

Chapter 11

Economic Evaluation and Budget Resources Analysis

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11.1 Project Cost and Traffic Forecast

11.1.1 Project Cost

(1) Project Cost (Financial Cost)

Table 11.1.1 shows a summary of the cost of the projects. The summary cost description of the 3 projects is tabulated in the clear outline below.

Table 11.1.1 Project Costs and Yearly Allocation

Project Name	Project Cost Component				Distance	Cost/km
	Construction	Land Acquisition	Engineering	Total	Km	US\$/km
1) Homa Bay-Mbita	11,985,471	194,900	887,814	13,068,185	42.41	308,139
2) Bumala-Port Victoria	9,945,898	5,470	736,734	10,688,102	42.99	248,618
3) Rongo-Obembo	4,664,016	0	345,483	5,009,499	19.02	263,436
Project Name	Yearly Allocation			Yearly Allocation		
	1st Year	2nd Year	3rd Year	1st Year	2nd Year	3rd Year
1) Homa Bay-Mbita	4,560,146	6,933,623	1,574,416	34.9%	53.1%	12.1%
2) Bumala-Port Victoria	3,369,725	5,755,462	1,562,911	31.5%	53.0%	14.6%
3) Rongo-Obembo	0	1,384,316	3,625,181	0.0%	27.6%	72.4%

1) Homa Bay – Mbita Road Upgrading Project

- a. Project: Upgrading from earth road to bituminous road.
- b. Length of the existing road: 42.40 km
- c. Length of the project road: 42.41 km
- d. Project cost: 13,068,000 US\$ (943,523,000 Ksh.)
- e. Project cost per km: 308,139 US\$ (22,271,000 Ksh.)
- f. Project cost component:
 - Construction cost: 11,985,000 US\$
 - Engineering cost: 888,000 US\$
 - Land acquisition cost: 195,000 US\$
- g. Construction period: 3 years
- h. Yearly allocation of cost: 1st year: 35%, 2nd year: 53%, 3rd year 12%

2) Bumala – Port Victoria Road Upgrading Project

- a. Project: Upgrading from earth road to bituminous road.
- b. Length of the existing road: 43.60 km
- c. Length of the project road: 42.99 km

- d. Project cost: 10,688,102 US\$ (771,681,000 Ksh.)
- e. Project cost per km: 248,618 US\$ (17,950,000 Ksh.)
- f. Project component:
 - Construction cost: 9,946,000 US\$
 - Engineering cost: 737,000 US\$
 - Land acquisition cost: 5,000 US\$
- g. Construction period: 3 years
- h. Yearly allocation of cost: 1st year: 32%, 2nd year: 54%, 3rd year 15%

3) Rongo – Ogembo Road Upgrading Project

- a. Project: Upgrading from earth road to bituminous road.
- b. Length of the existing road: 19.60 km
- c. Length of the project road: 19.02 km
- d. Project cost: 5,009,000 US\$ (361,686,000 Ksh.)
- e. Project cost per km: 263,436 US\$ (19,016,000 Ksh.)
- f. Project component:
 - Construction cost: 4,664,000 US\$
 - Engineering cost: 345,000 US\$
 - Land acquisition cost: 0 US\$
- g. Construction period: 3 years
- h. Yearly allocation of cost: 1st year: 0%, 2nd year: 28%, 3rd year 72%

The cost is estimated on the basis of 1999 prices. Fifteen percent of the physical contingency including price escalation is included in both construction and engineering costs. An exchange rate of 72.2 Ksh. to 1 US\$ as of the study year is used in the analysis. One Kenya pound is 20 Kenya shillings.

Original cost estimate for Homa Bay – Mbita Project is separated into 3 segments, Homa Bay – Obanda, Obanda – Mbita, and Mbita – Mbita causeway. However, the three segments are not analysed separately in the economic analysis, since traffic volume and character are presumed to be homogeneous through the 3 segments. The project of Bumala – Sio Port, and Sio Port – Port Victoria are also handled as one segment for the purpose of economic analysis.

(2) Estimation of Economic Cost

The financial cost estimate based on the market price does not express the real value of resources. The economic cost is therefore adopted to correct the price distortion in order to express the real price of resources to be used in terms of money value. It is calculated by removing many distorted factors such as import taxes, regulation of minimum wage of unskilled labour, monopoly of land, and the foreign exchange rate fixed by the Government, etc.

Table 11.1.2 shows the procedure and result of the conversion calculation for Homa Bay – Mbita project. Appendix Table 11.1.1 and 11.1.2 show those of Bumala – Port Victoria and Rongo – Ogembo projects.

Table 11.1.2 Conversion to Economic Cost from Financial Cost

Homa Bay - Obamda - Mbita - Causeway 42.41km Unit: 1000 Ksh.

Items	Project Costs In Market Prices	Foreign Portion	Local Portion					Overall Conversion Factor	Investment Costs in Economic Prices
			Tradable	Non- tradable	Skilled	Unskilled	Transfer		
			Goods	Goods	Labor	Labor	(Tax)		
		1.005	1.004	0.996	0.985	0.300	0		
Construction	865,351	30%	15%	10%	5%	20%	20%	66%	572,040
Land Acquisition	14,072			80%				80%	11,212
Engineering	64,100	60%			20%		20%	80%	51,267
Total	943,523								634,520

Conversion to economic cost from financial cost is calculated based on the following assumptions.

a. Composition of foreign and local portion:

-Construction cost: foreign portion 30%, local portion 70%

-Engineering cost: foreign portion 60%, local portion 40%

-Land cost: local portion 100%

b. Tax: 20%. Eliminated from financial cost.

c. Real value of unskilled labour: 20% adopted to market price as economic price.

d. Productivity of land: assumed 80% of market price as economic cost.

Table 11.1.3 shows economic costs of investment and Table 11.1.4 shows economic cost of maintenance corrected from financial costs. The economic cost of capital investment is 33 % lower than the market price.

Table 11.1.3 Comparison between Financial Cost and Economic Cost

Unit: 1000 Ksh.

	Project Cost in Market Price	Project Cost in Economic Price	Conversion Ratio
Homa Bay-Mbita	943,523	634,520	67.3%
Bumala-Port Victoria	771,681	517,554	67.1%
Rongo-Ogembo	361,686	242,553	67.1%
Bitumen			
Routine Maintenance			24.0%
Pothole & Resealing			66.1%
Gravel/earth			
Routine Maintenance			24.0%
Grading & Graveling			66.1%

Routine maintenance cost in terms of market price per year is 9,155,000 Ksh /km., which is calculated as 2,195,000 Ksh/km. for the economic cost. This is because 80% of the cost is accounted for the unskilled labour cost, and the real value rate is calculated at 20% to make the wage closer to the real value of the workers. Appendix Table 11.1.3 and 11.1.4 show the calculation for Bumala – Port Victoria and Rongo – Ogembo projects.

As economic costs express the real value of resources to be used in the project, these figures are to be compared with project benefits in the economic analysis.

Table 11.1.4 Comparison between Financial and Economic Costs of Maintenance

Homa Bay - Mbita Road Project 42.41 km

No.	Year	Financial Maintenance Cost				Economic Maintenance Cost			
		Routine	Pothole	Graveling	Total	Routine	Pothole	Graveling	Total
		Ksh/1m			1000Ksh	Ksh/1m			1000Ksh
4	2004	9,155	100,959	0	4,670	2,195	66,739	0	2,923
5	2005	9,155	108,531	0	4,991	2,195	71,744	0	3,136
6	2006	9,155	116,671	0	5,336	2,195	77,125	0	3,364
7	2007	9,155	125,421	0	5,707	2,195	82,910	0	3,609
8	2008	9,155	134,828	1,206,884	57,290	2,195	89,128	797,811	37,708
9	2009	9,155	144,940	0	6,535	2,195	95,812	0	4,157
10	2010	9,155	155,810	0	6,996	2,195	102,998	0	4,461
11	2011	9,155	167,496	0	7,492	2,195	110,723	0	4,789
12	2012	9,155	180,058	0	8,025	2,195	119,027	0	5,141
13	2013	9,155	193,562	1,206,884	59,781	2,195	127,954	797,811	39,355
14	2014	9,155	208,080	0	9,213	2,195	137,551	0	5,927
15	2015	9,155	223,686	0	9,875	2,195	147,867	0	6,364
16	2016	9,155	240,462	0	10,586	2,195	158,957	0	6,834
17	2017	9,155	258,497	0	11,351	2,195	170,879	0	7,340
18	2018	9,155	277,884	1,206,884	63,357	2,195	183,695	797,811	41,719
19	2019	9,155	298,725	0	13,057	2,195	197,472	0	8,468
20	2020	9,155	321,130	0	14,007	2,195	212,283	0	9,096
21	2021	9,155	345,214	0	15,029	2,195	228,204	0	9,771
22	2022	9,155	371,106	0	16,127	2,195	245,319	0	10,497
23	2023	9,155	398,938	1,206,884	68,491	2,195	263,718	797,811	45,113
24	2024	9,156	428,859	0	18,576	2,195	283,497	0	12,116

25	2025	9,157	461,023	0	19,940	2,196	304,759	0	13,018
26	2026	9,158	495,600	0	21,407	2,196	327,616	0	13,987
27	2027	9,159	532,770	0	22,983	2,196	352,188	0	15,029
28	2028	9,160	572,728	1,206,889	75,862	2,196	378,602	797,814	49,985

11.1.2 Traffic Volume Estimation

Data for traffic estimation is based upon the following two studies: the Traffic Count Study implemented by MOR&PW, in 1995, and the Supplementary Traffic Study implemented by the Study Team in 1999 (see Chapter 2).

Table 11.1.5 shows a summary of estimated traffic for the three projects. Benefit to bicycle users is anticipated. Hence the traffic volume of bicycles is included in the estimation.

Table 11.1.5 Estimation of Future Traffic Volume by Vehicle Types and by Year

Unit: Vehicle /day

Project	Year	Pass.Car	M.Cycle	Bus	S.M. Trucks	H.Truck	Total	Bicycle
Homa Bay-Mbita	1999	22	5	42	13	41	123	1113
Bumala-Port Victoria		18	31	36	11	13	109	2006
Rongo-Ogembo		22	16	59	23	26	146	525
Homa Bay-Mbita	2004	32	7	60	19	59	177	1,598
Bumala-Port Victoria		26	45	52	16	19	156	2,880
Rongo-Ogembo		32	23	85	33	37	210	754
Homa Bay-Mbita	2014	65	15	124	38	121	364	3,293
Bumala-Port Victoria		53	92	107	33	38	323	5,936
Rongo-Ogembo		65	47	175	68	77	432	1,553
Homa Bay-Mbita	2024	134	30	256	79	250	750	6,787
Bumala-Port Victoria		110	189	220	67	79	665	12,233
Rongo-Ogembo		134	98	360	140	159	890	3,202

Source: JICA, Supplementary study in 1999

Source: MOR&PW, Traffic Count Survey in 1995

Traffic volume is estimated for the 25 years beginning in the year of the project completion. The rate of increase in traffic is estimated at 7.5% per year for all vehicle types. It should be noted, however, that both the past traffic count survey by MOR&PW has shown the rate to be over 7.5% in some stations.

