yahoo.co.uk		
57	NGO	Ms. Betty Robin	Muthaiga Resident Association	F	Vice Chairman	P.O.Box 463423-00619 Nairobi	gbrobin@africaonline.co.ke		
58	NGO	Ms. M. Ruberti	Muthaiga Resident Association	F	-	P.O.Box 463423-00619 Nairobi	ruberti@africaonline.co.ke		
59	NGO	Dr. H. Croze	Muthaiga Resident Association	M	-	P.O.Box 463423-00619 Nairobi	hcroze@aerp.org		
60	NGO	Sihri Shah	Westland Residents Association	M	-	P.O.Box 10866-00400 nairobi	lovely@wananchi.com		
61	NGO	Fred G. Kariuki	Kenya Association of Manufacturers	M	-				
62	NGO	Ms. Terumi Matsushita	Moyo Children Center	M	Representative	P.Box 2712 Thika	moyo@africaonline.co.ke		
63	NGO	Mr. Edwins Mukabana	Kenya Buse Services	M	-	P.O.Box 40238-00100 Nairobi	emukabana@yahoo.com		
64	NGO	Ms. Jo Leyland	Association of Safe International Road Travel	F	Representative	P.O.Box 43799 GPO	joleyland@nbi.ispkenya.com		
65	NGO	Ms. Lynet N. Kaloo	Commuters Welfare Association	F	-	P.O.Box 41162 GPO	cowa@2004@yahoo.com		
66	NGO	Mr. Festo Fadauwa	NCBDA	M	-	P.O.Box 10687-00100	ncbda@africaonline.co.ke		
67	NGO	Mr. Sammy Gitau	ILCP (JICA)	M	-	P.O.Box 67395 Nairobi	sammymcfk@yahoo.co.uk		
68	NGO	Ms. Atiti Stela A.	UOM	F	-	P.O.Box 651 Ngong Hills	atitisa@yahoo.co.uk		
69	NGO	Mr. Kiama Stephen	Nyakuru League for Environment	M	-	P.O.Box 356 Nyakuru	mastakin500@vafo.com		

TABLE 14.4-1 LIST OF REGISTERED PARTICIPANTS

No.	Code	Representative Name	Organization	Sex	Occupation	Contact Address			Telephone
						P.O.Box	E-Mail		
70	NGO	Mr. Patrick J.M. Wem	KAM	M	-	P.O.Box 271 Athi River	wem@mabati.com		
71	NGO	Ms. Rahab Mundara	ITDG-EA	F	-	P.O.Box 39491 Nairobi	rahab.mundara@itdg.or.ke		
72	PC	Mr. Macharia Simon	OSDC	M	P. A.	P.O.Box 61243 Nairobi	smwangjm@yahoo.com	0722927753, 219794	
73	PC	Ian Barrett	Adam Smith International	M	Businessman	London	ibistc@btinternet.com	310123	
74	PI	Fredrick Macharia							
75	PI	Stephan Kamau							
76	PI	Jane Mwhaki							
77	PI	Rev. Samuel Njoroge	ACK Maiu a.ihii		Reverend	P. O. Box 47420 Nairobi	acknya@insightkenya.co		
78	PI	Mr. E.M. Gukunju	COTU			P.O.Box 49628 Nairobi			
79	PI	Mr. Akanya Stallone Solomon			Anthropologist	P.O.Box 3662-00200 Nairobi	maotsekanga@yahoo.com		
80	PI	Mr. A. Okum							
81	PI	Mr. Frederick Ngugi	PA to Hon Beth Mugo, MP			P.O.Box 30040-001000 Nairobi	bmugo@kenyaweb.com		

Code: CG/Central Government, LG/Local Government, PA/Parastatal, INS/Institute, IO/International Organization, NGO/Non Governmental Organization, PC/Private Company, PI/Private Individual

14.5 MINUTES OF MEETING OF THE FIRST STAKEHOLDERS MEETING

14.5.1 Minutes of Meeting of the First Stakeholders Meeting

MINUTES OF MEETING OF THE FIRST STAKEHOLDERS MEETING

Place: Kenya School of Monetary Studies, Nairobi

Time: 11th November, 2004.

1 Opening Ceremony:

Eng. B. G. Ariga of MOLG took the lead of opening ceremony and Eng. C.F. Kiranga, PS of MORPW presented the opening speech of the first stakeholders meeting for the Study on Master Plan for Urban Transportation of the Nairobi Metropolitan Area. Eng. B. G. Ariga of MOLG then introduced himself for which the participants of the meeting took turn to introduce by themselves.

2 Session I

Eng. C.M. Chiuri presented the “Present Issues of Transport in Nairobi Metropolitan Area” and highlighted the present issues the study team is facing. Ms.M.Mibey of NEMA associated with MORPW presented the “Kenya’s Role of Environmental Impact Assessment” followed by the presentation of Mr. J. Inamura, Deputy Representative of JICA Kenya Office “JICA: Role of Environmental Impact Assessment”. Mr. S. Minato then presented JICA’s EIA guidelines.

JICA Study Team presented the “Observation of Transport Problems” containing the following:

- Outlines of JICA Study for the Study on Master Plan for Urban Transportation of the Nairobi Metropolitan Area presented by Mr. T. Bekki;
- Urban Development presented by Mr. A. Nakamura;
- Road Network presented by Mr. S. Toda;
- Public Transport presented by Mr. M. Kotoh;
- Traffic Management presented by Mr. M. Kotoh; and
- Urban Environment presented by Mr. S. Minato

The issue on “Pilot Project - Intersection Improvement at Westlands” was presented by Mr. K. Isomoto of JICA Study Team.

3 Plenary Discussion

After the presentation on the present transport problems, the session went on to discuss the issues on with all the participants as follows:

- Discussion on Transport Problem;
- Proposals on Problem Solutions; and
- Social Consideration in Project Implementation

There have been a number of questions and comments on various topics related to the present transport problems as follows:

- 1) Comment & Question (C&Q): Additional comment on EIA was made. Further, accidents tend to occur at the road where conditions of road are good. If road improvement is a major topic of the master plan, it should be taken into account of road safety. When intersection improvement, such as the one at Westland, it is particularly important.

A: It is noted.

- 2) C&Q: What is the outcome of the intersection improvement of Westland?

A (CCN) : We understand that the Ring Road should be widened, Missing links should be improved, and bus stops are in need of improvement. This pilot project is to carry out roundabout improvement and signalization because of limited budget. CCN will confirm the effect of pilot project before any budget is allocated.

A (Chairman): Because of budget shortage, roundabout improvement is carried out as it is considered worst contributing to the traffic problem. Any further improvement as a whole has to be dealt with the discussion and budget of GOK and KRB.

C & Q (CCN-Planning) : Upon confirmation of the effect of pilot project, MRPW and MOLG will be able to allocate budget for ring road improvement. In the case of Westland intersection improvement, decision making could have been made by BC.

A (Chairman) : It was decided by the Steering Committee of the master plan study upon technical workshop was made.

C & Q: If traffic improvement is to cater for the smooth flow of private cars and matatu, it is an improvement of vehicle flow. Human flow of traffic should be considered. It appears that a number of alternatives related to Westland intersection improvement have not been closely examined. For instance, the area from Westland to Museum to riverside area could be improved as a whole. Cost-benefit analysis of the present proposal for the Westland intersection improvement seems to have not carried out. If done, other areas could have been selected instead of the one at Westland.

A (Chairman): It is noted.

- 3) C & Q: For the road network, direct link between Thika Road and Mombasa Road (This would mean Eastern Bypass?)

A (Chairman) : It is noted.

- 4) C & Q: Southern by-pass is the project going through ecologically sensitive areas. There are a rare species of cactus growing in the area near Carnivore Restaurants. There are a number of species in Ngong Road Forest where Kibera residents use for medicine, firewood and other purposes. Thus explicit mitigation measures along with EIA should be taken. Northern portion of Southern By-pass should not pass through Nderi Swamp in Kikuyu. It is ecologically fragile and valuable wetland area.

A (Chairman): It is well noted. Please discuss about it in the afternoon's group discussions (see Group 3's discussion "4) Forest Issues" and "5) Southern Bypass, 3 Summary of Conclusion").

- 5) C & Q: It is our concern that the present traffic jam and road accidents should be resolved. However, if it would lead to make good road, road accidents might increase. Thus road/traffic safety should be a part of the master plan study. Non-motorized mode and vehicles should be separated for traffic safety. In Langata Road, accidents increased as road conditions are improved. In Juja Road, separation of non-motorized mode of transportation and vehicular transportation should be separated for the entering traffic from Outer ring Road. Thus safety of non-motorized mode transportation should be catered for. Equally true is to consider mass transit system.

A (Chairman) : It is well noted and the progress should be presented in February 2005.

- 6) C & Q: Institutionalization of the stakeholders such as this stakeholder meeting should be considered and it must make a very important contribution to the master plan study.

A (Chairman): It is well noted.

- 7) C & Q: At present, water supply, sewage improvement and other projects are on-going in Nairobi. These projects add to the problems on traffic congestions. There must be some sort of coordinated act. Cycling lane has been made but not used as it was taken over by vehicles. Pedestrian bridges are not used while there was an accident involving pedestrian at the bottom of the bridge. These phenomena should be looked upon.

A (Chairman) : It is noted.

- 8) C & Q: Westland intersection improvement works may cause severe traffic congestion.

A (Chairman): As construction works are carried out in the night too, construction period is minimised to a couple of months.

- 9) C & Q: Nairobi's urban development pattern is no longer the concentric pattern since employment centres are not merged to the central business district only but dispersed to trunk roads. Thus this has to be taken into account of master plan study.

A (Chairman): It is noted.

- 10) There must be a large number of road bumps in order to control the traffic. Majority of them should be removed.
- 11) C & Q: When air pollution is concerned, noise should be a part of pollution control and it should be incorporated into the master plan study.
A (Chairman): It is noted.
- 12) C & Q: When air pollution is concerned, noise should be a part of pollution control and it should be incorporated into the master plan study.
A (Chairman): It is noted.
- 13) Kenya is such a poor country while vehicle importation is relatively large. There should be a controlling mechanism of vehicle importation.
- 14) C & Q: There is no urban development policy. Since the master plan of Nairobi urban development was carried out in 1973, it was not appropriately implemented to date. There are a lot of coordination between building works and parking area development. Public transportation has been relying on matatu without appropriate policy. Thus these have to be incorporated into the master plan study.
A (Chairman): It is well noted.