11.2 Project Benefits

Countable benefits from the project consist of the following items.

- Vehicles... .. Vehicle operating cost saving benefit
- Roads... .. Road maintenance saving benefit
- Passengers... .. Passenger time cost saving benefit
- Fish transport... .. Fish Spoilage cost saving benefit

e) Induced traffic Induced benefit

11.2.1 Vehicle Operating Cost Saving Benefit

(1) Estimation of Unit Vehicle Operating Cost

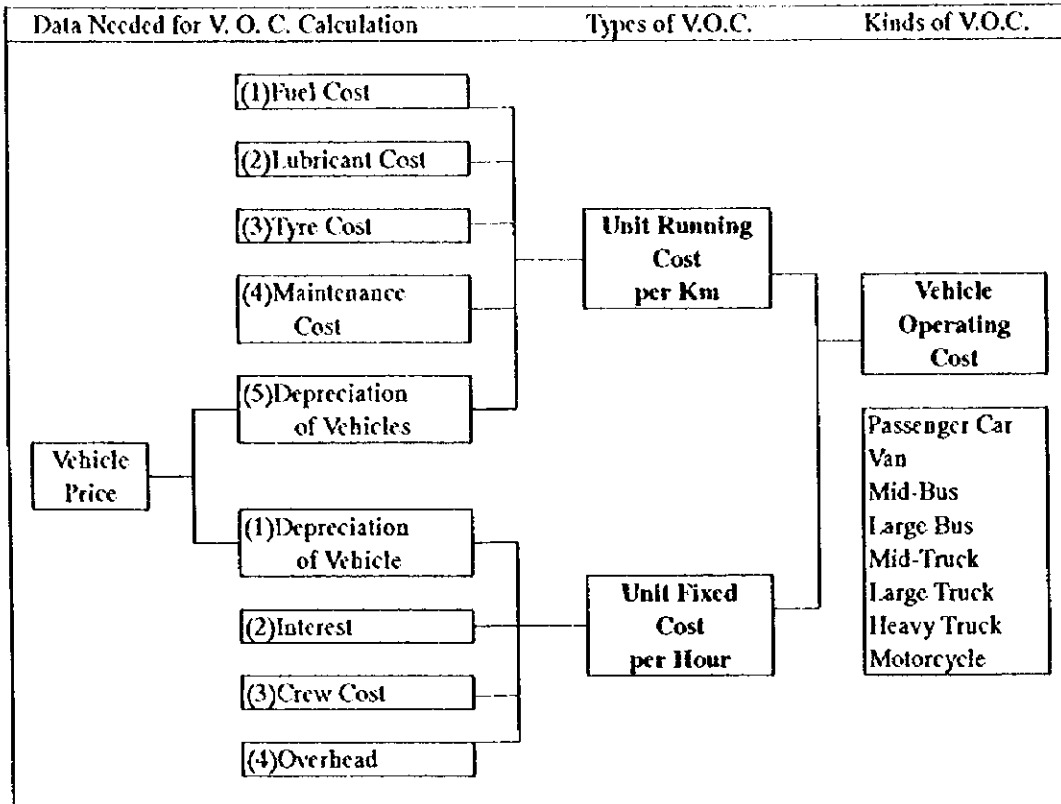


Fig. 11.2.1 Diagram Depicting Vehicle Operating Cost Estimation Procedure

Vehicle operation cost (VOC) can be divided into two major groups: 1) running cost, and 2) fixed cost. Vehicle running cost changes in proportion to vehicle running conditions and vehicle usage conditions. As shown in Fig. 11.2.1, the running cost of vehicles consists of five factors: 1) fuel cost, 2) lubricant cost, 3) tyre cost, 4) maintenance cost, and 5) depreciation cost related to running distance.

Fixed cost accrues by possessing a vehicle and not by driving. As shown in the Table 11.2.1, there are four items which define the fixed cost such as 1) depreciation cost related to time consumed, 2) interest cost, 3) crew cost, and 4) overhead cost.

**Table 11.2.1 Input Data for Unit Vehicle Operating Cost Calculation
by Base Speed**

Unit : Ksh./Vehicle

Items	Passenger Car	Matalu (Bus)	Large Bus	Medium Truck	Heavy Truck	Motor Cycle
Vehicle Price(Excl.Tyres)Fin-Ksh.	1,978,611	1,968,405	4,500,000	1,749,760	4,585,000	155,000
Vehicle Price(excl.Tyres)Econ-Ksh.	1,601,427	1,712,505	3,914,995	1,592,282	4,155,095	140,467
Vehicle Life(Years)	8	8	8	8	8	6
Vehicle Life Km	104,000	382,500	320,000	224,000	322,500	90,000
Vehicle Annual Km	13,000	47,813	40,000	28,000	43,000	15,000
Vehicle Life Operating Hours	4,000	12,750	12,800	9,600	11,250	3,600
Vehicle Annual Operating Hours	500	1,594	1,600	1,200	1,500	600
Fuel Price (Fin-Ksh./Liter)	44.3	37.8	37.8	37.8	37.8	44.3
Fuel Price (Econ-Ksh./liter)	37.7	32.1	32.1	32.1	32.1	37.7
Fuel Consumption (Liter/Km)	0.13	0.18	0.25	0.27	0.30	0.03
Tyre Unit Price (Fin-Ksh./Price)	4,000	7,720	10,880	16,000	36,000	4,000
Tyre Unit Price (Econ-Ksh./Price)	3,400	6,562	9,248	13,600	30,600	3,400
Number of Tyres	4	4	6	6	10	2
Tyre Life -Km	30,000	30,000	40,000	40,000	40,000	30,000
Lubricants Price(Fin-Ksh./Liter)	190	190	190	190	190	190
Lubricants Price(Econ-Ksh./Liter)	162	162	162	162	162	162
Lubri.Oil Consumpt (Liter/1000km)	1.2	2.0	2.2	3.0	3.4	0.2
Maintenance Spares/Year (%)	7	8	10	8	8	3
Maintenance Labor(Hour/1000km)	3	15	15	12	15	2
Maintenance LaborCost(Fin-Ksh./h)	319	319	319	319	319	319
Maintenance LaborCost(Econ-K./h)	271	271	271	271	271	271
Depreciation.Distance Related(%)		80	85	70	70	60
Depreciation.Time Related(%)	100	20	15	30	30	40
Opportunity Cost of Capital(%)	12	12	12	12	12	12
Real Rate of Interest of Capital (%)	16	16	16	16	16	16
Overhead cost(Annum Fin-Ksh.)	231,000	231,000	210,000	231,000	231,000	0
Overhead cost(Annum Econ-Ksh.)	196,350	196,350	178,500	196,350	196,350	0
Crew-Number(Driver)	0.5	1	1	1	1	0
Crew-Number(Assistant)	0	1	1	1	1	0
Crew Unit Cost (Fin-Ksh./Hour)	77	77	70	77	77	0
Crew Unit Cost(Econ-Ksh./Hour)	69	69	63	69	69	0

Prices of input items for Vehicle Operating Cost Estimation in Table 11.2.1 show the cost by items by vehicle types. The following items outlined in the table are obtained through the related organisations, 1) vehicle price, 2) fuel price/litre, 3) tyre unit price, 4) lubricant price/litre, 5) maintenance labour cost, 6) overhead cost, and 7) crew unit cost. Items in the table other than the aforementioned are collected from the data of IBRD and AASHTO with consideration to actual data obtained in the Study Area.

Table 11.2.2 presents the results of vehicle operating cost by vehicle types, which are estimated according to the following formula by using input data of Table 11.2.1.

Table 11.2.2 Composite Unit of Vehicle Operating Cost per Vehicle Km

Unit: Ksh/Km

Speed Km/h	Passenger Car			Bus			Truck			Motorcycle		
	Running	Fixed	Total	Running	Fixed	Total	Running	Fixed	Total	Running	Fixed	Total
10	17.5	8.1	25.6	29.5	7.0	36.5	52.8	10.7	63.5	31.2	0.3	31.6
15	16.1	8.1	24.1	27.4	7.0	34.5	48.1	10.7	58.8	31.2	0.3	31.6
18	14.7	8.1	22.8	25.6	7.0	32.6	43.9	10.7	54.6	31.2	0.3	31.6
20	13.5	8.1	21.6	23.9	7.0	31.0	40.1	10.7	50.8	31.2	0.3	31.6
25	12.4	8.1	20.5	22.5	7.0	29.5	36.7	10.7	47.5	31.2	0.3	31.6
30	11.4	8.1	19.5	21.2	7.0	28.3	33.8	10.7	44.5	31.2	0.3	31.6
35	10.5	8.1	18.5	20.2	7.0	27.2	31.4	10.7	42.1	31.2	0.3	31.6
40	9.8	8.1	17.8	19.4	7.0	26.4	29.3	10.7	40.1	31.2	0.3	31.6
45	9.1	8.1	17.2	18.8	7.0	25.8	27.8	10.7	38.5	31.2	0.3	31.6
50	8.5	8.1	16.6	18.3	7.0	25.4	26.6	10.7	37.4	31.2	0.3	31.6
55	8.1	8.1	16.2	18.1	7.0	25.2	25.9	10.7	36.7	31.2	0.3	31.6
60	7.8	8.1	15.8	18.1	7.0	25.2	25.7	10.7	36.4	31.2	0.3	31.6
65	7.5	8.1	15.6	18.3	7.0	25.4	25.9	10.7	36.6	31.2	0.3	31.6
70	7.4	8.1	15.5	18.8	7.0	25.8	26.5	10.7	37.3	31.2	0.3	31.6
75	7.4	8.1	15.5	19.4	7.0	26.4	27.6	10.7	38.4	31.2	0.3	31.6
80	7.5	8.1	15.6	20.2	7.0	27.2	29.2	10.7	39.9	31.2	0.3	31.6
85	7.8	8.1	15.8	21.2	7.0	28.3	31.1	10.7	41.9	31.2	0.3	31.6
90	8.1	8.1	16.2	22.5	7.0	29.5	33.6	10.7	44.3	31.2	0.3	31.6
95	8.5	8.1	16.6	23.9	7.0	31.0	36.4	10.7	47.1	31.2	0.3	31.6

Note 1): Refer to Appendix Table 11.2.1 Unit Vehicle Operating Cost per km by Base Speed.

Note 2): Refer to Appendix Table 11.2.2 Total Vehicle Operating Costs by Vehicle Groups

Note 3): Refer to Appendix Table 11.2.3 Vehicle Operating Cost by Different Speeds for Passenger Car, and Bus.

Note 4): Refer to Appendix Table 11.2.4 Vehicle Operating Cost by Different Speeds of Truck and Motorcycle.