Reaction of the participants was that it was well represented the interests of which the organization each participant is representing. Despite the fact that there are a lot of the natural and social environmental issues already known to the prospective transport projects, constructive discussions took place among the participants. NGOs were more interested in individual project implementation and appeared that they wanted to raise specific issues while the first stakeholders meeting took place for discussions on the overall and conceptual transport issues as a whole.

4 Session II

After the lunch break, participants were subdivided into four groups for discussion on the geographical area of the study area. Each groups raised the following issues:

1) Group 1: Nairobi-Ruiru-Thika

Traffic generation

- Transit traffic.
- Institutions cater for the transport issues.
- Residential development.
- Commercial/Industrial area development should be controlled.
- Agricultural products distribution should be catered for.

Problems

- Sub-divisions of plot for uncontrolled development

- Inadequate capacity of traffic.
- Population growth is very rapid.
- Pollution (Air/Noise) control is not implemented.
- Maintenance of road and vehicles are not adequate.
- Traffic congestion should be comprehensible.
- Lack of alternative routes add to further traffic congestions.
- Direct access to highway is not existing.
- Uncontrolled development of housing areas is conspicuous.
- Encroachment of illegal residents on road reserves.
- Distribution of services (e.g schools) not adequate.
- Accidents are increasing.
- Lack of NMT/IMT facilities (pedestrian/bicycle facilities).
- Driving manner is in need of discipline.
- Lack of law enforcement.
- Road furniture (signs/markings) should be adequately provided.
- Inadequate shoulders should be repaired as soon as possible.
- Security on traffic should be looked upon.
- Inappropriate design of footbridges and use of it should be campaigned for public awareness.
- High patrols of policemen cause a lot of traffic jam.
- Increased commuter population from/to dormitory towns.
- Uncoordinated road works.
- Road geometry is not contributing to road safety.
- Poor road surfacing e.g. Thika-Kenol section should be improved as soon as possible.
- Badly located/small bus lay-bay should be improved.
- Inadequate secondary roads especially on the eastern side of Nairobi should be looked upon.

Suggestions

- Coordinated land use planning and development (designate the corridor as a special area) is very important.
- Provision of smooth and direct link between Thika and Mombasa Road should be considered.

2) Group 2: Nairobi-Kangundo and Mavoko

Traffic Congestion and other factors

- JICA study plan should incorporate the Eastern Bypass.
- Look at the conditions of the present existing roads for further improvement.
- Kangundo-Machakos-Mombasa Road is narrow. Hence needs to expand the existing road.
- Do other roads to make them possible to reduce traffic flowing onto main roads.
- Mombasa Road is a trunk road (high speed road) and it should be maintained as it has to be.

Short Term Solutions

- Open back roads at plots for more traffic flow.
- Widen the roads.
- Local junctions to be improved.
- Open a linkage of Mavoko – Tala.
- Government should give fat incentives to public transport system.
- Encourage the use of bicycles, hence path should be built for them.
- Increase railway wagons and add more trains.
- Remove road bumps.

Long Term Solutions

- Nairobi City Council should come up with appropriate land use plan to help in opening up the area for more traffic improvement
- Develop parking areas outside the city
- Have tanker depots at weighing bridge outside of Nairobi
- Introduce governance to reduce human traffic
- Railway line should be modernised
- Investments for passenger trains should be considered
-

3) Group 3: Nairobi City to Ngong Hill Area

Issues

- Land-use policy is not appropriate.
- Road network is not appropriate.
- Transportation issues are chronically not solved.
- Environmental issues should be discussed explicitly.

Problems

- No efficient planning on land use is resulting in the mixture of different land use zones in confusion. Industrial, commercial, residential area, etc. should be explicitly separated.
- Strategic plan on land use exists (or being prepared) and it should be adopted.
- Urban sprout in Karen, originally residential area, is now mixed up with non-residential activities and they are on the increase and cause transport havoc.

Recommendations

- Present trends to advice strategic planning should be incorporated in the master plan.
- Certain areas to be conserved such as forests.
- Consider dominant land-use practices should be linked. For instance Karen to.
- Westlands by Ring Road could be linked as both areas are in the same type of land use.
- Do not to wait for government strategic plan but it will take long time to realize.
- Look into non-motorised transport cycling paths.

- Demolition of illegal structures that are built after the land is assigned to specific land use.
- Involve more stakeholders, slum dwellers and any of those affected by project.
- Approach of humane-social issue should be considered.
- Plan to recognise slums need to be linked and have proper infrastructure.
- Isolate agricultural areas and protect them. Maintain buffer zones such as forests between urban and agricultural areas.
- Have a clear land-use policy in relation to metropolitan area.
- Improve road network to cater for increasing demand of various industries.
- Consider use of railway.
- Use integrated approach for the structure of governance to ensure plans are implemented and coordinated in the process.
- Relevant authorities should be involved.

Forest Issues

- Some 150 acres of forest to be cleared and this will affect biodiversity and other forest resources.
- Possible mitigation measures might of expanding Langata South Road instead of building Southern Bypass.
- A corridor for about 4 Km should be fenced for security reasons.
- Consider positive and negative impact to the area.

Way Forward

- Have an EIA explicitly carried out. Consider negative impacts and workout mitigation measures as much as possible.
- Strategy to deter massive migration to urban areas i.e. decentralization/ devolution of government institutions is necessary.
- Encourage public transport system. Borrow from Curitiba in Brazil as a sample, and finalise land use plan as fast as possible to included public transport issues.
- Categorized issues are:
 - i. Immediate term;
 - ii. Medium term; and
 - iii. Long term
- Solution to the integrated transport system should be:
 - i. Short Term
 - Non- Motorised Transport
 - Mass transport
 - ii. Middle/Long Term
 - Dual carriage way
 - Corridor
- Control vehicles coming into the city. Up-country vehicles should terminate at the periphery of Nairobi and park-and-ride system should be considered.
- Personal/private vehicles not to be allowed into CBD.

- Enforce highway codes/immediate public education on traffic rules.
- Encourage people to work from home or stay close to work.

(4) Group 4: Nairobi to Kikuyu, Limuru and Kiambu Area

Present Issues

- Road reserves already taken by residents.
- Population increasing rapidly.
- Visibility is poor.
- Non- motorised mode of transportation cyclists and pedestrian should be provided with their own path.
- Adequate participation by all stakeholders should be realized. Affected community should be involved in more of this kind of meetings.
- Sanitation/drainage along the road should be improved.
- Resources for training on road use and safety should be created.
- Consider side roads for non-motorised mode of transportation.
- Trains to Limuru for 6-8hrs of operation. It is just 35km away.
- Encroachment on road reserves should be properly controlled.
- Security clearing for road reserves should be ensured.
- Involve hawkers for casual labour.

5 Summary of Conclusions

Eng. B. G. Ariga of MOLG took to chair the wrap-up of the group discussions and he concluded as follows:

- 1) Specific land-use plans to control the corridors where there is a lot of subdivision of land to control road network.
- 2) Maintenance of the existing roads.
- 3) Improvement of local junctions- to improve local circulation.
- 4) Clearance of bypasses corridors to open them for traffic flow.
- 5) Development of proper interchange for matatus- parking in the CBD to be removed to a suitable area e.g. Muthurwa area around the Machakos Country bus station. Since Kenya Railway own this piece of land, arrangement can be made to secure it for the proposed matatu interchange/parking.
- 6) Special line for commuter trains need to be introduced.
- 7) Shoulders of roads are wearing out and therefore need repair.
- 8) Security/ road safety to be improved.
- 9) Non-motorised transport to be encouraged.
- 10) Road geometry/drifts to be improved- long /short term intervention.
- 11) Education of motorists and training of the drivers.
- 12) Environment NEMA to participate more effectively in broadening EIA and EA to include human settlement.
- 13) EIA to be conducted before construction of the Southern by pass which will go through Ngong road forest.

- 14) Demolition of slums-human face to be given to this exercise and the affected people should be consulted.
- 15) Land-use policy of metropolitan area to be looked into.
- 16) Land-use planning in the Nairobi Metropolitan area- a Multidisciplinary Task force will be formed to facilitate in the designing of strategic structure plan for Nairobi.
- 17) Staggering reporting hours to work to be encouraged so that people do not report at the same time and cause congestion.
- 18) Improvement of security in the CBD to encourage people to work passed the usual 5.pm, which is known to be the peak hour of congestion as people go home early to avoid insecurity.
- 19) Missing Links to be incorporated. For example a link needs to be introduced to connect Mombasa road and Nairobi Tala- Kangundo road.

Eng. B. G. Ariga of MOLG presented the speech of the Minister of MOLG as per attached and the meeting was closed.

**MINISTER’S SPEECH: FIRST STAKE HOLDERS WORKSHOP ON THE STUDY
ON THE MASTER PLAN FOR URBAN TRANSPORT IN THE NAIROBI
METROPOLITAN AREA**

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA) COUNTRY OFFICE REPRESENTATIVE MR. INAMURA, ENGINEER IN CHIEF, ENG. C.F. KINANGA, DIRECTOR URBAN DEVELOPMENT DEPARTMENT ENG. B. G. ARIGA, ACTING CHIEF ENGINEER, ENG. F. G. NGACHU, CITY ENGINEER, ENG. C. M. CHIURI, JICA STUDY TEAM LEADER MR. TSUNEO BEKKI, STUDY TEAM MEMBERS AND THE VARIOUS KEY STAKEHOLDERS.

LADIES AND GENTLEMEN,

I TAKE THIS OPPORTUNITY THIS AFTERNOON TO APPRECIATE YOUR DAY LONG PARTICIPATION IN THIS VERY IMPORTANT WORKSHOP WHICH HAS BEEN ORGANIZED JOINTLY BY THE MINISTRY OF ROADS AND PUBLIC WORKS AND MINISTRY OF LOCAL GOVERNMENT TO DELIBERATE ON THE TRANSPORT ISSUES FOR NAIROBI METROPOLITAN AREA. ALSO, I HIGHLY APPRECIATE THE WIDE PARTICIPATION OF THE VARIOUS KEY STAKEHOLDERS WHO HAVE BEEN DRAWN FROM ENVIRONMENTAL BODIES, LABOUR ORGANIZATIONS, LOCAL AUTHORITIES, BUSINESS COMMUNITIES, UNIVERSITIES AND OTHER RESEARCH INSTITUTIONS, RESIDENT ASSOCIATIONS, DEVELOPMENT PARTNERS AND OTHERS.

LADIES AND GENTLEMEN,

I AM BRIEFED THAT YOU HAVE EXHAUSTIVELY DELIBERATED ON MANY ASPECTS AFFECTING URBAN MOBILITY, NOT ONLY IN THE CITY OF NAIROBI BUT ALSO IN THE DORMITORY TOWNS OF MAVOKO, NGONG, KIKUYU, LIMURU, RUIRU, THIKA AND KANGUNDO.

I NOTE THAT THE OBJECTIVE OF THE STUDY IS TO FORMULATE A MASTER PLAN FOR THE URBAN TRANSPORT IN THE NAIROBI METROPOLITAN AREA FOR THE TARGET YEAR 2026 AND TO CONDUCT A PRE-FEASIBILITY STUDY ON THE PRIORITY PROJECT UNDER THE MASTER PLAN.

LADIES AND GENTLEMEN,

AMONG THE ISSUES THAT HAVE BEEN COVERED, I HAVE NOTED THE FOLLOWING WITH KEEN INTEREST:-

- MANY STUDIES ON THIS PARTICULAR SUBJECT HAVE BEEN CARRIED OUT SINCE 1973 WHEN THE FIRST STUDY ON NAIROBI METROPOLITAN GROWTH STRATEGY WAS UNDERTAKEN.
- ENVIRONMENTAL MATTERS THAT NEED TO BE ADDRESSED TO FACILITATE THE STUDY AND IMPLEMENTATION OF RECOMMENDATIONS OF THE SAME.
- PUBLIC TRANSPORT PROBLEMS WHICH INCLUDE POOR ROAD NETWORK, PUBLIC TRANSPORT AND TRAFFIC MANAGEMENT.
- THE PROPOSED PILOT INTERVENTION AT THE WESTLANDS ROUNDABOUT WHICH WILL BE IMPLEMENTED DURING THE STUDY.

LADIES AND GENTLEMEN,

I AM CONVINCED THAT THE DELIBERATIONS OF THIS WORKSHOP HAVE ADDRESSED THE CONCERNS RAISED ABOVE AS WELL AS THE STUDY OBJECTIVES.

THE GOVERNMENT, THROUGH THE POVERTY REDUCTION AND THE ECONOMIC RECOVERY STRATEGY PAPERS SUPPORTS PROPER MANAGEMENT OF URBAN DEVELOPMENT. ONE OF THE CORE FUNCTIONS OF THE GOVERNMENT IS TO FORMULATE POLICIES THAT WILL FACILITATE AN ENABLING ENVIRONMENT FOR PROVISION OF SERVICES TO THE CITIZENS. IT IS MY EXPECTATION THAT THIS PARTICULAR STUDY WILL GO A LONG WAY IN COMING UP WITH RECOMMENDATIONS THAT WILL CONTRIBUTE TO SOLVING CHALLENGES ON:-

- DECONGESTING OF THE CITY OF NAIROBI.
- LAND USE PLANNING
- URBAN SPRAWL
- PROVISION OF SERVICES.

LADIES AND GENTLEMEN,

MAY I TAKE THIS OPPORTUNITY TO THANK THE GOVERNMENT OF JAPAN THROUGH JICA WHO ARE FUNDING THE STUDY, OFFICIALS FROM THE MINISTRIES OF ROADS AND PUBLIC WORKS, LOCAL GOVERNMENT AND OTHER GOVERNMENT INSTITUTIONS, NAIROBI CITY COUNCIL, DEVELOPMENT PARTNERS INCLUDING WORLD BANK, EUROPEAN UNION, GERMANY DEVELOPMENT SERVICE (DED), UNITED NATIONS, INTERMEDIATE TECHNOLOGY DEVELOPMENT GROUP (ITDG). YOUR SINCERE AND WORTHWHILE CONTRIBUTION TO THIS WORKSHOP IS EARNESTLY APPRECIATED.

I NOW DECLARE THIS WORKSHOP OFFICIALLY CLOSED.

**HON. MUSIKARI KOMBO,
MINISTER OF LOCAL GOVERNMENT**

MINUTES OF MEETING OF FIRST INDIVIDUAL STAKEHOLDER MEETING

Table: List of Organizations Invited for Individual Stakeholder Meeting

Name of Organization	Main Topics
1 Muthaiga Resident Association (Community organization)	- Proposed alternative route for Muthaiga community
2 Westland Resident Organization (Community organization)	- Proposals of junctions and traffic improvement in Westland
3 Dr. Kambe and Kenya Forest Working Group (NGOs)	- Ngong Road Forest area - Rare species conservation
4 Intermediate Technology Development Group of East Africa (ITDG)	- Proposed NMT (Cyclist and pedestrian transport)
5 Kenya Railway Corporation	- Proposed railway and commuter improvement
6 Kenya Bus Service	- Proposed bus services improvement
7 Commuter Welfare Association	- Request of transport improvement for commuters
8 Association for Safe International Road Travel	- Proposal of the improvement of matatu services
9 Public Transport Consultant	- Proposed public transport improvement
10 UN-Habitat	- Proposed urban transport improvement
11 Department of Houseing	- Slum Up-grading programme's housing project
12 MORPW-Right of Way Section	- Existing road reserve
13 UN-Habitat	- Slum Up-grading Program undertaken in Kibera Slum

1 Kenya Railway Corporation (KRC)

A stakeholder meeting was held with KRC as follows:

Date: 17th November 2004, 10:00am

Place: Kenya Railway Corporation

Attendance: Mr. James Kimuyu, Project Manager – Planning & Research,
JICA Study Team - Mr. M. Koto

Highlights of the discussion that will have an important bearing on the project's planning direction are as follows:

Improvement of existing commuter train facilities

Many stations have no platform because the railway line has been mainly used for freight services. Therefore, it is necessary to improve the station facilities such as building platforms for a more convenient and safe loading/alighting of rail passengers.

Commuter train arrangement and capacity of the train are limited owing to inadequate number of coaches. Commuter trains use the extra coaches of the intercity service.

Proposed lines

The following three directions are the possible commuter train lines in the future.

From existing Limuru commuter line near Kibera station to Kangemi

From Uhuru Hwy/Lusaka Road intersection to Ongata Rongai.

From Makadara to Kayole

Others

Considering the future population in the Metropolitan Area, the decentralized urban structure pattern is more favorable for the Nairobi Metropolitan Area.

2 Association of Safety for International Road Transport (ASIRT)

A stakeholder meeting was held with ASIRT as follows:

Date: 22nd November 2004, 10:00am

Place: International Business Centre

Attendance: Mrs. Jo Leyland of ASIRT

JICA Study Team - Mr. M. Koto

The following were the highlights of the discussion.

Organization

Association of Safe International Road Travel (ASIRT) was formed by Dr. David Silverstein following the loss of his son through a bus crash. It is an international organization whose objective is to support road safety initiatives.

The Matatu Owners Association Kenya (MOAK) is an association of matatu owners who are keen to make their business more effective and efficient. It was established in 2003.

Problems identified

Wage system – the current system where drivers are paid on a daily basis does not generate much sense of responsibility for the vehicle. The main objective of the drivers is to make as many trips as possible with little regard for road safety.

- Matatu owners do not take full control in running their vehicles. There is no proper cooperation between the drivers and matatu owners.
- Passengers are not well informed about traffic rules and regulations and therefore often cause drivers to break rules such as stopping at places which are not designated bus stops.
- There is no coordination between the private sector and government in the provision of public transport.
- The change from low-capacity to high-capacity vehicles should be gradual (implemented in stages) because the matatu industry is a small enterprise business, therefore many owners may not easily afford to buy the more expensive high-capacity buses. It was suggested that one way of encouraging this change is through capacity building for the matatu owners.
- Funding – while many organizations including the World Bank, DFID, USAID have shown interest in the joint initiative between MOAK and ASIRT, none has promised to provide any funding towards the initiative.

Finally, both of us agreed that there should be greater cooperation between JICA Study Team, ASIRT and MOAK.

3 Kenya Bus Services (KBS)

A stakeholder meeting was held with KBS as follows:

Date: 22nd November 2004, 2:00pm

Place: Mr. Mukabana's Office at KBS

Attendance: KBS - Mr. Mukabana (Managing Director)

JICA Study Team - Mr. M. Koto

The highlights of the meeting were as follows;

- Unfair competition – Established bus companies are experiencing unfair competition from the informal matatu industry because the matatu industry is not controlled by the government. For instance, while the bus companies have to pay taxes for their employees, matatu owners don't pay any taxes for their staff.
- Double-decker buses were previously introduced during the 1960's and 1995 but they never performed well on both occasions due to high maintenance cost. There are plans to reintroduce them but no specific details are available.

- While many Public Transport Policies have been done, all have just remained on paper and none of them has yet to be implemented.
- There is lack of standardization of operational systems between matatus and bus companies. The current situation is more favourable to the matatus.
- The attitudes and behaviours of most drivers of public transport vehicles needs to be changed. They need to be educated on traffic safety issues and road discipline.
- Economic instruments such as zero rating VAT on spare parts may be used to encourage people to invest in high-capacity public transport vehicles.
- Travel speeds in the city centre have reduced from 34 kph in the 1980's to about 14 kph at present due to traffic congestion.
- There is no clear distinction between logistics and passenger transport. At the moment many public transport vehicles carry both goods and passengers.

Finally, Mr. Koto requested bus transport for data and the managing director noted the request.