- 1) Fuel cost/km: Fuel price/litre x fuel consumption /km by speed
- 2) Lubricant cost/km: lubricant price/litre x lubricant consumption/100km
- 3) Tyre cost/km: Tyre unit price / tyre life km
- 4) Maintenance
 - Spares portion/km: Vehicle price / vehicle life km x % of maintenance spare cost /year as % of vehicle price
 - Labour portion/km: (working hour/1000km x labour cost/hour) 1000
- 5) Depreciation
 - Distance related/km: Vehicle price / vehicle life km x distance ratio(40%)
 - Time related/km: Vehicle price / vehicle life hour x time related ratio (60%)
- 6) Overhead cost/km: Annual labour cost x annual working hour
- 7) Crew cost/km: Annual crew cost x time cost/hour

(2) Estimation of Vehicle Operating Cost Saving Benefit

Table 11.2.3 shows vehicle operating cost saving benefit accruing from the improvement of the 3 road projects. The benefit is calculated according to the following formula:

$$\text{Benefit} = \text{VOC by speed} \times \text{traffic volume} \times \text{average travelling distance} \times 365.$$

Benefit is estimated for 25 years. Estimation of benefit is based on the following assumptions.

Average vehicle-travelling speed in 1999 without project:

- 1) Passenger car: 35km/h, Average speed decreases by 2km/h every 2 years
- 2) Bus and truck: 30km/h, Average speed decreases by 2km/h every 2 years
- 3) Motoreycle: 25km/h, Average speed decreases by 2km/h every 2 years
- 4) Bicycle: 6km/h, Average speed decreases by 1km/h after 10 years

Average vehicle travelling speed with project does not change for project life:

- | | | | |
|-------------------|--------|----------------|--------|
| 1) Passenger car: | 70km/h | Bus and truck: | 60km/h |
| 2) Motoreycle: | 45km/h | Bicycle: | 10km/h |

Average travelling distance:

- | | | |
|--------------------------|----------------------|--------|
| 1) Homa Bay-Mbita: | 42.41km x 80% | 33.9km |
| 2) Bumala-Port Victoria: | 42.99km x 70% | 30.1km |
| 3) Rongo-Ogembo: | 19.02km x 80% | 15.2km |

Table 11.2.3 Estimation of Vehicle Operating Cost Saving on Project Roads

Unit: 1000Ksh./Year

Year	1) Homa Bay-Mbita 42.41km						2) Bumala-Port Victoria 42.99km						3) Rongo-Ogembo 19.02km						Total
	Average Travel Distance: 33.9 km			Total	Average Travel Distance: 30.1 km			Total	Average Travel Distance: 15.2 km			Total							
	Pass.Car	Bus	Truck		M.Cycle	Pass.Car	Bus		Truck	M.Cycle	Pass.Car		Bus	Truck	M.Cycle				
2004	1,702	3,683	17,050	40	22,475	1,227	2,831	6,785	227	11,070	763	2,340	6,862	59	10,024				
2005	1,915	4,191	19,138	47	25,290	1,380	3,221	7,616	265	12,483	859	2,663	7,703	69	11,293				
2006	2,059	4,505	20,573	50	27,187	1,483	3,463	8,187	285	13,419	923	2,862	8,280	74	12,140				
2007	2,314	5,119	23,068	58	30,558	1,667	3,934	9,180	332	15,113	1,038	3,252	9,284	86	13,660				
2008	2,487	5,503	24,798	63	32,850	1,792	4,229	9,869	356	16,247	1,115	3,496	9,981	92	14,684				
2009	2,792	6,242	27,777	72	36,884	2,012	4,798	11,054	413	18,277	1,252	3,966	11,180	107	16,505				
2010	3,002	6,711	29,860	78	39,650	2,163	5,158	11,883	444	19,648	1,346	4,264	12,018	115	17,743				
2011	3,367	7,602	33,415	90	44,473	2,426	5,843	13,298	514	22,080	1,510	4,850	13,449	133	19,921				
2012	3,619	8,172	35,921	97	47,809	2,608	6,281	14,295	552	23,736	1,623	5,192	14,457	143	21,415				
2013	4,056	9,245	40,160	112	53,573	2,923	7,106	15,982	637	26,648	1,819	5,874	16,164	165	24,021				
2014	4,360	9,938	43,172	120	57,591	3,142	7,639	17,181	685	28,646	1,955	6,314	17,376	177	25,823				
2015	4,882	11,229	48,226	138	64,474	3,518	8,631	19,192	788	32,128	2,189	7,134	19,410	204	28,937				
2016	5,248	12,071	51,842	149	69,310	3,781	9,278	20,631	847	34,538	2,353	7,669	20,866	219	31,107				
2017	5,871	13,622	57,863	171	77,526	4,230	10,470	23,027	972	38,700	2,633	8,655	23,289	251	34,828				
2018	6,311	14,644	62,202	183	83,341	4,548	11,256	24,754	1,045	41,603	2,830	9,304	25,035	270	37,440				
2019	7,055	16,506	69,371	210	93,142	5,083	12,687	27,607	1,198	46,575	3,164	10,487	27,921	310	41,881				
2020	7,584	17,744	74,574	226	100,128	5,465	13,639	29,677	1,287	50,068	3,401	11,274	30,015	333	45,022				
2021	8,471	19,979	83,105	258	111,814	6,104	15,357	33,072	1,472	56,005	3,799	12,694	33,448	380	50,322				
2022	9,106	21,478	89,338	278	120,200	6,562	16,508	35,553	1,583	60,206	4,084	13,646	35,957	409	54,096				
2023	10,164	24,157	99,487	317	134,125	7,324	18,568	39,592	1,806	67,290	4,558	15,348	40,042	467	60,415				
2024	10,926	25,969	106,949	341	144,184	7,873	19,960	42,561	1,942	72,336	4,900	16,499	43,045	502	64,946				
2025	12,186	29,180	119,016	388	160,770	8,781	22,428	47,363	2,212	80,785	5,465	18,539	47,902	572	72,478				
2026	13,100	31,368	127,942	417	172,828	9,440	24,110	50,916	2,378	86,844	5,875	19,930	51,494	615	77,914				
2027	14,602	35,212	142,284	474	192,572	10,522	27,065	56,623	2,705	96,915	6,549	22,372	57,267	699	86,886				
2028	15,697	37,853	152,955	510	207,015	11,311	29,095	60,870	2,907	104,183	7,040	24,050	61,562	751	93,403				

11.2.2 Road Maintenance Cost Saving Benefit

The existing earth road, without implementation of the project, requires regular road maintenance work. On the other hand, bituminous road, with project implementation, also needs road maintenance works.

Table 11.2.4 shows the results of calculation of road maintenance benefit with and without the project for Homa Bay- Mbita project while Appendix Table 11.2.5 and 11.2.6 show the results of Bumala – Port Victoria and Rongo – Ogembo.

Table 11.2.4 Maintenance Cost Saving Benefit With and Without the Project

HomaBay-Mbita Road Project										
No.	Year	Without Project				With Project				Maintenance Cost Saving Benefits
		Routine	Rtn. Grading	Graveling	Total	Routine	Pothole	Graveling	Total	
		Ksh./1km			1000Ksh	Ksh./1km			1000Ksh.	
4	2004	2,195	53,917	0	2,379	2,195	66,739	0	2,923	-544
5	2005	2,195	53,917	0	2,379	2,195	71,744	0	3,136	-757
6	2006	2,195	53,917	417,132	20,066	2,195	77,125	0	3,364	16,702
7	2007	2,195	53,917	0	2,379	2,195	82,910	0	3,609	-1,230
8	2008	2,195	53,917	417,132	20,066	2,195	89,128	797,811	37,708	-17,643
9	2009	2,195	53,917	417,132	20,066	2,195	95,812	0	4,157	15,909
10	2010	2,195	53,917	0	2,379	2,195	102,998	0	4,461	-2,082
11	2011	2,195	53,917	417,132	20,066	2,195	110,723	0	4,789	15,277
12	2012	2,195	53,917	417,132	20,066	2,195	119,027	0	5,141	14,925
13	2013	2,195	53,917	0	2,379	2,195	127,954	797,811	39,355	-36,976
14	2014	2,195	53,917	417,132	20,066	2,195	137,551	0	5,927	14,139
15	2015	2,195	53,917	417,132	20,066	2,195	147,867	0	6,364	13,701
16	2016	2,195	53,917	417,132	20,066	2,195	158,957	0	6,834	13,231
17	2017	2,195	53,917	417,132	20,066	2,195	170,879	0	7,340	12,725
18	2018	2,195	53,917	417,132	20,066	2,195	183,695	797,811	41,719	-21,653
19	2019	2,195	53,917	417,132	20,066	2,195	197,472	0	8,468	11,598
20	2020	2,195	53,917	834,265	37,752	2,195	212,283	0	9,096	28,656
21	2021	2,195	53,917	417,132	20,066	2,195	228,204	0	9,771	10,294
22	2022	2,195	53,917	417,132	20,066	2,195	245,319	0	10,497	9,568
23	2023	2,195	53,917	417,132	20,066	2,195	263,718	797,811	45,113	-25,047
24	2024	2,195	53,917	417,132	20,066	2,195	283,497	0	12,116	7,949
25	2025	2,195	53,917	417,132	20,066	2,196	304,759	0	13,018	7,048
26	2026	2,195	53,917	417,132	20,066	2,196	327,616	0	13,987	6,078
27	2027	2,195	53,917	417,132	20,066	2,196	352,188	0	15,029	5,036
28	2028	2,195	53,917	417,132	20,066	2,196	378,602	797,814	49,985	-29,919
		54,880	1,347,931	8,759,782	430,894	54,883	4,536,771	3,989,057	363,908	66,986

All costs are converted from financial costs to economic costs. For level of unit maintenance cost and maintenance methodology, refer to Chapter 8 'Road Maintenance Programme'.

11.2.3 Passenger Travel Time Cost Saving Benefit

(1) Estimation of Unit Time Cost of Passenger

Benefit of the time cost saving is calculated from the difference of running speed between the existing road and the project road. Beneficiaries of time cost saving are users of passenger cars, buses and motorcycles. Time saving benefit of vehicles is not included here because it is calculated in running cost benefit as a fixed cost item.

Passenger time value is a function of the wage rate and trip purpose. Time value was obtained from: a) gross domestic product per worker in the Study Area, b) income structure, c) working time value by type of vehicle users, and productivity of time saving by vehicle users.

Table 11.2.5 shows the distribution of income by the level of income in the Lake area. The figure generated for 1999 is based on the data in 1955, while the number of employment is determined by applying 1.58% per annum of population increase rate, and in terms of income it is applied 2.14% per annum of GRDP growth rate of the Lake area. Approximately 77% of the employees get an income between 6,000 to 15,000Ksh. per year.