4 ITDG

A stakeholder meeting was held with ITDG as follows:

Date: 23rd November 2004, 2:00pm

Place: International House Business Centre

Attendance: ITDG - Ms. Rahabat Mundara

JST - Mr. S.Toda

After explanation of the purposes of the meeting by JICA Study team, Ms R. Mundara pointed out the followings issues and requested to take them into consideration for the Master Plan.

Decongestion of CBD

Every public transport enters the city centre, and it is difficult to control these traffics. To decongest the CBD, it is required to stop the public transport from entering the city, and to use shuttles in CBD. The study is required where the public transport be controlled.

Accessibility of Various Place of CBD

On Mama Gina Street, non-MT traffic area is successfully established. This concept must be expanded in the city centre for improve accessibility of various place of CBD on foot.

Private Vehicle Control

For long term solution, private vehicles that enter the centre must be controlled. There are not sufficient spaces for parking. To find parking places, many cars move around. It is proposed

that private vehicles are parked outside CBD to stop the private cars from entering CBD. It is required in the Master Plan to study the parking issues.

Sharing the Road with Hand-carts in CBD

At present the central market is located in the CBD. The central market was planned to relocate in the eastern area by KFW four years ago. But CCN rejected this plan. They wanted to keep the Central Market within the City jurisdiction.

Every morning (7 to 9 am), there are a large number of hand-carts that carry vegetables to hotels and small traders. These hand carts pass through Uhuru Highway and Jogoo Roads where the traffic conflicts take place against motorised transport.

Traffic safety of Cyclist

Since the passenger number on matatu is controlled and increase the fare, many people use bicycle. Safety of cyclist becomes a new problem. Major road improvement must integrate safety measures for cyclist and pedestrian. The following routes of bicycle are proposed.

- Ngong Road: The most critical route because many peoples commute between Kibera and Industrial Area. They start waling since 6:00 am in the morning.
- Thika Road:

In addition to the traffic safety, facilities of police stations or posts are required for human security and safety of pedestrians and cyclist.

NMT route

The following routs are proposed:

- Thika Road: City centre to Thika Town. KUTIP proposed route is too short;
- Ngong Road: City Centre to Karen; and
- Jogoo Road: City centre to outside of Outer Ring Road up to built-up areas. (not stop a junction).

A meeting of resident and cyclist in this area was held in two weeks ago. They used bicycle for their business, such as delivering service of milk and bread, and Boda-Boda (bicycle taxi).

There are three problems for cycle promotion as follows:

- Conditions of roads;
- Conflicts of MT and NMT: When accident occurred, the police complained a cyclist; and

- Condition of bicycle: Quality of spare parts produced in Kenya is low. Kenya Bureau of Standards intends to intervene the quality improvement.

Bicycle Parking Space in CBD

In CBD, bicycle parking space is needed.

Promotion of Cycling City

Access and connectivity to education facilities is required. The people consider that using bicycle is for the poor. We need to change this culture. Before the introduction of new rule, the children could stand by the mother and pay half of the fare of adult. At present, matatu requests full fare for children because all passengers must sit on the seat. Many children are forced to walk to the school at long distance. A transport plan is required for children.

Public Transport Efficiency

The study initiated by “Sustainable Urban Transport of African Network (SUSTRAN) in Kenya is the final stage. For Kenya, A Rapid Transport System is proposed to introduce a public transport lane in Waiyaki Way and Uhuru Highway as pilot project. The project proposal under “Global Village Environmental Program has been sent to UNDP. UN HABITAT (Mr. William) is coordinator. The aim is to improve air pollution, but also improve the traffic efficiency.

Small Trader Space on MNT Route

Small trader space on NMT route is required. CCN relocated them but they returned soon. The arrangement of their space must be incorporated in the plan. They are neglected in the plan.

Development of Small Centres and New Land Use Plan

Besides the city centre, small centres must be developed like the Karen Centre where the area changes from high residential area to sub-divisions now. Renewal of the land use plan is delayed too much. There is no control of the land use.

5 Westlands Resident Association (WRA)

A stakeholder meeting was held as follows:

Date: 18th November, 11:30am

Place: International House Business Centre

Attendance: WRA - Mr. Shirish Shah,

JST: Mr. Bekki (Team leader), Mr. Isomoto and Mr. Mwangi

The following were the suggestions from Mr. Shirish Shah of Westlands Association:

- Traffic Enforcement – Installation of traffic signals and other traffic management measures cannot work unless there is enforcement of the existing rules and regulations by traffic police.
- Traffic education – both the police and the public need to be educated on road discipline.
- To control movement of traffic through intersections, yellow boxes should be introduced, the intention being that drivers may not enter the box unless they can leave. This would ensure that intersections are always kept clear.
- Parking – parking should be prohibited on selected roads within the CBD to allow easy movement of through traffic. It was suggested that Off-street parking be recommended in the Master Plan.
- Stricter control on parking should be enforced to prevent illegal parking. An example of Moi Avenue was given where the change from flash parking to angle parking has reduced the capacity of the road.
- The main reason why the traffic police do not perform their duties effectively is because they lack MOTIVATION and INTEREST in their work.
- To reduce the number of private vehicles in the city, public transport should be improved to encourage people to use it.
- Minor modifications on the existing roads such as constructing missing links, canalisations, road markings, providing NMT facilities, junction improvement would help reduce traffic congestion and improve traffic flow.

Finally, he proposed that JICA do a Pilot Bicycle Scheme from Kangemi through Westlands to Nairobi.

6 Muthaiga Resident Association (MRA)

A stakeholder meeting was held as follows:

Date: 11th November, 11:00am

Place: International House Business Centre

Attendance: MRA - Mrs. B. Robin (Vice chairperson), Mrs. Ruberti, Dr. H. Croze,

JST - Mr. Bekki (Team Leader), Mr. Toda (Deputy Team Leader),

Mr. Isomoto and Mr. Mwangi.

The following is the summary of the discussion of the meeting:

- Mr. Bekki started by explaining that the pilot project is part of the study whose aim is to determine which type of intersection is most suitable. He explained that

because of time limitations and lack of adequate funding, only the improvement of the round about was possible at this time.

- The Muthaiga Association explained their proposal regarding the planned ring road connecting Muranga Road and Limuru Roads and also their proposal on the Muthaiga Bypass. They also gave a presentation on the likely environmental impact of constructing the Muthaiga Bypass.
- Mr. Bekki suggested two other alternative alignments for the same bypass and said that all three alternatives would be carefully evaluated.

Finally, the Muthaiga Resident Association's representative was informed that the final master plan study report would be ready in October 2005 and that before then they were allowed to raise any suggestions or objections on any issues.

7 Kenya Forest Working Group

A stakeholder meeting was held as follows:

Date: 23 November 2004, 2:00pm

Place: Meeting Room, International Life House

Attendance: Dr. Kambe (Member of Kenya Forest Working Group)
JST - Mr. Bekki, Mr. Toda, Mr. Isomoto (JICA Study Team)

After explanation of the purposes of the meeting by JICA Study team, Dr. Kanbe pointed out the followings issues of the Southern Bypass construction, and requested to take them into consideration:

- The route to be planned will pass through the areas having about 10km of length and 60m of width in the Ngong Road Forest and Dagoretti Forest.
- The following wild plants and animals are found:
 - Endangered species of Cactus near Wilson Airport
 - Kikuyu Swamp for migrate birds
 - Ngong Road Forest and Dagoretti for special species of birds
 - Useful wood in the Ngong Forest for resident of Kibera
- Mitigation measures
 - Realignment of habitat of cactus in the above area.
 - Use the present roads for Ngong Forest area
 - Realignment of Kikuyu area
- Demolition in Kibera area for new Link roads

8 Commuter Welfare Association (CWA)

A stakeholder meeting was held as follows:

Date: 23 November 2004, 2:00pm

Place: Transcom House, MORPW

Attendance: CWA - Mrs. Lynette Kaloo, Director of Finance, CWA,
JST - Mr. M. Koto

The following were the proposals from Commuter Welfare Association:

- Construction of parking bays and rehabilitation the existing ones due to the inconvenient and inadequate current parking facilities especially for the women.
- Construction of Ring roads 15 kilometers from the city centre to avoid the concentration of too much traffic to the city centre.
- Rehabilitation of estate routes to improve accessibility to the many upcoming unplanned residential estates with poor access roads.

9 Public Transport Consultant

A stakeholder meeting was held as follows:

Date: 30th November 2004, 2:00pm

Place: International House Business Centre

Attendance: Mr. Ian Barret – Public transport consultant,
JST- Mr. M.Koto

The summary of discussion is as follows:

- The bus/matatu operational statistics presented during the stakeholders meeting (such as daily passenger numbers for buses and matatus) seem very low as compared to data from Matatu Welfare Association and that collected by Ian Barret.
- The data presented during the last stakeholder meeting was as a result of a one-day survey done by KBS. We understand that this is not complete PT data in Nairobi Metropolitan Area.
- Ian Barret is carrying out a comparative study for institutional and financial conditions of public transport in four African cities with the aim of developing a best practice and a framework.
- His impression of the study from our presentation was that its aim was to provide short-term solutions to the transport problems.
- Our scope of work is a comprehensive master plan targeting the year 2025.

- The efficiency of bus companies may be increased by running them as a franchise – bus leasing.
- Mass transport may not be viable in Nairobi because of the lack of concentration of public transport demand.

10 UN-Habitat

A stakeholder meeting was held as follows:

Date: 6th December, 2004, 10:00am

Place: Mr. B. William's Office at UN-habitat

Attendance: UN-Habitat, Mr. Brian Williams,
JST, Mr. T. Bekki and Mr. M.Koto

The following is a summary of discussion:

- Coordination between JICA Study and other relevant agencies/organizations. Mr. Williams offered to act as a facilitator between the various concerned stakeholders.
- Slum upgrading – A slum upgrading project in Kibera is currently underway which involves among other things, development of local streets to include cycle and footpaths.
- It was suggested that there should be coordination between UN's local street network and JICA's road network development.
- Mr. Williams has an idea of experimenting with a bus priority lane along Uhuru Highway from Kangemi to the Airport. The plan however is still in its initial stage.
- The cheaper urban transport should be integrated as part of the urban transport investment.

11 MOLH: Department of Housing

A stakeholder meeting was held as follows:

Date: 10th and 14 December, 2004, 10:00am

Place: Mr. Simon Opondo 's Office

Attendance: MOLH-Chief Architectural Office, Mr. Simon Opondo,
JST, Mr. S. Minato

The following is a summary of meeting.

- Kibera is an area created by the Colonial Government to house the soldiers during the independence war in 1950s. Since then the area grew as the residential areas of

low-income households. These days there are a large number of squatters congesting the area.

- There is no road reserve joining your Missing Link No.12 and Southern Bypass, whose road reserve exists in the south of Kibera Slum.
- There is Kibera Slum Up-grading Project undertaken. Any GOK agencies, donors, international and national NGOs are encouraged to participate since the project's approach is very holistic that ranges from transportation to domestic science to public health including AIDS/HIV campaigns to education to sport activities to micro-economic development and enterprises. JICA Study Team could participate in its capacity to solve the transportation problems.

12 MORPW

A stakeholder meeting was held as follows:

Date: 15th December, 2004, 10:00am

Place: Mr. J. Nganga's Office

Attendance: MORPW, Mr. J. Nganga, Road Clearance and Right of Way
JST, Mr. S. Minato

The following is a summary of meeting.

- There is no road reserve going through Kibera Slum between District Officer's Office to the bottom of the valley at present.
- There has been demolition of structures in order to create proposed alignment of the road inside Kibera Slum.
- Final alignment of the road reserve is with Chief Surveyor's Office.

13 UN-Habitat

A stakeholder meeting was held as follows:

Date: 17th December, 2004, 15:00pm

Place: Mr. B. William's Office at UN-habitat

Attendance: UN-Habitat, Mr. Brian Williams
JST, Mr. S. Minato

- In addition to the meeting held on 6th December, 2004, Mr. Brian Williams and JICA Study Team's Mr. S. Minato discussed specifically on the issues related to Kibera Slum Up-grading Project in relation to the Master Plan for Transport Improvement in the Nairobi Metropolitan Area. The following is a summary of discussion.

- Slum Up-grading project has been agreed to proceed in June 2004 and launched in October 2004. It is a project to up-grade all sort of urban infrastructure up-grading project including road development.
- A pilot project of Slum Up-grading Programme launched in Soweto area, the village in the east of Kibera, is not affected by the link road under consideration by JICA's Master Plan.
- The link road passing through Kibera should be constructed as planned because it is so effective to Kibera Slum in terms of socio-economic of the area. Kibera has been developed during the past decades and it is now with almost no effective linkages to the outside the slum i.e. it is a "socio-economic fortress" within Nairobi.
- It is not necessary to plan alternative route but the present plan of link road passing through Kibera is just right. However, the road should be equipped with non-motorized transportation system. Thereby such a dead-locked slum area receives such a large corridor of traffic i.e. it provides "wind tunnel effect" on the socio-economic conditions of Kibera Slum. What is more important with the link road construction project is that not only Kibera Slum but also business areas in Nairobi as a whole will receive a great benefit from such "wind tunnel effect" of the link road construction project.
- I would like to emphasize once again that the link road should go through Kibera Slum as planned but it should take care of all sort of non-motorized transportation system not only internal but also external access of the public transportation system.
- UN-Habitat is quite willing to support on the resettlement matter i.e. the link road project is worth to implement despite such large number of resettlement is involved.

14.5.2 Minutes of Meeting of the Second Stakeholders Meeting

MINUTES OF MEETING OF THE SECOND STAKEHOLDER MEETING

Place: Kenya School of Monetary Studies

Time: 3rd February, 2005

Opening Ceremony

Eng. B. G. Ariga of Ministry of Local Government presided over the opening ceremony. Deputy Town Clerk of Nairobi City Council presented the opening speech of the second stakeholder meeting for the Study on Master Plan for Urban Transportation in the Nairobi Metropolitan Area.

Session I

Eng. J.N. Maina who represented the Chief Engineer (Road) of MORPW presented the minutes of the first stakeholder's meeting for recapitulation of the participants. JICA Study Team then presented the "Master Plan Scenario" containing the findings of the study to date as follows:

- 1) Result of Traffic Analysis presented by Mr. K. Isomoto;
- 2) Progress of IEE presented by Mr. S. Minato;
- 3) Master Plan Scenario presented by Mr. T. Bekki;
- 4) Road Network, Non-motorised Transport and Problem Areas of the Master Plan Scenario presented by Mr. T. Toda;
- 5) Public transportation and traffic management presented by Mr. M. Koto; and
- 6) Funding of the Urban Transport Development presented by Dr. T. Hashimoto.

During the presentation, participants queried 1) if contents of socio-economics study on the social environment impact assessment were articulated; 2) If other traffic master plans were incorporated into the Master Plan study of JICA Study Team; and 3) the development plans of Karen-Langata area's physical development plan was incorporated into the Study. The chairman of the meeting responded that these are the issues possibly to be discussed in the afternoon session, which is for group discussions.

Session II

After the lunch break participants were divided into three groups for discussion on the theme of master plan as follows:

- 1) Road Network and Non-motorised Transportation;
- 2) Public Transportation (Bus, Matatu and Railway); and

- 3) Traffic management.

Group 1: Road Network and Non-motorised Transportation

The group discussion was centred on the principle of the master plan scenario which contained six alternatives and that the Alternative 3 was the selection of JICA Study Team. Thus the group discussed the six alternatives and the alternative 3 in particular.

- 1) The Group 1 agreed that the Alternative 3 was selected as Master Plan Scenario and provision of the maps showing the detailed layout of each project should be presented in the next meeting;
- 2) Eastern area of Nairobi including missing links and Eastern Bypass plan should be studied since it passes through one of the fast growing areas;
- 3) Care should be taken on the road reserves from the encroachment, and the natural environment and social environment affected by the projects should be addressed;
- 4) Short, medium and long term plan is considered;
- 5) Footpath for pedestrians and barrier-free facilities for disabled persons should be provided;
- 6) The way the intersection is improved should be explicitly illustrated and presented including short, medium and long term solutions such as geometrical improvement, signal system introduction, and others;
- 7) Missing links are constructed where appropriate and absolutely necessary;
- 8) Functional drainages, vehicle bridges and footbridges should be incorporated in the Study;
- 9) Landscaping by planting trees and flowers and grasses as well as street lighting should be incorporated in the road design of the Study;
- 10) Maintenance of the road conditions should be done by GOK and the road should not be looked as “maintenance free facility” and the stakeholders should change their attitude on the road maintenance works;
- 11) Nairobi river road should be environmentally friendly design and careful designing and construction manner for the riparian environment is important;
- 12) According to the detailed proposal, suggested components are constructed in a phased manner. The way construction phases are selected, it will affect the quality of each project component, especially those facilities catering for pedestrians, cyclists, disabled and man-drawn cart users;

Group 2: Public Transportation

Group 2 discussion on the suggestions on the improvement of transportation is summarised as follows:

- 1) Carry out thorough research works before any proposal is implemented;
- 2) Restructuring of the traffic system with transfer points of modal change should be incorporated in the study;
- 3) Construction of mass transit interchange outside of Nairobi should be considered;
- 4) Control the number of public service vehicles entering the city by use of buses and increase the fare of matatu in order to encourage use of buses;
- 5) Freight transportation should be rescheduled so as not to contribute congestions with passenger vehicle services;
- 6) Decentralize some service centres from the city such as Wakulima Market so as to contribute to decongestion of the road traffic;
- 7) Security and safety issues should be addressed in all the projects contained in the master plan scenario;
- 8) Development of NMT should be encouraged by providing walkways and shades along the road, which should be totally segregated from on-going traffic;
- 9) Encourage use of buses but at the same time improve comfortableness of riding them especially seating arrangements, which should be improved;
- 10) All stakeholders should be organized so as to form an agency which can bring the standard of transportation system to the required level;
- 11) The present arrangement on public transportation should progress to a new administrative model. This should be done in a phased manner with clearly marked goals and performance indicators;
- 12) Enhance the capacity of City Council of Nairobi in order to control the movement of vehicles entering the city;
- 13) Comprehensive land use plan of the city should be explicitly drawn;
- 14) Private sector should be mandated to participate and undertake responsibilities in the public transport management. Thereby local economy will be enhanced and that it should become a tool of depoliticising transport issues;
- 15) Railway stations should be increased along the railway lines in order to cater for short distance commuters between station. So that more commuters can safely ride the trains. Also, construction of light railway system should be considered where land is available;
- 16) Discourage the use of private vehicles by increasing the parking charges and re-introducing time-based and space-based charges; and
- 17) Encourage public participation in all transport projects.

Additional comments after the presentation of the result of Group 2 discussions was made that the possibility of allowing Kenyans to invest to the road project. There was also additional comment that there should be explicit planning for the people walking to work. Thus

improvement of facilities supporting them should be a part of the Study. Railway concession for privatization is another issue to the public transport. Eng. Ariga stated that the past failure discourages privatisation of railway. Interconnection with bus and railway should also be an important issue to look at.

Group 3: Traffic Management

1) Definition of Traffic Management

Traffic management is defined as follows:

Application of traffic management principles would have to ensure effective and efficient utilization of the roadway space, and to serve adequately to the general public.

2) Traffic Management Areas/Zones

Traffic management areas/zones are as follows:

- a. City Centre;
- b. Radial roads leading to CBD;
- c. Upper hill areas; and
- d. Peripheral commercial centres such as Gigiri Village market, Westland, etc.

3) Traffic Management Policies

a. Demand Management

i. Service Oriented Policy

- Decentralization of services from CBD such as government offices;
- Public transport service improvement such as terminals, frequency of services, comfort of vehicles and security;

ii. Infrastructure

- Parking management
- One way streets

iii. Regulations

- Staggering working hours
- Priority on high occupancy vehicles
- Increase parking charges to bar vehicles from CBD

b. Establishment of Urban Traffic Management Body

To plan and coordinate all traffic management issues with the established body is essential.