Under 6,000Ksh./year	8.6%
6,000-15,000Ksh./year	77.5%
14,000-25,000Ksh./year	10.5%
Over 25,000Ksh./year	3.4%

Table 11.2.5 Distribution of Wage Employment and Income Groups in the Lake Area, 1955 – 1999

Income Group (Ksh./Year)	<2000	2000-3999	4000-5999	6000-7999	8000-14999	15000-19999	20000-24999	25000-29999	30000>	Total
Nyanza (Number)	121	957	1,218	39,457	1,105	1,214	628	2,093	1,077	47,870
Western (Number)	148	1,088	1,434	640	839	963	3,287	728	943	10,070
Total Lake Area 1955	269	2,045	2,652	40,097	1,944	2,177	3,915	2,821	2,020	57,940
1996 (Number)	273	2,077	2,694	40,731	1,975	2,211	3,977	2,866	2,052	58,855
1997 (Number)	278	2,110	2,736	41,374	2,006	2,246	4,040	2,911	2,084	59,785
1998 (Number)	282	2,143	2,780	42,028	2,038	2,282	4,104	2,957	2,117	60,730
1999 (Number)	286	2,177	2,824	42,692	2,070	2,318	4,168	3,004	2,151	61,690
Income Level in 1995	1,000	3,000	5,000	7,000	11,500	17,500	22,500	27,500	35,000	
1996 (Ksh.)	1,021	3,064	5,107	7,150	11,746	17,875	22,982	28,089	35,749	
1997 (Ksh.)	1,043	3,130	5,216	7,303	11,997	18,257	23,473	28,690	36,514	
1998 (Ksh.)	1,066	3,197	5,328	7,459	12,254	18,648	23,976	29,304	37,295	
1999 (Ksh.)	1,088	3,265	5,442	7,619	12,516	19,047	24,489	29,931	38,094	
Av. Income (Ksh.) / Employment, 1999		4,310		7,845		22,544		33,337		

Note 1): Excluding casual employees, unpaid family workers and unpaid directors.

Note 2): Towns with 1000 or more persons engaged since 1972

Source: Central Bureau of Statistics (Statistical Abstract, 1996,p302)

Table 11.2.6 shows working time value by income level. The group with the highest Working Time Value is assumed to be the user of passenger cars and the lowest to be bicycle users.

Table 11.2.6 Working Time Value by Income Level

Income Level	Income (Ksh./year)	Working Hour (H/Year)	Working Time Value (Ksh./h)	Vehicle Type
Highest	33,337	2,400	13.89	Passenger Car
Third	22,544	2,400	9.39	Motorcycle
Second	7,845	2,400	3.27	Bus
Lower	4,310	2,400	1.80	Bicycle

Time saving in terms of trip in relation to production generates a benefit. Time saving related to leisure as such, is not considered a benefit. Therefore the ratio of that portion is deducted.

Table 11.2.7 Transportation Time Value of Passenger by Types of Vehicles

Usage of Vehicle	Types by Passenger		Passenger Car	Motorcycle	Bus	Bicycle
Trip Purpose	Work	A	35%	35%	50%	15%
	Non-Leisure	B	45%	45%	25%	60%
	Leisure	C	20%	20%	25%	25%
Time Productivity	Work	D	35%	35%	15%	15%
	Non-Leisure	$e = b \times 0.50$	23%	23%	13%	30%
	Leisure	F	0%	0%	0%	0%
	of Time	$g = d + e$	58%	58%	28%	45%
Time Value/h	Working	H	13.89	9.39	3.27	1.80
	Trip	$I = g \times h$	7.99	5.40	0.90	0.81
No. of passengers	Passengers	J	3.00	1.06	25.00	1.01
Trip Time Value	Vehicle/h	$k = I \times j$	23.96	5.73	22.47	0.82
	Vehicle/Min.	$l = k / 60$	0.399	0.095	0.375	0.014

Note) Business trips are valued at 100% of wage while non work related trips are assumed at 50%.

The following value unit is used for estimation of passenger time saving benefit.

Time value per minute	Passenger car	0.399Ksh./minute
Time value per minute	Bus	0.375Ksh./minute
Time value per minute	Motorcycle	0.094Ksh./minute
Time value per minute	Bicycle	0.014Ksh./minute

(2) Benefit of the Time Cost Saving

Tables 11.2.8 shows the result of estimation of time cost saving benefit of the 3 road projects. These figures are based upon the calculation of the following 5 items: a) running distance, b) running speed, c) time value, d) traffic volume and e) vehicle types.

Table 11.2.8 Estimation of Time Cost Saving Benefit on Project Roads

Unit: 1000Ksh./Year

T. Value Year	Homa Bay-Mbita 42.41km						Bumala-Port Victoria 42.99km						Rongo-Ogembo 19.02km					
	0.399		0.375		0.095		0.399		0.375		0.095		0.399		0.375		0.095	
	Pass.Car	Bus	Truck	M.Cycle	Bicycle	Total	Pass.Car	Bus	Truck	M.Cycle	Bicycle	Total	Pass.Car	Bus	Truck	M.Cycle	Bicycle	Total
2004	152	318	0	11	65	546	109	245	0	60	118	532	68	215	0	65	251	599
2005	173	366	0	12	70	622	125	281	0	70	127	603	78	247	0	76	289	690
2006	186	394	0	13	75	668	134	302	0	76	136	648	83	266	0	82	310	742
2007	212	453	0	16	81	761	153	348	0	89	146	736	95	306	0	96	357	854
2008	228	487	0	17	87	818	164	374	0	96	157	791	102	329	0	104	384	918
2009	259	560	0	20	94	933	187	430	0	112	169	899	116	379	0	122	441	1,058
2010	279	602	0	21	101	1,003	201	463	0	121	182	966	125	407	0	131	475	1,138
2011	318	693	0	25	163	1,199	229	533	0	142	293	1,197	143	469	0	154	547	1,312
2012	342	745	0	27	175	1,289	246	573	0	153	315	1,287	153	504	0	166	588	1,411
2013	390	859	0	32	188	1,469	281	661	0	180	339	1,460	175	581	0	195	677	1,629
2014	419	924	0	34	202	1,579	302	710	0	194	364	1,570	188	625	0	210	728	1,751
2015	478	1,066	0	40	217	1,802	345	820	0	228	391	1,784	214	721	0	248	840	2,024
2016	514	1,146	0	43	233	1,937	370	881	0	246	421	1,918	231	775	0	267	904	2,176
2017	587	1,325	0	51	251	2,214	423	1,018	0	291	452	2,184	263	896	0	315	1,044	2,519
2018	631	1,424	0	55	270	2,380	455	1,095	0	312	486	2,348	283	963	0	339	1,123	2,708
2019	722	1,649	0	65	290	2,726	520	1,267	0	370	523	2,681	324	1,115	0	402	1,300	3,140
2020	776	1,773	0	70	312	2,930	559	1,362	0	398	562	2,882	348	1,198	0	432	1,397	3,376
2021	888	2,056	0	83	335	3,362	640	1,580	0	474	604	3,298	398	1,390	0	515	1,620	3,923
2022	955	2,210	0	89	360	3,615	688	1,699	0	510	649	3,545	428	1,494	0	553	1,742	4,217
2023	1,094	2,569	0	79	387	4,129	789	1,975	0	609	698	4,070	491	1,737	0	661	2,025	4,913
2024	1,176	2,762	0	93	416	4,448	848	2,123	0	655	750	4,375	528	1,867	0	711	2,177	5,283
2025	1,350	3,218	0	100	447	5,116	973	2,474	0	786	806	5,039	606	2,176	0	853	2,537	6,171
2026	1,452	3,460	0	119	481	5,512	1,046	2,659	0	845	867	5,417	651	2,339	0	917	2,727	6,634
2027	1,669	4,044	0	128	517	6,358	1,203	3,108	0	1,021	932	6,264	748	2,733	0	1,108	3,187	7,777
2028	1,794	4,347	0	153	556	6,850	1,293	3,341	0	1,098	1,002	6,733	805	2,938	0	1,192	3,426	8,361

11.2.4 Cost Saving Benefit of Commodities

(1) Transportation of Commodities by Truck

Table 11.2.9 shows the truck volume on the project road per day in 1999, in 2004, the opening year, and in 2010.

Table 11.2.9 Estimation of Truck Volume per Day on the Project Road

Project	Unit: Vehicle /day		
	1999	2004	2010
Homa Bay-Mbita	54	78	120
Bumala-Port Victoria	24	35	53
Rongo-Ogembo	49	70	109

According to the road user survey, the following corporations mainly possess trucks and operate transportation of commodities. Some operate everyday and others operate only once a week. Truck traffic comes in and goes out in the lake area.

Green tea... .. Tea factory
 Sugarcane, Fertilisers... .. Sugar company
 Tobacco, Tobacco leaves... .. Tobacco farmer
 Cotton... .. Cotton converter
 Fresh and Dried Fish, Ice... .. Fisherman Co-operative

Vegetables, Milk, Banana, Beans, Timber, Rice, Coffee, Meat... Market administrators

Pork, Daily Meat, Fuel... .. Trading companies

Transportation goods consist of various commodities: i.e. heavy agricultural products such as sugarcane with low value to light commodities like processed tea with high value.

With project implementation it is considered that the commodities in stock can be decreased, and saving capital and increasing productivity are expected by the decrease of transportation costs. Commodities that will be most positively affected through the implementation of the project, are tea and fish in this project area. The fishery industry especially will have the most benefit out of the project.

(2) Benefits of Fish Transport from Project

The kinds of fish found in this area are mainly Nileperch, Tilapia and Omema (small fish). There are 33 fish loading beaches around Mbita in Suba District and 17 around Port Victoria in Busia District.

Suba District: 10,928ton/year (20% of total catch of fish in the lake area)

Busia District: 15,082 ton/year (28% of total catch of fish in the lake area)

(Source: Annual Report, Fishery Department of Ministry of Tourism and Wildlife).

Without the project, the fish products lose their freshness and sometimes spoil during truck transport due to delay of arrival, and interruption of transport in the rainy season. Table 11.2.10 shows the tonnage of fish products that will be spoiled without the project.

Table 11.2.10 Estimation of the Tonnage of Spoiled Fish without the Project

Area	Fish Production (Tons)	Production of Project Areas				Spoiled Fish	
		Share	Raw Fish	Ton/year	Ton/month	Share	Ton/month
Mbita	10,928	80%	70%	6,120	510	20%	102
Port Victoria	15,082	85%	70%	8,974	748	20%	150

The amount of tonnage of spoiled fish is estimated based on the following assumptions:

- 1) At Mbita of Suba District 80% of the fish products is assumed to be handled.
- 2) At Port Victoria of Busia District 85% of the fish products is assumed to be handle.
- 3) The ratio of transport of fresh fish to dried fish is assumed to be 30% : 70%.
- 4) The fish spoilage ratio is assumed to be 20% in the rainy season.

The rainy season is considered to be 4 months for estimation of the benefit, 2 months, in February and March, and another 2 months from August to November on the average (half of a month is not regarded as a rainy season because it does not rain heavily) in Homa Bay area. There are 5 months of rainy season, 3 months from March to May, 2 months from August to November (half of a month is not regarded as a rainy season for the same reason as above) in Busia area.

Table 11.2.11 Estimation of Value of Spoiled Fish without the Project

Area	Months Affected		Spoiled Value/year	
	Months	Ton/year	Ksh./kg	1000Ksh.
Mbita	4	408	30	12,239
Port Victoria	5	748	30	22,434

Total value of loss by fish spoilage amounts to 11, 239,000 Ksh. per year in Homa Bay - Mbita road upgrading project area, and 22,434,000 Ksh. per year in Bumala - Port Victoria road project area.