- 4) Enforcement of Regulations
 - a. Coordination of various enforcement agencies is necessary
 - b. Training on enforcement of the regulations is required

- 5) Implementation and Maintenance
 - a. Effective coordination of implementation for traffic issues;
 - b. Development of performance measures
 - c. Continuous monitoring and evaluation of the performance measures

- 6) Resources Generation, Allocation and Utilization
 - a. Issues of public-private partnership should be discussed to realize.
 - b. Issues of concession/privatization should be considered.
 - c. Modalities of budgetary allocation need to be re-addressed by the relevant government authorities.
 - d. Availability of land as resources should be explicitly studied.

- 7) Road Safety and Security
 - a. Road safety and its education should be well understood by all road users and the traffic police should be fully involved.
 - b. Schedule and introduce proper curriculum on road safety education in schools.
 - c. Elaborate explicit high way code.
 - d. Layout of explicit policy on road safety is elaborated.
 - e. Publicity on road safety such as road safety campaigns through media.
 - f. Intensify police patrol on roads, car parks and terminals.
 - g. Provision of phone booths on road for emergency communication should be considered;
 - h. Provision of adequate street lighting is necessary for security ; and
 - i. Screening of passengers before they embark on their trip is necessary for security.

- 8) Legislation
 - a. Consideration to harmonize the various traffic laws under different acts in order to successfully implement and manage enforcement of these laws.
 - b. Legislation for instant fines and heavy penalties for not observing the regulations should be considered.
 - c. Develop a point system to be incorporated into insurance laws such as a driver who has high accident rate should be charged more.
 - d. Monitor the operation of driving schools and regularly conduct tests on their instructors.

9) Safety Facilities for Disabled

Facilities for crossing road for disabled people from safety point of view should be considered.

Closing Remarks

JICA Study Team has been working on the solutions of the urban transport. What makes this study different from the past studies is that it may have to look for the funding sources for implementation of some of the recommendations during the study. Westland roundabout improvement project was one of them that should play an important part of the Study as pilot project. Such pilot project's implementation was a great enhancement to the knowledge of the ministries concerned with the Study.

Issues on the environment, both positive and negative, are looked at quite closely with the development of urban transport. Missing links, which are featured in the past studies are being studied in the Study. The missing sections, which are necessary to solve traffic problems in the city are looked at within the framework of the Study. Traffic management issue are the other important issues in addition to the missing link construction works that had to be included in the JICA Study Team.

In principle, the selection of the Alternative 3 was agreeable, which is the expansion of the basic policy of the government proposal. Thus fundamental and critical issues would hopefully be solved in addition to the NMT issues, which should be discussed and would become a part of the Study. To achieve the overall objective of the Study, the completion of small projects including the Pilot Project would lead us to a successful implementation of larger projects and beyond.

Minutes of Meeting: Second Individual Stakeholder Meeting

Table: List of Organizations Invited for Individual Stakeholder Meeting

	Name of Organization	Main Topics
1	UN-Habitat Mr. Brian Williams	Kibera Slum Up-grading Programme Incorporation of UN-Habitat to the Master Plan
2	Menya Railway Mr. P. J. Mainga	Proposal that appears in the Interim Report
3	Kenya Bus Services Mr. T. Mukabana	Proposal that appears in the Interim Report
4	Kenya Association of Manufacturers Mr. Fred Kariuki	Transportation problems in relation to the Business in Kenya

1 UN-Habitat

An individual stakeholder meeting after the second stakeholder meeting was held as follows:

Date: 10th February, 2005, 10:00am

Place: Mr. B. William's Office at UN-habitat

Attendance: UN-Habitat, Mr. Brian Williams,
JST, Mr. T.Bekki, Mr. K. Isomoto and Mr. S. Minato

Mr. Brian Williams stated that UN-Habitat wrote a letter, which sent out to JICA Kenya Office on 14th January 2005, requesting to be included in the Steering Committee of the Master Plan Study. He stated that UN-Habitat has been undertaking Kibera Slum Up-grading Project and it also possess expertise on the transport issues related to eliminate poverty. With these tools UN-Habitat could become a supporting organization in terms of the promotion of transport improvement in Nairobi for the years to come even after JICA Study Team completed the master plan study.

Mr. T. Bekki commented that the reply to the letter might be in the process and that he felt MoRPW would have to make the final decision to the suggestion. Mr. B. Williams of UN-Habitat noted if it has to write a separate letter to MoRPW. He has further suggested if JICA Kenya Office could write a letter to make a recommendation to MoRPW for holding a talk on the issue. Mr. T. Bekki noted his words would be conveyed to JICA Kenya Office.

Mr. B. Williams tabled a set of document showing the location of Kibera Slum Up-grading Project which involves multiple sectors of Nairobi ranging from public transportation including railway, water supply, sanitation, public health, housing etc. UN-Habitat now holds various

project liaison officers promoting participation of various donor organizations and public companies as well as NGOs.

Based on the detailed road construction plan, Mr. B. Williams stated that the external public transportation system linking to the internal transportation system of Kibera Slum is essential. He stated that the link road going across Kibera Slum is especially important in terms of best utilization of such a concentrated population as urban workforce. Instead of avoiding the link road going across Kibera Slum area, the link road project should be positively reconsidered as trunk line of transportation hitherto the local residents never had chances to enjoy its effectiveness. If the link road project was carried out, contribution of such urban workforce to the economy in Nairobi would be drastically expanded.

Mr. B. Williams further stated that the coordination between JICA and UN-Habitat is needed, particularly for the future possible study on access roads adjoining Kibera Slum area, if such study could be implemented. Mr. T. Bekki agreed on this matter.

Mr. T. Bekki noted the comments made by Mr. B. Williams would be incorporated into the final report of the master plan study. For this matter, Mr. B. Williams stated, that the project on the missing link No.6 and 7 would play an important role for the purpose of up-grading Kibera Slum.

2 Kenya Railway

An individual stakeholder meeting after the second stakeholder meeting was held as follows:

Date: 17th February, 2005, 10:00am

Place: Office of Kenya Railway Services

Attendance: Kenya Railways - Mr. P. J. Mainga (Stock Control Officer)

JST - Mr. M. Koto, Mr. T. Kimura, Mr. S. Mwangi

The aim of the meeting was to present the draft report on the proposed improvement of the commuter rail service. The following was discussed:

- The team from KR confirmed that the assumed figure of 24,000 passengers per day was correct.
- For the commuter service to meet the current demand, 70 coaches are required from the current average of 44 coaches.
- All members agreed that it is necessary to urgently improve the current condition of the commuter services, especially the coaches and the stations (by introduction of platforms)

- Mr. P. J. Mainga suggested that the improvement of stations should include construction of exit markets and recreational facilities.
- On concessioning, Mr. Mainga clarified that the program is still in the debate stages and that it should not affect the proposed improvements to the commuter rail.
- The team from Kenya Railways asked whether there was a possibility of obtaining funding from the Japanese Government to implement the proposed improvements. The JICA Study team responded that further study on the current conditions of the commuter rail service would be required for such funding to be considered by the Japanese Government.

Finally it was agreed that a meeting should be arranged between JICA Study Team leader and the Managing Director of Kenya Railways to allow further discussions on JICA Study Teams' proposed improvements to the commuter rail.

3 Kenya Bus Service

An individual stakeholder meeting after the second stakeholder meeting was held as follows:

Date: 22nd February, 2005, 10:00am

Place: Office of Kenya Bus Services

Attendance: Kenya Bus Services - Mr. T. Mukabana (Managing Director)
JST - Mr. M. Koto, Mr. T. Kimura, Mr. S. Mwangi

The aim of the meeting was to present the draft report on the proposed improvement of the commuter bus services. The following was discussed:

- Mr. Mukabana suggested that the Ngong road corridor does not only attract traffic from high class residential areas but also from satellite towns such as Ngong, Kikuyu and also some long distance traffic from as far as Kisumu, therefore a bus way may be necessary along the corridor. The Study Team agreed on the proposal.
- Mr. Mukabana noted that because of the lack of standards in the public transport sector, the informal operators undercut the formal operators (mainly BusTrack) because they (informal operators) incur less operating expenses. The Study Team concurred and stressed the need to introduce standards for public transport operators and suggested the formation of a Nairobi Transport Authority.
- The Managing Director suggested that there was need to reduce the journey times for bus so as to increase the number of trips made per day. The Study Team agreed and added that the move from low-capacity to high-capacity vehicles would help reduce the journey times.
- Finally it was agreed that one way of giving incentives to bus operators was through Public Private Partnerships (PPP).

4 Kenya Association of Manufacturers

An individual stakeholder meeting after the second stakeholder meeting was held as follows:

Date: 19th February, 2005, 14:00am

Place: Meeting Room, Kenya Association of manufacturers (KAM)

Attendance: Mr. Fred Kariuki (KAM) and members of Infrastructure Committee of KAM
Mr. S. Minato (JST)

Mr. F. Kariuki presented a paper concerned with the “Infrastructure and Competitiveness of Kenya Industry”. He also presented recent incidents on the traffic safety. He stated that the traffic issues are heavily related to the competitiveness and productivity of the Kenya’s manufacturing industry. He stated that, KAM as a pressure group for Kenyan manufacturing industry, it is deeply concerned with efficiency in road and rail transport, telecommunications, and airport/seaport as well as the energy in terms of their cost and performance.

Mr. F. Kariuki stated that since he was not able to attend the second stakeholder meeting, he requested JICA Study Team to present the up-to-date result of the study, which contains bypass road, improvement of the existing roads including missing links and signalization as well as the capacity building of traffic-related institutions.

Mr. F. Kariuki stated if priority of the road improvement could be placed on Eastern Bypass and Southern Bypass, Kenya’s manufacturing industry would greatly be benefited. It is his reasoning that the raw material manufacturing centre of Thika is in need of proper transportation route to the industrial area of Nairobi. Thus Eastern Bypass is a lifeline to the manufacturing industry in Kenya. On the other hand, KAM is concerned to divert heavy vehicles carrying goods to Uganda and other countries inland, Southern Bypass is vital. Thereby traffic congestion is reduced in Nairobi and therefore Kenya’s manufacturing industry should greatly benefit.

Mr. S. Minato stated that the final result will be presented at the third stakeholder meeting. Mr. F. Kariuki and members of Infrastructure Committee of KAM noted that they will try to attend the meeting.