11.2.5 Induced Benefit

The improvement of road conditions and the increase of convenience for road users along the road will accelerate their movement and their economic activities.

- 1) Traffic using existing road: Normal traffic which increases by economic development
- 2) New traffic by project road: Induced traffic which is estimated through increase of convenience

Normally induced traffic appears in the area along a project road. But the level of economy on roadside people does not reach motorization yet in the lake area. Induced traffic can be expected to be more as a result of adequate maintenance of affiliated roads connecting the local central cities, Kisumu and Kisii.

Table 11.2.12 is the list of affiliated roads related to the project. Fig. 11.2.2 shows the locations of affiliated roads (see Fig. 8.3.1). Those affiliated roads strongly need to be kept in good condition by ensuring adequate maintenance in order to make the upgrading of the project more effective.

Table 11.2.12 Affiliated Roads to Benefit from the Enhancement of the Project

Project	Feeder Road	Length	Road Condition
Homa Bay-Mbita	Homa Bay-Kendu Bay	30km	G/E Road
Rongo-Ogembo	Homa Bay-Rongo	29km	Bituminous with holes
	Rongo-Kisii-Oyugis	63km	Bituminous with holes
	Oyugis-Kendu Bay	18km	G/E Road
Bumala-Port Victoria	Mundere-Siaya	38km	G/E Road
	Siaya-Bondo	21km	G/B Road

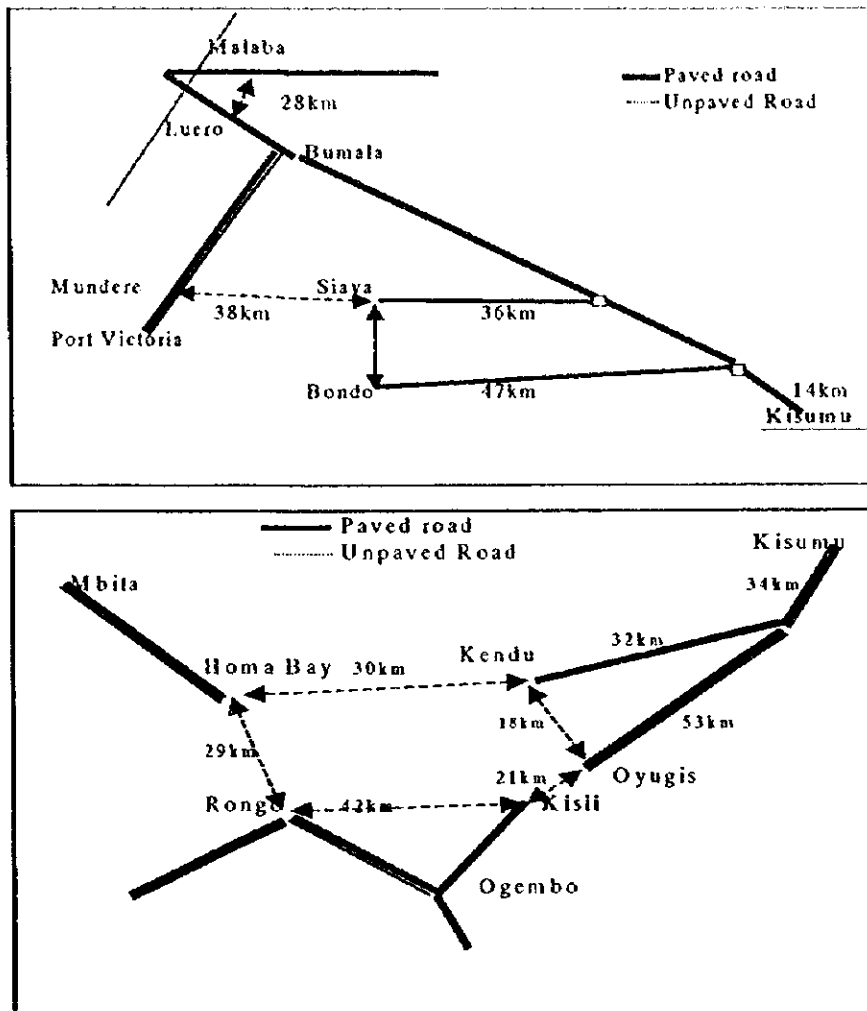


Fig. 11.2.2 Affiliated Road Network

Traffic volume of induced traffic fluctuates based on the characteristics of the projects. The induced traffic is estimated to be at 15% of the normal traffic based on the "Economic Evaluation of Transport Project, by Hanse A. Adler". In addition, it is expected to prevail only 10 years after the operation of the project. Unit benefit of the induced traffic is calculated as that of the half of normal traffic as shown in Fig. 11.2.3.

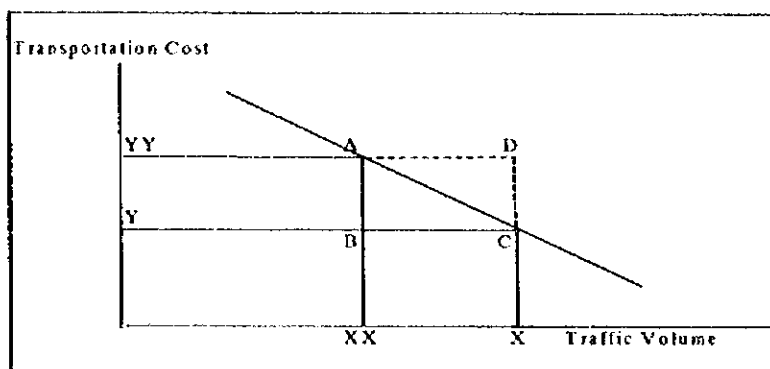


Fig. 11.2.3 Relation between Normal Traffic and Induced Traffic

Induced traffic X will occur when transportation cost decreases from YY to Y by road improvement. The benefit resulting from normal traffic is the square of YY, Y, A, and B. The benefit of induced traffic is the triangle of A, B, C which is half of the square A, B, C, D.

Table 11.2.13 shows the result of benefit from induced traffic.

Table 11.2.13 Induced Benefit of the Three Projects

Unit: 1000Ksh.

Year	Homa Bay-Mbita	Bumala-Port Victoria	Rongo-Ogembo
2004	2,645	2,621	797
2005	2,861	2,741	899
2006	3,007	2,821	966
2007	3,267	2,966	1,089
2008	3,443	3,062	1,170
2009	3,754	3,237	1,317
2010	3,967	3,354	1,416
2011	4,343	3,579	1,593
2012	4,600	3,722	1,712
2013	5,046	3,976	1,924
2014	0	0	0

11.3 Economic Evaluation

11.3.1 Results of Economic Analysis

(1) Result of Economic Analysis

1) Three Criteria for Economic Justification

There are three methods for the comparison of economic costs with economic benefits in order to select the optimum scales of the project. Here, comparison of Economic Internal Rate of Return (EIRR) is adopted as an index to prove investment feasibility.

(a) Economic Internal Rate of Return (EIRR)

(b) Net Present Values (NPV)

(c) Cost Benefit Ratio (B/C)

The internal rate of return is the discounted rate in which the total discounted present value of the benefits equals the total discounted present value of the costs. The higher the economic internal rate of return is, the higher is the priority of the project. If the internal rate of return turns out higher than the opportunity cost of capitals, which is usually 12%, investment is proved to be feasible.

2) Result of Calculation

Table 11.3.1 shows the summary of the result of economic analysis. More details of EIRR calculation are shown in the Table 11.3.2 for Homa Bay-Mbita, Table 11.3.3 for Bumala-Port Victoria and in Table 11.3.4 for Rongo-Ogembo.

Table 11.3.1 Summary of the Result of Economic Analysis

Name of Project	Internal Rate of Return
Homa Bay – Mbita	8.27%
Bumala – Port Victoria	7.07%
Rongo – Ogembo	7.88%

Generally speaking, an EIRR of 12% is often used as justification of projects and the EIRR of all selected high priority road projects were below 12%.

Unit: 1000Ksh.

No.	Year	Economic Cost		Total	Economic Benefit				Total Benefits	Cost Benefit Comparison	
		Capital Cost	Maintenance Cost		Vehicle VOC Saving	Maintenance Cost Saving	Passenger Time Saving	Commodity Saving		Induced Benefit	Discount Factor
1	2001	221,416		221,416						0.924	204,505
2	2002	336,659		336,659						0.853	287,199
3	2003	76,445		76,445						0.788	60,233
4	2004		2,923	2,923	546	(544)		2,645	37,361	0.728	2,128
5	2005		3,136	3,136	622	(757)		2,861	40,256	0.672	2,108
6	2006		3,364	3,364	668	(1,230)		3,007	59,804	0.621	2,088
7	2007		3,609	3,609	761	(1,230)		3,267	45,596	0.575	2,070
8	2008		37,708	37,708	32,850	(17,643)		3,443	51,708	0.530	19,971
9	2009		4,157	4,157	36,884	15,909		3,754	69,719	0.489	2,053
10	2010		4,461	4,461	39,650	(2,082)		3,967	54,777	0.452	2,016
11	2011		4,789	4,789	44,473	15,277		4,343	77,532	0.417	1,998
12	2012		5,141	5,141	47,809	14,925		4,600	80,862	0.385	1,982
13	2013		39,355	39,355	53,573	(36,976)		5,046	35,351	0.356	14,010
14	2014		5,927	5,927	57,591	14,139			85,548	0.329	1,949
15	2015		6,364	6,364	64,474	13,701			92,217	0.304	1,933
16	2016		6,834	6,834	69,310	13,231			96,717	0.281	1,917
17	2017		7,340	7,340	77,526	12,725			104,705	0.259	1,902
18	2018		41,719	41,719	83,341	(21,653)			76,307	0.239	9,983
19	2019		8,468	8,468	93,142	11,598			119,705	0.221	1,872
20	2020		9,096	9,096	100,128	28,656			143,953	0.204	1,857
21	2021		9,771	9,771	111,814	10,294			137,710	0.189	1,842
22	2022		10,497	10,497	120,200	9,568			145,632	0.174	1,828
23	2023		45,113	45,113	134,125	(25,047)			125,447	0.161	7,256
24	2024		12,116	12,116	144,184	7,949			168,821	0.149	1,800
25	2025		13,018	13,018	160,770	7,048			185,173	0.137	1,786
26	2026		13,987	13,987	172,828	6,078			196,657	0.127	1,775
27	2027		15,029	15,029	192,572	5,036			216,206	0.117	1,759
28	2028		49,985	49,985	207,015	(29,919)			196,185	0.108	5,404
		634,520	363,908	998,428	2,149,770	66,986	64,264	36,934	2,623,938	8.27%	647,202

**Table 11.3.2 Cost Benefit Analysis for Investment Justification
(Homa Bay – Mbita)**

Unit:1000Ksh.

No.	year	Economic Cost		Economic Benefit						Total Benefits		Cost Benefit Comparison	
		Capital Cost	Maintenance Cost	Vehicle VOC Saving	Maintenance Cost Saving	Passenger Time Saving	Commodity Time Saving	Induced Benefit	Total Benefits	Discount Factor	Present Worth		
											Cost	Benefit	
1	2001	163,173									0.934	152,395	
2	2002	278,699									0.872	243,096	
3	2003	75,681									0.815	61,653	
4	2004		2,447	11,070	(477)	1,437	22,434	2,621	37,085		0.761	1,861	28,215
5	2005		20,633	12,483	17,498	1,633	22,434	2,741	56,789		0.711	14,662	40,353
6	2006		2,447	13,419	(917)	1,756	22,434	2,821	39,512		0.664	1,624	26,222
7	2007		20,633	15,113	17,024	1,998	22,434	2,966	59,536		0.620	12,789	36,900
8	2008		2,447	16,247	(35,262)	2,148	22,434	3,062	8,630		0.579	1,416	4,995
9	2009		2,447	18,277	(1,710)	2,447	22,434	3,237	44,686		0.541	1,323	24,158
10	2010		2,447	19,648	(2,015)	2,631	22,434	3,354	46,052		0.505	1,235	23,252
11	2011		20,633	22,080	15,845	3,211	22,434	3,579	67,150		0.472	9,750	31,665
12	2012		20,633	23,736	15,492	3,452	22,434	3,722	68,837		0.440	9,087	30,316
13	2013		2,447	26,648	(36,908)	3,928	22,434	3,976	20,078		0.411	1,006	8,258
14	2014		20,633	28,646	14,707	4,223	22,434		70,011		0.384	7,926	26,894
15	2015		20,633	32,128	14,269	4,815	22,434		73,647		0.359	7,403	26,422
16	2016		20,633	34,538	13,799	5,176	22,434		75,947		0.335	6,914	25,448
17	2017		20,633	38,700	13,293	5,912	22,434		80,341		0.313	6,457	25,142
18	2018		20,633	41,603	(21,085)	6,356	22,434		49,308		0.292	6,031	14,411
19	2019		20,633	46,575	12,166	7,276	22,434		88,451		0.273	5,632	24,144
20	2020		20,633	50,068	11,537	7,822	22,434		91,862		0.255	5,260	23,419
21	2021		20,633	56,005	10,862	8,977	22,434		98,278		0.238	4,915	23,399
22	2022		20,633	60,206	10,136	9,650	22,434		102,426		0.222	4,588	22,776
23	2023		20,633	67,290	(24,479)	11,105	22,434		76,350		0.208	4,285	15,856
24	2024		20,633	72,336	8,517	11,938	22,434		115,226		0.194	4,002	22,349
25	2025		20,633	80,785	7,616	13,781	22,434		124,616		0.181	3,738	22,574
26	2026		20,633	86,844	6,646	14,815	22,434		130,739		0.169	3,491	22,119
27	2027		20,633	96,915	5,604	17,164	22,434		142,117		0.158	3,260	22,455
28	2028		20,633	104,183	(29,351)	18,451	22,434		115,718		0.148	3,045	17,076
		517,554	406,715	1,075,543	42,807	172,101	560,862	32,078	1,883,391		7.07%	588,820	588,820

Table 11.3.3 Cost Benefit Analysis for Investment Justification
(Bumala -- Port Victoria)

Unit: 1000Ksh.

Rongo-Ogembo 19.02km

No.	year	Economic Cost		Total	Economic Benefit				Total Benefits	Cost Benefit Comparison	
		Capital Cost	Maintenance Cost		Vehicle VOC Saving	Maintenance Cost Saving	Passenger Time Saving	Commodity Time Saving		Induced Benefit	Discount Factor
1	2001	84,651		84,651						0.927	78,468
2	2002	128,675		128,675						0.859	110,564
3	2003	29,228		29,228						0.796	23,280
4	2004		1,100	1,100	10,024	(211)	599	0	797	0.738	812
5	2005		1,100	1,100	11,293	(307)	690	0	899	0.684	753
6	2006		9,276	9,276	12,140	7,767	742	0	966	0.634	5,885
7	2007		1,100	1,100	13,660	(519)	854	0	1,089	0.588	647
8	2008		9,276	9,276	14,684	(7,636)	918	0	1,170	0.545	5,056
9	2009		9,276	9,276	16,505	7,411	1,058	0	1,517	0.505	4,687
10	2010		1,100	1,100	17,743	(901)	1,138	0	1,416	0.468	515
11	2011		9,276	9,276	19,921	7,128	1,312	0	1,593	0.434	4,027
12	2012		9,276	9,276	21,415	6,970	1,411	0	1,712	0.402	3,753
13	2013		1,100	1,100	24,021	(16,550)	1,629	0	1,924	0.375	410
14	2014		9,276	9,276	25,823	6,618	1,751	0	34,191	0.346	3,208
15	2015		9,276	9,276	28,937	6,421	2,024	0	37,382	0.321	2,973
16	2016		9,276	9,276	31,107	6,210	2,176	0	39,493	0.297	2,756
17	2017		17,451	17,451	34,828	14,160	2,519	0	51,506	0.275	4,807
18	2018		9,276	9,276	37,440	(9,434)	2,708	0	30,713	0.255	2,368
19	2019		9,276	9,276	41,881	5,478	3,140	0	50,499	0.237	2,195
20	2020		17,451	17,451	45,022	13,372	3,376	0	61,770	0.219	3,829
21	2021		9,276	9,276	50,322	4,893	3,923	0	59,138	0.205	1,886
22	2022		17,451	17,451	54,096	12,744	4,217	0	71,057	0.189	5,290
23	2023		9,276	9,276	60,415	(10,956)	4,913	0	54,372	0.175	1,621
24	2024		9,276	9,276	64,946	3,842	5,282	0	74,070	0.162	1,503
25	2025		9,276	9,276	72,478	3,437	6,171	0	82,086	0.150	1,393
26	2026		9,276	9,276	77,914	3,003	6,634	0	87,550	0.139	1,291
27	2027		9,276	9,276	86,886	2,535	7,777	0	97,199	0.129	1,197
28	2028		9,276	9,276	93,403	(13,142)	8,361	0	88,622	0.120	1,109
		215,538		458,092	966,903	52,333	75,322	0	1,107,440	7.88%	274,264

**Table 11.3.4 Cost Benefit Analysis for Investment Justification
(Rongo – Ogembo)**

(2) Sensitivity Analysis

1) Effect of Traffic and Cost

With a 10% increase of traffic, or with 10% decrease of construction cost, the economic internal return is found to be less than the capital opportunity cost of 12%. Table 11.3.5 shows the results of the sensitivity analysis.

In a sensitivity analysis, usually traffic decrease and cost increase are considered the major factors.

Table 11.3.5 Sensitivity Analysis of Economic Indicators

Project Name	Base Case	Traffic 10% Increase	Construction Cost 20% Decrease	Maintenance Cost Decrease	Investment 1 Year Postponed
Homa Bay-Mbita	8.27%	8.97%	10.07%	8.90%	
Bumala-Port Victoria	7.07%	7.58%	8.93%	8.49%	
Rongo-Ogembo	7.88%	8.70%	9.50%	9.62%	8.44%

2) Effect of Maintenance Cost

Data of maintenance cost is adopted from Chapter 8 'Road Maintenance Programme', which estimates maintenance costs.

3) Effect of Allocation of Investment Cost

The design engineer estimated the yearly allocation of investment cost at 28% in year 2002, and 72% in 2004. There is no allocation for the year 2001 (See Chapter 9, 'Construction Work and Cost Estimation'). This is because the same construction machines will be used for Rongo – Ogembo project 1 year later, after completion of Homa Bay – Mbita project. The base case of the EIRR used the same ratio of allocation of investment cost with Homa Bay-Mbita which is 35% in 2001, 53% in 2002, and 12% in 2003. The Rongo-Ogembo EIRR, will turn out to be 8.44%, if investment starts 1 year later.

11.3.2 Intangible Benefits

Intangible benefits are not included in investment feasibility analysis. As projects are on the borderline of investment feasibility, many intangible benefits should be considered.

a) Intangible benefits:

i) Benefit of freedom from impassable roads during the rainy season

The important roles and functions of project roads in rural area are to enhance the local economy and to improve accessibility to support the daily lives of the residents. In this view it can be said that impassable roads greatly hinder even the subsistence of the residents. Improvement of gravel and earth roads to bituminous standard roads will, without doubt, contribute to poverty eradication and the enhancement of the quality of life of the residents who live along the roads.

ii) Benefit of dustless air on the road side during the rainy season

Most of the current rural roads are of gravel and earth. In the dry season, they become dusty along the sides. The annoyance of the residents is expected to be reduced by improvement to bituminous roads

iii) Benefit from increased attendance rates

Education is one of the important factors to promote national and regional development in Kenya. Almost all of the students walk to schools. Many students are troubled in their commuting due to muddy road conditions in the rainy season. Although a quantitative increase of school attendance cannot be estimated, it is considered that improvement of road conditions will contribute to higher school attendance.

iv) Benefit of increased bus (Matatu) service frequency.

The benefit accruing from saving time of bus operation is calculated in economic analysis. However, Matatu plays an important role in the daily lives of the residents. The current muddy conditions of rural roads hinder smooth operation of the Matatu bringing about many problems in the daily lives of the residents. The increase of bus service frequency is considered one of the intangible benefits.

v) Benefit by increased accessibility to hospitals and medical health facilities.

The benefit from saving vehicle operating costs by which people come to major public facilities is calculated in the economic analysis. One of the important roles and functions of the rural roads is to secure accessibility from villages to various local and major centres and this contributes to betterment of the quality of life of the residents. Improvement to bituminous standard roads makes accessibility to those centres easy.

vi) Benefit of regional integration to neighbouring villages and local centres

Improvement of the above mentioned will also enlarge the territories of economic and daily life activities in the region and this will promise improvement of the standard of living of the residents.

vii) Benefit of increased production by strong impacts to fishery zones and tea producing areas

Fish and tea transport is a focal point to enhance the local economy in the areas along the road improvement projects. Although some benefits accruing from the reduction of spoilage of fish products in the rainy season are estimated in the economic analysis, more indirect benefits to materialise potential economic activities can be expected by the improvement of fish and tea transport in the peripheral areas of the roads.

11.4 Budget Resources Analysis

11.4.1 Budgeting Scale of the Central Government

(1) Government Revenues

For the purpose of grasping budget resources and appropriation for road projects, revenues and expenditures of the central government will be reviewed. As shown in Table 11.4.1, the general revenue of 1995/96, 7,171 million K£ has increased by 1.3 times to 9,673 million K£ in 1998/99.

General revenue sources are 1) income duty, 2) value added tax, 3) custom duty, 4) excise duty, 5) non-tax revenue, in the order of a considerable amount in terms of revenue. In addition, there is revenue from appropriation-in-aid and external grants. The fuel tax levy earmarked for road maintenance is included in 4) excise duty.