14.5.3 Minutes of Meeting of the Third Stakeholders Meeting

MINUTES OF MEETING OF THE THIRD STAKEHOLDER MEETING

Place: Kenya School of Monetary Studies

Time: 3rd March, 2005

Opening Ceremony

Eng. B. G. Ariga of the Ministry of Local Government presided over the opening ceremony. After the self introduction of participants, Mr. J. Gakuo, Town Clerk of Nairobi City Council, presented the opening speech of the third stakeholder meeting for the Study on Master Plan for Urban Transportation in the Nairobi Metropolitan Area.

Session I

Eng. J.N. Maina who represented the Chief Engineer (Road) of MORPW presented the minutes of the second stakeholders meeting for recapitulation of the participants. JICA Study Team then presented the “Overall Implementation Programme” containing the result of the study on Alternative 3, which was suggested to select as the Master Plan during the second stakeholders meeting as follows:

- 1) Overall Implementation Programme presented by Mr. T. Bekki;
- 2) Road Network and Non-motorised Transport presented by Mr. T. Toda;
- 3) Public transportation and traffic management presented by Mr. M. Koto;
- 4) Result of IEE presented by Mr. S. Minato; and
- 5) Pilot Project at Westlands presented by Mr. K. Isomoto.

During the presentation, participants queried or commented 1) if classification and hierarchy of the road network was appropriate and if each class of road’s function is appropriate ; 2) if BOT of Southern Bypass Construction Project was the appropriate option and how it is implemented; 3) if uniformity on the security and safety on NMT of the Master Plans Study and other GOK studies are considered; 4) if the relocation plan was appropriately elaborated with a number of alternatives within the framework of the Master Plan; 5) if the contents of Master Plan Study was implemented, it might become the same as before and congestion would return if the Master Plan Study was not taking care of the urban poor which is accounted for 50% of the urban population; 6) if any other follow-up actions are taken in the future in relation to Westlands roundabout improvement project; 7) if past flooding incidents have been studied and incorporated into the Master Plan Study; 8) if land acquisition is involved, indicated in the master plan the locations of land acquisition; and 9) the importance of the presentation was well registered by the participants.

The chairman of the meeting and JICA Study Team responded to some of the queries 1) City centre's hawkers have been removed recently and a lot of effort was paid to it; 2) matters of compensation in Kenya is not a simple task but solved through complicated process of meetings and negotiations i.e. new dimension on resettlement plan is elaborated in the modern society taking care of their destinations; 3) Westlands roundabout improvement has also brought to the new dimension of the solutions on traffic congestion and GOK has every reasons to appreciate it; 4) there will be a number of follow-up improvement works based on the recommendations of JICA Study Team and some are done within 1-2 months, and some would take further study and designing works.

For other queries, the chairman noted and that these queries are the issues possibly to be discussed in the afternoon session, which is for group discussions.

Session II

After the lunch break participants were divided into three groups for discussion on the theme of Master Plan as follows:

- 1) Road Network and Non-motorised Transportation;
- 2) Public Transportation (Bus, Matatu and Railway); and
- 3) Traffic management.

Group 1: Road Network and Non-motorised Transportation

The group discussion was centred on the proposed road network improvement project of the Master Plan's scenario. Thus the group discussed the way road network would be developed including NMT as follows:

1. Road Network Projects
 - 1) Terminology on "disabled" may have to be changed to "persons with disability" or "persons with physically challenged". Chairman noted;
 - 2) Contents of the proposed road improvement projects should be reviewed if it is in accordance with originally intended contents of study. A member of MORPW stated that the past studies, including Southern and Northern Bypass and others done by EU, WB as well as other countries have all been incorporated into the study and it is as we intended;
 - 3) There are environmental and socio-economic aspects considered for the bypass road project's study and these should be incorporated into the Master Plan. A member of MORPW stated that EIA study is a mandatory requirement of the laws of Kenya. Thus the environmental and social impact study and resettlement action plan should cater for mitigation measures for local residents;

- 4) Northern Corridor Project funded by WB should be incorporated into the Master Plan. A member of JICA Study Team stated that any road project undertaken or in the process of undertaking at present by concessionaire have been excluded from the Master Plan;
 - 5) Road design should incorporate the drainage system. A member of JICA Team stated it is incorporate but the design criteria in terms of flood return year is subject of feasibility study;
 - 6) The area from Outer Ring Road to Thika Road, the eastern fringe of the study is not quite included in the Master Plan. A member of JICA Study Team stated that it is included in the detailed report of the Master Plan;
 - 7) International highway of A2 and A104 should be joined properly and if it was incorporated in the Master Plan. A member of JICA Study Team stated that it is incorporated into the Master Plan.
2. Non-motorised Transportation (NMT)
- 1) If the road area for hand cart was considered and incorporated into the Master Plan. A member of JICA Study Team stated it is considered and incorporated into the study.
 - 2) How NMT is incorporated into the roads of different classes and how is it controlled with motorised traffic was not clearly explained. A member of JICA Study Team stated that hand cart should not be mixed with motorised traffic. At the road crossing, the traffic islands with streamlines at intersections should cater half-way crossing of it. Also the typical cross section could be modified.
 - 3) For the safety reasons, fences or barriers should be put up. The comment is noted.
 - 4) National Transport Policy should include the NMT facilities. The growing trend of NMT should also be incorporated into it.
 - 5) Cycling road seems not included in the Master Plan. There is no chapter discussed for the cycling in the Master Plan. Bicycle parking areas should also be developed and incorporated within the Master Plan. These comments are noted.
3. Others
- 1) Man-hole covers made of steel are stolen. Concrete covers should be developed and placed. Pavement damages have not been immediately taking care of. These matters should be addressed in the Master Plan. These comments are noted.
 - 2) Excavation for electricity and telephone are not properly back-filled and the City Council of Nairobi's administration should be enforced. The comment is noted.
 - 3) The area where modal change should take place must be properly designed with wide area of plaza, or open market area. Thereby modal interchange areas would be able to cater for a large number of people. The comment is noted.
 - 4) The Master Plan should have its own power of mandatory for implementation.

Group 2: Public Transportation

Group 2 discussion on the suggestions on the improvement of transportation is summarised as follows:

- 1) For the inter-modal change system is introduced, busses should be operated to and from railway stations. Also railway raiding ticket and bus riding ticket should be incorporated into one system.
- 2) Private operation of public transport system should be allowed:
- 3) It is absolutely important to integrate urban development and land use and it should be associated with the Master Plan. Thereby public transportation system is strategically laid out.
- 4) Development of functional road network directly connecting old and new industrial areas should be considered. Thereby effective public transportation is possible to develop in order to take care of the growing number of industrial workers.
- 5) Modal interchange areas should be developed in the areas near CBD.
- 6) Bus stops may have to be developed on the secondary and tertiary roads in order to avoid congestions on the main road.

Group 3: Traffic Management

- 1) Traffic management zones should be redefined. Other than CBD, there are Industrial Area, Westlands and Kilimani Business Districts. These areas should also be treated equally as CBD and comprehensive traffic management within these districts should be exclusively studied.
- 2) Increase capacity of traffic by introducing one-way streets and reduce the traffic conflicts.
- 3) Increase a number of commercial centres other than CBD. Thereby traffic is diverted to other commercial centres.
- 4) Increase number of parking areas in CBD and other commercial areas and different parking charges. Suggested one day charge could be 1 hour charge.
- 5) Purchase vacant land at present for future parking area development.
- 6) Uhuru Park's parking area should also be made available for public parking. However, security is not assured at present.
- 7) Road signs are not adequately supplied in Nairobi. More permanent nature of road signs should be developed.

Wrap-up of the Meeting

The chairman stated that there are a large number of participants contributed to this stakeholders meeting and a lot of meaningful contributions from the NGOs concerned with transportation, institutions and government staff as well as other organizations have been made during the last two meetings as well as the one we have held today. We have looked at road networks, public transportation, traffic management and environmental management issues. Presentation on circular road development around CBD was particularly important for the future development. Not only for the CBD but also the surrounding towns of Thika, Mavoko and Limuru should also receive benefit from the Master Plan Study. To close the this meeting, Director of Physical Planning of the Ministry of Land and Housing, Mr. L. Mbwaga gives closing remark.

Closing Remarks

Nairobi has historical and chronicle development problems on various issues from Kibera Slum development to industrial area development to the CBD development. These areas should be supported by proper road development schemes. Thereby slum dwellers do not have to walk to work. On the other hand, dispersing development from the centre of city to the periphery in terms of business and industrial development appears to be important while configuration of the CBD development scheme fell behind the schedule. Even moving of the administration from the city centre would contribute. However, the lack of framework to guide the local administration for urban growth has been hampering effective growth of urban area in the city of Nairobi.

Issue of traffic congestion was coupled with the regional political strife. Sudan and Somalian political turmoil added the population increase of Kenya. Thereby Nairobi grew into the direction not quite the way it was intending. Recently, therefore, discussions on Nairobi Metropolitan Authority were held at parliament and this should begin taking its form. After the organization is established, further discussion should taka place to which direction Nairobi would be developed in terms of political and physical plans.

Bypass construction projects would be looked at which it will take more vital role for the development of Nairobi. At every effort these roads are legitimately implemented by GOK. Parking area development project would fuel to the development of Nairobi to a large extent. Park the private cars and ride public transportation system, or walk to work in CBD would be another solution to reduce the present traffic congestions. Introduction of one way traffic should become very effective and would become easy way to manage traffic. In addition working hour staggering is to create time lag of traffic congestion.

Nairobi Metropolitan Authority should handle all these issues as soon as it assumes its role. It would be a very new and difficult scheme for the City Council of Nairobi to handle the matter seriously with the new organization. I hope it would be successful and thank for the contribution today to all of you.

14.6 VIEWS OF THE PEOPLE IN NAIROBI ON THE TRAFFIC ISSUES

1 Unpaved road shoulders

These are not well protected. This inhibits vehicles from pulling off the road safely. Thus, the road spaces are used as bus stops or parking area. This contributes to the slowing down or stoppage of the ongoing traffic that causes further traffic congestion.