Table 11.4.1 Comparison of Budget Estimates with Actual Out-Turns

	1995/96			1996/97		
	Budget	Actual	Difference	Budget	Actual	Difference
Million K£						
General Account						
Revenue	7,193	7,171	(21)	7,538	7,354	(184)
Expenditure	7,437	7,795	358	7,617	7,845	228
Balance	(244)	(624)	(380)	(78)	(491)	(412)
Development Account						
External Financing(Net)	500	287	(213)	924	(43)	(966)
Expenditure+Net Lending	1,961	1,400	(561)	2,143	1,497	(647)
Balance(Net)	(1,706)	(1,737)	(31)	(1,298)	(2,030)	(732)
	1997/98*			1998/99**		
	Budget	Actual	Difference	Budget	Actual	Difference
General Account						
Revenue	8,368	9,083	715	9,308	9,674	366
Expenditure	11,070	14,480	3,409	10,169	10,653	484
Balance	(2,702)	(5,397)	(2,694)	(861)	(979)	(119)
Development Account						
External Financing(Net)	38	(93)	(131)	(121)	(121)	0
Expenditure+Net Lending	2,334	1,224	(1,109)	1,852	1,974	122
Balance(Net)	(4,998)	(6,714)	(1,716)	(2,833)	(3,075)	(241)

Note: * Provisional, ** Includes external grants

Note: Balance of Development Account: Ex. Budget in 1995/96; 1,706=500-1961-244

Note: 1 K£ is equivalent to 20 Ksh.

Source: Central Bureau of Statistics, Economic Survey 1999

(2) Government Expenditures

Expenditure is divided into two groups, recurrent expenditure and development expenditure. The recurrent expenditure consists of 1) wages and salaries, 2) operation and maintenance, 3) domestic interest, 4) foreign interest, in order of expenditure levels.

The development expenditure is mainly financed by sources of assistance from foreign countries mainly composed of loans and grants. The ratio of recurrent expenditure to development expenditure is roughly 80 to 20.

Financial expenditure of the government has increased. The expenditure in 1998/99 was targeted to be 10,168 million K£, but additional 484 million K£ was reported to increase to 10,653 million k£. (Economic Survey, 1999).

The economic development situation of a country affects its industrial activities. It also greatly affects its financial situations. Real GDP in Kenya, having increased to 4.8% in 1995, decreased to 1.6% in 1998.

1994	1995	1996	1997	1998
3.0%	4.8%	4.6%	2.3%	1.6%

In the Budget Speech by the Finance Minister in June 1999, the government published the expected growth rate of general revenue at -1.5% for the fiscal year 1999/2000. GDP growth rate is expected to be 2.5% ~ 3% because of decreasing of poverty and increasing of job creation.

Table 11.4.1 presents a comparison of budget estimates with actual out-terms for fiscal year 1995/96 to 1998/99. According to the Annual Report of Central Bank of Kenya, increase of government expenditure occurred mostly in three areas as follows:

- 1) Salary increases of civil servants.
- 2) Relief operation following the crop damage associated with the 'El Nino weather.
- 3) Expenditure on interest payments in respect to public debt.

As to the deficit, the Government is in debt due to treasury bills and bonds and government stocks in the domestic field. On the other hand, it is also in debt to bilateral and multilateral foreign financing institutions, export credit, and others.

The estimated recurrent expenditure of the Central Government for 1999/2000 was published as 12,207 million K£. In this 5,875 million K£ consolidated fund expenditure is included.

The target of the government is to reduce both interest rates and government borrowing, as well as repayment of the current stocks of short term treasury bills.

11.4.2 Breakdown of the Road Related Budget

(1) Road Expenditure vs. National Budget

Table 11.4.2 shows a proportion of road -- related expenditure in the total government budget. The total expenditure includes public debt. Breakdown of the expenditure is as follows in order of amount:

- 1) General public administration
- 2) Health, education, defence service, etc.
- 3) Social service
- 4) Economic service
- 5) Public debt

Road related expenditure in the table is included in Economic Service category.

Road expenditure is divided into recurrent expenditure and development expenditure.

- 1) Recurrent expenditure is for ordinary light routine maintenance works.
- 2) Development expenditure is for new road construction and periodic maintenance.

Road related expenditure amounts to 25% or 30% of the expenditure in Economic Service category.

Table 11.4.2 Comparison of Road Expenditure with National Budget

Million K£

	1995/96			1996/97		
	Recurrent	Development	Total	Recurrent	Development	Total
General Public Administration	1,133	304	1,437	1,330	467	1,797
Social Service	2,407	345	2,752	2,612	296	2,908
Economic Service	654	735	1,389	744	579	1,323
Other Service(incl.Public debt)	3,602	0	3,602	3,160	0	3,160
Total Expenditure	7,795	1,384	9,180	7,845	1,342	9,187
General Public Administration	15%	22%	16%	17%	35%	20%
Social Service	31%	25%	30%	33%	22%	32%
Economic Service	8%	53%	15%	9%	43%	14%
Other Service(incl.Public debt)	46%	0%	39%	40%	0%	34%
Road Expenditure	191	194	385	248	149	397
% to Economic Services	29%	26%	28%	33%	26%	30%
% to Total Expenditure	2%	14%	4%	3%	11%	4%
% of GDP			31%			29%
	1997/98			1998/99		
	Recurrent	Development	Total	Recurrent	Development	Total
General Public Administration	1,590	333	1,923	1,877	525	2,402
Social Service	3,273	376	3,649	3,496	474	3,970
Economic Service	728	486	1,213	876	922	1,797
Other Service(incl.Public debt)	8,889	0	8,889	4,404	0	4,404
Total Expenditure	14,480	1,195	15,674	10,653	1,921	12,574
General Public Administration	11%	28%	12%	18%	27%	19%
Social Service	23%	31%	23%	33%	25%	32%
Economic Service	5%	41%	8%	8%	48%	14%
Other Service(incl.Public debt)	61%	0%	57%	41%	0%	35%
Road Expenditure	241	135	377	261	177	437
% to Economic Services	33%	28%	31%	30%	19%	24%
% to Total Expenditure	2%	11%	2%	2%	9%	3%
% of GDP			31%			30%

Source: Central Bureau of Statistics, Economic Survey 1999.

Note: 1 K£ is equivalent to 20 Ksh.

(2) Road Recurrent Expenditure

As tabulated in Table 11.4.2, the recurrent expenditure has increased from 190 million K£ in 1995/96 to 260 million K£ in 1998/99. Table 11.4.3 shows the breakdown of the road expenditure of 260 million K£ for 1998/99. It should be noted that there are slight differences in the figure due to different sources. 20% of the expenditure is used for the routine maintenance of trunk roads, while 31% is used for the routine maintenance of rural roads.

Table 11.4.3 Breakdown Components of Recurrent Road Expenditure 1998/99

	1000Ksh.	K£1,000	%
Payment of pending bills	985,820	49,291	19%
Maintenance of trunk roads	1,533,200	76,660	29%
Maintenance of rural roads	1,619,140	80,957	31%
Repair and maintenance of bridges	349,000	17,450	7%
Maintenance of KWS roads	30,000	1,500	1%
Repair and maintenance of equipment	140,000	7,000	3%
Axle load controls	48,700	2,435	1%
Headquarter support services	425,840	21,292	8%
Special programs and environment	20,000	1,000	0%
Kenya national roads board	10,000	500	0%
Road safety	12,000	600	0%
Emergency works	10,000	500	0%
Collection costs(KRA/Transit charges)	116,300	5,815	2%
Total	5,300,000	265,000	100%

Source: Sept1998, Ministry of Finance, Financial Secretary/Treasury.

Note: 1 K£ is equivalent to 20 Ksh.

(3) Road Development Expenditure

Table 11.4.4 shows a breakdown of road development expenditure. 86% of the total expenditure accounts for the construction of 34 new roads and for the Northern Corridor Rehabilitation Project. For the development budget, all funds depend on loans and grants except for small amount of domestic budget.

Besides the above mentioned, the total financial budget of the Ministry of Roads and Public Works includes 16 million K£ for building and works and 5 million k£ for the building research centre, planning and research and for others.

Table 11.4.4 Road Development Expenditure required in 1999/2000

Unit: Million K£

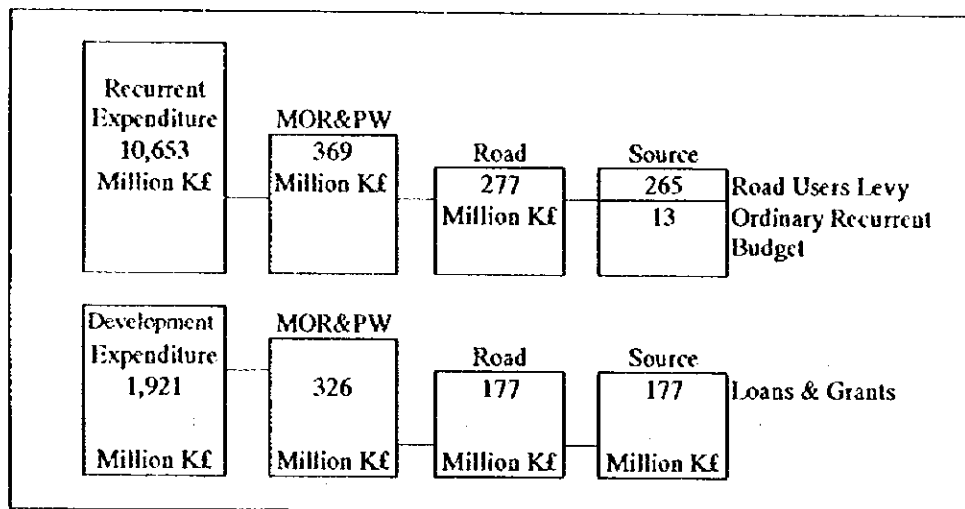
Title	Appropriations in Aid	Net Expenditure	Total
Major roads (15 sections)	116	36	152
Other roads (19 sections)	59	7	66
Road markings and signs	0	0	0
Planning and design	0	0	0
Northern corridor rehabilitation	40	0	40
Miscellaneous	29	13	42
Total Expenditure	244	56	300

Source: 1999/2000 Estimates of Development Expenditure by Government of Kenya

Note: 1 K£ is equivalent to 20 Ksh

11.4.3 Resources of Road Budget**(1) Recurrent Budget**

Table 11.4.5 shows the total picture of the scale of recurrent and development accounts of the central government budget. The recurrent account and development account of the central government is explained in Chapter 11.4.1. The recurrent account and development account of the road is explained in Section 11.4.2. This section deals with road expenditure and its resources.

Table 11.4.5 Total Image of National and Road Account

Note: 1 K£ is equivalent to 20 Ksh.

Table 11.4.6 shows financial sources for road maintenance. Financial sources for road recurrent expenditure is comprised of the following three items:

- fuel levy fund
- transit toll
- other funds from recurrent budget

Table 11.4.6 Road Source for Recurrent Expenditure

Unit: Million £

	1994/95	1996/97	1998/99	1999/00
Fuel Levy	69	*	*	*
Transit Toll	6	*	*	*
Sub total	75	159	265	314
Other Funds	52	85	13	29
G. Total	127	243	277	343

Note: * means no data is announced as of October 1999

Note: 1 K£ is equivalent to 20 Ksh.

The road maintenance expenditure is funded by the road users levy, and the administrative expenses are funded by the central government recurrent budget.