2 Outdated roads designs

Most of the roads in Nairobi were designed during the colonial Era and no major modification have taken place since then to take care of the increased number of motor vehicles and population. Such concerns are of the size of the roads e.g. Ngong Road that is very narrow and roundabouts that are longer effectively functional especially in absence of traffic policemen.

3 Small bus stops

Bus-stops are too small to accommodate full lengths of buses when they pull off the road to drop or pick passengers. As such, excessive number of buses and matatus are parked on the side of the road. This consequently contributes to traffic congestion.

4 Inadequate pedestrian facilities

In most road intersections pedestrian crossing ways and traffic signal as well as pedestrian bridges should be provided. One of the examples is the intersection of Lang'ata and Mbagathi Road largely ignoring the safety of pedestrians. However, it has lately been observed that the City Communities have started paying attention to some road issues. An example is the Nakumatt chain of Stores who have included provision of pedestrian facilities at the Dagorretti corner round about at the junction of Ngong road and Naivasha road. In a few sections there are safe pedestrian walk ways protected for vehicle encroachment.

5 Lack of sidewalk

Except for very few places within Nairobi, such as the area around state house and Kenyatta Avenue, Dagorreti roundabout, there are no sidewalk exist for the pedestrians in most parts of the city. This leaves the pedestrians sharing the road space with motorist, which is dangerous. Sidewalks should be wide enough for a lot of people comfortably and safely walk with joy. It should also provide areas of street activities not only for selling things at a number of kiosks but also for cultural activities. Further, malfunction of drainage system in the city causing flooding when it rains the flooding is so serious that some vehicles stall in the middle of the road causing serious traffic jam.

6 No provision for parking outside the CBD

Currently all motorists are allowed to drive to city or through it. There is no provision of convenient and safe parking outside the city. This resulted to traffic congestion as motorists rush in and out of town in the morning and evening.

7 Encroachment by non-motorised transport systems

Bicycles and man-driven carts also compete for road space. This is a contributor to traffic congestion in addition to endangering human life, as accidents are likely to occur when being overtaken by motorists.

8 Insecurity

City of Nairobi is very unsafe especially at night due to lack and or absence of street lighting, which contribute a great deal to this insecurity. Insecurity has also been cited as a cause of traffic congestion especially in the evenings because motorists rush to be at their homes before dark to avoid attacks by gangsters at night. In safer situations, people would generally work late in their offices. This would greatly reduce the traffic congestion.

9 Railway

The Mombasa train that passes through the city environs carries people to and from the city on its way to from Mombasa. Another Kisumu bound train carry people from or to Kikuyu on its way from or to Kisumu. There are no trains that serve the city commuters per se.

10 Non-motorized transport

The most prevalent non-motorized transport modes in East and central Africa are walking, cycling and handcarts. In the city of Nairobi this transport system includes the handcarts, commonly known as mkokoteni, bicycles, wheel chairs and walking. During this study the authors noticed a large population of handcarts (mikokoten) within the city centre. These are largely means of transporting goods from the famous farmers market commonly known as “marigiti” on Haile Sellassie Avenue, and from other smaller ones like Hawkers Market on Limuru Road. They are also seen ferrying goods of one kind or the other within the central business district.

The mkokoteni are mainly for transporting goods while bicycles in Nairobi are usually one-man transport system unlike in other cities for example Kisumu where they are used like “taxis”. Wheel chairs used by physically handicapped are also common in the city. Walking is also a common mode of transport especially for the working poor who cannot afford fair to their working places. In the morning and evening long queues of walking workers to and from industrial area are very conspicuous along the main roads of the city.

Handcarts have two important functions as a source of employment and as means of transport for personal or occupational reasons. In Nairobi 65% of handcarts serve the main central markets, 24% a round bus terminus and the remaining 12% on the streets.

It is worth noting that all the non-motorized transport system competes for space with the motorized transport system. Since they are pushed and pulled by man, they move at a very aslow speed hence causing traffic congestion because they compete for road space with vehicles since there is in no provision for non-motorized transport in this city. Non-motorized transport needs to be taken into consideration in planning to increase the mobility levels of the majority of rising urban populations as follows:

- a) Improvement of urban traffic management and infrastructure facility.
- b) A change of the transport user attitudes towards non- motorised transport.
- c) More research in non-motorised transport which is scarcely documented.

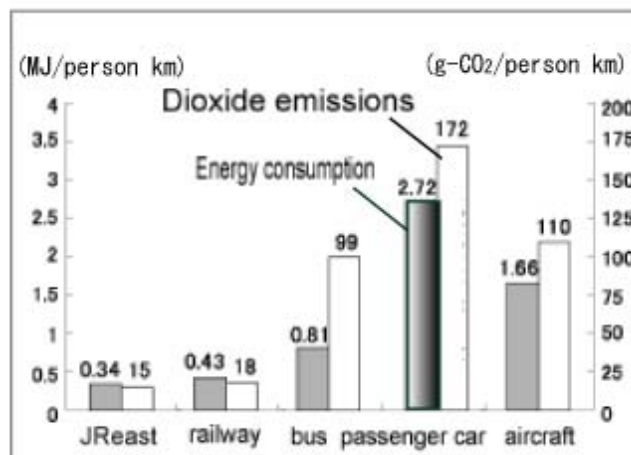
14.7 GLOBAL WARNING

1. Change of Transportation

Global warming is a complex phenomenon dependent on the density of green house gases such as carbon dioxide, methane and nitrous oxide in the atmosphere. Human activities affect the amount of greenhouse gases in the atmosphere contributing to global warming.

Greenhouse gases are composed of several types of gases. The highest proportion is carbon dioxide (64%), followed by methane (19%), fluorocarbon (10%), and the remaining 7% are composed of other gases.

Figure 14.7-1 shows a comparison of the energy consumption and carbon dioxide emissions of transport of one person per 1km. When a passenger car is compared with a bus, the passenger car consumes about three times the amount of energy than a bus, and emits twice as much carbon dioxide. It can be said that bus is more environmental friendly mode of transport compared with passenger car from the viewpoint of energy consumption and carbon-dioxide emissions.



Source: Society Environmental Report, 2002 (East Japan Railway)

FIGURE 14.7-1 ENERGY CONSUMPTION AND CARBON DIOXIDE EMISSIONS OF TRANSPORTATION

Energy consumption and CO₂ exhaust in 2025 are estimated using the coefficient in Figure 14.7-1. The results are available in Table 14.7-1.

TABLE 14.7-1 ENERGY CONSUMPTION AND CO₂ EXHAUST (2025)Energy Consumption and CO₂ Exhaust (2025)

		Walk	Car	Bus	Rail	Total	
Trips	Do-Nothing(2025)	3,613,716	2,156,541	2,481,632	24,020	8,275,909	
	Master Plan(2025)	3,302,738	2,069,525	2,849,800	53,830	8,275,893	
Trip*km	Do-Nothing(2025)	8,488,986	18,330,055	23,111,184	366,074	50,296,299	
	Master Plan(2025)	6,951,110	16,081,988	26,124,200	821,775	49,979,073	
Energy (MJ/Day)	Unit(MJ/person*km)	0.00	2.72	0.81	0.43		
	Do-Nothing(2025)	0	49,857,751	18,720,059	157,412	68,735,221	
	Master Plan(2025)	0	43,743,007	21,160,602	353,363	65,256,972	
	(M/P)-(D/N)	0	-6,114,743	2,440,543	195,952	-3,478,249	per day
CO ₂ (g/Day)	Unit(g-CO ₂ /person*km)	0.0	172.0	99.0	18.0		
	Do-Nothing(2025)	0	3,152,769,531	2,288,007,197	6,589,331	5,447,366,059	
	Master Plan(2025)	0	2,766,101,931	2,586,295,772	14,791,955	5,367,189,658	
	(M/P)-(D/N)	0	-386,667,600	298,288,574	8,202,624	-80,176,401	per day
	Energy Save Effect(%)=		5.1				
	CO₂ Decrease Effect(%)=		1.5				

The figures in the table shows that a reduction of 5.1% in energy consumption and 1.5% in carbon dioxide emission (CO₂) can be achieved if a shift from passenger car to bus and railway is realized in 2025. This will help reduce greenhouse gases which are contributing to global warming.

2. Deforestation

As mentioned, carbon dioxide makes up 64% of the world's greenhouse gases. The equation for the amount of carbon dioxide absorbed by trees, used by the Intergovernmental Panel on Climate Change (IPCC) is shown below.

$$\text{Absorption Amount of CO}_2 = (\text{FA} \times \text{ABGF}) \times 0.5 \times 44/12 \quad (1)^1$$

where

FA = Forest area

ABGF = Amount of biomass growth for forest

When a cut down tree is burnt, CO₂ is released. This discharge however is not considered here making the results conservative. The amount of biomass growth is 2.6~3.9 ton/ha, based on a sampling investigation in the forests of Japan².

¹ Independent Administrative Agency, Forestry and Forest Products Research Institute

² "Global Warning Forest Monitoring by Land ecosystem" (Forestry Agency, 1995-1997)

Assuming the lost of biomass growth is 3.9 ton/ha, which is a rather safe assumption, the amount of CO₂ absorption per year for Missing links 3, 6 and 7 is 0.5 ton. This point is expanded below.

$$0.5 \text{ ton} = (0.07\text{ha} \times 3.9 \text{ ton/ha}) \times 0.5 \times 44/12$$

0.07ha = Area deforested by the road works is assumed by the number of cut down trees. (75)

$$(\text{Number of cut down trees by the road works}) \times 9 \text{ m}^3 / 10,000 \text{ m}^3 = 0.07 \text{ ha}$$

The amount of biomass reproduced by solar energy on the earth every year is estimated to be 170 billion tons (carbon conversion is 80 billion ton)^{3,4}. The lost of 0.5 ton of carbon dioxide per year is very small compared to 80 billion ton. Taking this into account, in addition to the fact that the deforestation is for the road works, the deforestation is considered acceptable.

³ Biomass Resources, Energy, and Biomass Production, Kazuo Shibata, Shuua Kitani, 1981

⁴ Biomass Energy, Ecology and Energy, Energy and Society in the future, Energy, Resource Society, Hideo Iwaki, 1990