The Breakdown of the road levy fund is listed below:

Maintenance of primary Roads	38%
Maintenance of secondary Roads	13%
Maintenance of major Roads	20%
Maintenance of service Roads	2%
Maintenance of rural Roads	24%
Maintenance of special proposed Roads	3%

The Breakdown of the administrative expenditure for road maintenance is listed below:

Road marking and signs	1%
Grant to municipality	1%
Headquarters road branch	30%
Road work inspection	1%
District Administration and technical services	67%

(Personal emoluments, telephone, medical, transport, electricity, etc.)

1) Road Users Levy Fund

The road maintenance budget depends totally on the Road Maintenance Levy Fund. The road users levy fund was established in 1994 as follows:

Gasoline tax	1.5 Ksh. / Liter
Diesel oil	1.0 Ksh. / Liter
Lubricant oil	1.0 Ksh. / Liter

IBRD assisted the Nairobi – Mombasa Rehabilitation Project in 1995. The above road levy fund was established at that time. The crop tax (a levy on crop sales) could provide some funding for rural road maintenance. However, it would not be sufficient for the entire road network.

The road users as the main beneficiary of improved roads, are the major means of collecting such revenue through fuel sales.

2) Transit toll

In 1994, the government introduced the Common Market for Eastern and South Africa (COMESA) and harmonized road transit charge at the following rate:

- a. Heavy goods vehicle with up to 3 axles US\$ 3 / 100km
- b. Heavy goods vehicle with more than 3 axles US\$ 8 / 100km
- c. All articulate vehicles US\$ 8 / 100km

(2) Development Expenditure

The budget scale of the government between the total recurrent budget and the development budget is about 80 to 20 in ratio.

The road budget in the development account has not increased remarkably each fiscal year. The amount of requested development budget for 1999/2000 is explained in Table 11.4.7.

Table 11.4.7 Requested Development Budget for the Road Project by Foreign Donors

Unit: Million K£

Project	Amount	Donors
15 Major projects	153	EEC/EDF(European Development Fund) IDA, OPEC,FRG(Germany) Saudi Fund, Kuwait
19 Other Project	66	BADEA, ADF(African Development Fund) EEC, FRG, China
Others	81	SIDA, DANIDA(Denmark) Netherlands, EEC, EDF, FRG
Total	300	

Source: 1999/2000 Estimates of Development Expenditure by the Government of Kenya

Note: 1 K£ is equivalent to 20 Ksh.

11.4.4 Road Investment in the Project Area

(1) Cost Required in the Study Area

Table 11.4.8 shows the road expenditure budget for the Study Area from 1996/97-1999/2000. The budget fluctuated remarkably these years.

Table 11.4.8 Road Expenditure in the Study Area

1 Million Ksh.

	1996/97	1997/98	1998/99	1999/00
Recurrent Budget	44.3	74.3	44.7	151.5
Development Budget	43.1	61.6	35.6	19.8
Total	87.4	135.9	80.3	171.3

Note: 1999/00 is on request base

Note: 1 K£ is equivalent to 20 Ksh.

Table 11.4.9 shows the required road maintenance cost and construction cost in the Study Area. The total maintenance cost amounted to 129 million K£ for 6 years indicating a requirement of 21 million on average per year.

Table 11.4.9 Required Road Investment Cost in the Study Area

1) Road Maintenance Cost of Study Area (Recurrent)

Year	2000/01	2001/02	2002/03	2003/04	2004/05	Total
Maintenance cost in million Ksh. (in million US\$)	310 (4.3)	326 (4.5)	342 (4.7)	359 (5.0)	695 (9.6)	2,032 (28.1)
Maintenance cost in million K£	16	16	17	18	35	102

2) Construction Cost of Projects (Development) Unit: Million Ksh. (Million US\$)

Project	2000/01	2001/02	2002/03	Total
Homa Bay-Mbita	329 (4.6)	501 (6.9)	114 (1.6)	944 (13.1)
Port Victoria-Bumala	243 (3.4)	416 (5.8)	113 (1.6)	772 (10.8)
Rongo-Ogembo	0 (0)	100 (1.4)	262 (3.6)	362 (5.0)

Source: JICA Study Team

Note: 1 K£ is equivalent to 20 Ksh. Note: 1 K£ is equivalent to 20 Ksh.

On the assumption that High Priority Roads starts 2000/01

(2) Source from Road Maintenance Fuel Levy Fund

The road maintenance cost of 102 million K£ of the Study Area for 5 years is to be mainly funded by the Road Maintenance Fuel Levy Fund in the recurrent budget.

Comparing the road expenditure with the national budget (Table 11.4.2), the road expenditure in the coming 5 years is estimated based on the following assumptions:

- i) Ratio of road expenditure to the total national budget is maintained around 2%.
- ii) Ratio of the road expenditure to the economic service category budget is maintained around 30%.
- iii) Annual increase rate of the road budget is 11% on average.

Table 11.4.10 shows the recurrent budget estimate applied with the following assumptions:

- i) Road recurrent budget will be increased at 11% annually.
- ii) 85% of the road recurrent budget is expected to be funded by the Road Maintenance Fuel Levy Fund.
- iii) The 15% shortage for the road recurrent budget will be funded by the general recurrent budget.

Table 11.4.10 Recurrent Budget Estimation for the Whole Country and for the Study Area (2000/01 – 2004/05)

Unit: Million K£.

	2000/01	2001/02	2002/03	2003/04	2004/05	Total	Annual Average
Levy Fund	274	304	337	374	415	1,705	341
General Budget	48	54	60	66	73	301	60
Sub total	322	357	397	440	489	2,005	401
Requested Cost for Study Area	16	16	17	18	35	102	20.4
Allocation Ratio	5.0%	4.5%	4.3%	4.1%	7.2%	5.1%	5.1%

Note: 1 K£ is equivalent to 20 Ksh.

The required amount for road maintenance in the Study Area reaches around 5.1 % of road levy fund and general budget for road sector.

Road length of the Study Area accounts for around 12.6% of the whole country. If the government uses 5.1% of the road budget of the whole country, the road maintenance cost of the Study Area will be fully covered. This assumption does not exceed the pertinent allocation.

(3) Sources from the Development Fund

The estimated project cost is comprised of 103 million K£ (47+38+18). The project period is planned from 2001 to 2003, to be completed in year 2004. The cost of the project is to be financed by the development account, with assistance from foreign funds.

The annual budgeting scale in the past 5 years was 160 million K£.

The average cost per one project was 10 million K£ per year. For assistance conditions in the appropriation of aid, loans account for 57% as shown in the Table 11.4.11.

Table 11.4.11 Composition of Loans and Grants in the Development Budget

1999/2000				
	Kenya*	MOR&PW*	%	Component
1) Appropriations in Aid				
a) Grants	483.4	72.9	15%	22%
b) Loans	752.6	190.5	25%	57%
c) Local	696.3	71.8	10%	21%
Total	1,932.3	335.2	17%	100%
2) External Revenue				
Grants	98.8	14.3	14%	83%
Loans	371.9	3.0	1%	17%
G. of Kenya	302.9		0%	0%
Total	773.7	17.3	2%	100%
Gross Expenditure				
Approved	2,706.0	352.5	13%	

Source: Estimates of the Development Expenditure, Votes D01-D36 1999/2000

Note: * Million K£, 1 K£ is equivalent to 20 Ksh.

Chapter 12

Conclusions

Chapter 12 Conclusions

(1) Significance of the Road Network Improvement Plan

The significance of the road network improvement plan emanates out of the long-term perspective that focuses on establishing a well-developed road network. This is expected to support both the local economy and the daily lives of the residents living in the road network's influence area. Any sufficient development of the road network will inevitably require some time. This is so, since the realisation of the road improvement plan including the construction of new and additional roads will depend on donor assistance for some time to come. The road network improvement plan proposed in this Study will make, notwithstanding this reality, a contribution to the GOK's self-help efforts to establish an integrated and unified road network for future long-term development.

(2) Key Elements for Road Maintenance Improvement

The two key elements for implementing the road maintenance improvement plan will be:

- Realising MOR&PW's institutional and organisational reforms; and
- Ensuring that adequate budgetary resources are allocated for the road sector.

Hence, addressing the following two issues will be essential.

a) Improvement of Management Skills that Match with Privatisation Needs

MOR&PW will be converted into a Road Agency in line with the GOK's structural reform efforts, and the Mechanical and Transport Department is expected to be modified under the privatisation scheme into a private equipment-leasing corporation. All new departments and/or entities under the privatisation scheme will have to be managed in accordance with the new roles defined under said scheme.

It is essential for the smooth realisation of the reform efforts that full use is made of foreign expertise with ample accumulated experience in private sector management skills. Because MOR&PW's personnel does not have enough experience in privatisation schemes and can not match the management requirements. It is anticipated that this issue will be addressed through external assistance, such as dispatching of experts.

b) Adjustments in the Fuel Levy

Insufficient allocations for the road budget in the past have been the most serious obstacle for implementing proper road maintenance. This situation is unlikely to change over the short-term. The Road Maintenance Fuel Levy has played an important role since 1994 in securing a portion of the road sector's budgetary resources. However, a long time may pass by until this levy can cover fully budgetary requirements. It is recommended to revise the fuel ratio level in accordance with the growth performance of the national economy with a view to secure an increasing share from that source for future road maintenance requirements.

Transparency about the actual use of the fuel levy is another significant issue and accountability to the public about the actual road budget use is essential. The Road Maintenance Fuel Levy Fund is to be managed by the Road Board through discussions among Road Board members after the establishment of the Road Board. Hence, disclosure to the public of key information on the actual use of the road budget will increase public awareness about the road budget and road maintenance activities.

(3) Implementation of Recommended High Priority Roads

It is expected that the improvements of the recommended high priority roads, that is C19, D250/D251/C30 and C20, will be implemented through donor funded assistance schemes, since almost all of the road sector's development budget will be supported through external aid schemes for the time being. Enhancement of road maintenance is the single most important factor of success for implementing the projects, since improvement of the recommended high priority roads will be meaningless without sufficient road maintenance activities. The GOK is invited in this context to adopt measures geared at improving the following aspects.

a) Strengthening DWO

PWO and DWO share the responsibility for road maintenance implementation. DWO, in co-ordination with PWO, should be engaged in major works, since DWO has the most up-to-date information on current road conditions. It will be necessary in this context for the DWOs to take the initiative in actual road maintenance works including road maintenance planning, and in-house and out-house subcontract management.

b) Involvement of Local Communities

It is unlikely that sufficient equipment for road maintenance works will be provided soon due to the inadequate road maintenance budget. Some limitations on proper road maintenance in the areas of equipment availability, human and financial resources are likely to remain in force even in the future. It is recommended, under such circumstances, that a broader and more flexible approach ranging from equipment- to labour-based methods be introduced. Such an approach would reduce the limitations imposed on proper road maintenance caused by limited resources. Involvement of the local communities in road maintenance is likely to compensate somewhat for inadequate resources allocated for maintenance works of rural roads. For example, reporting by the local communities to DWOs on prevailing deteriorated road conditions and/or participation by local communities in the labour-based method in actual routine road maintenance work are expected to support smooth and low-cost rural road maintenance.

Appendices

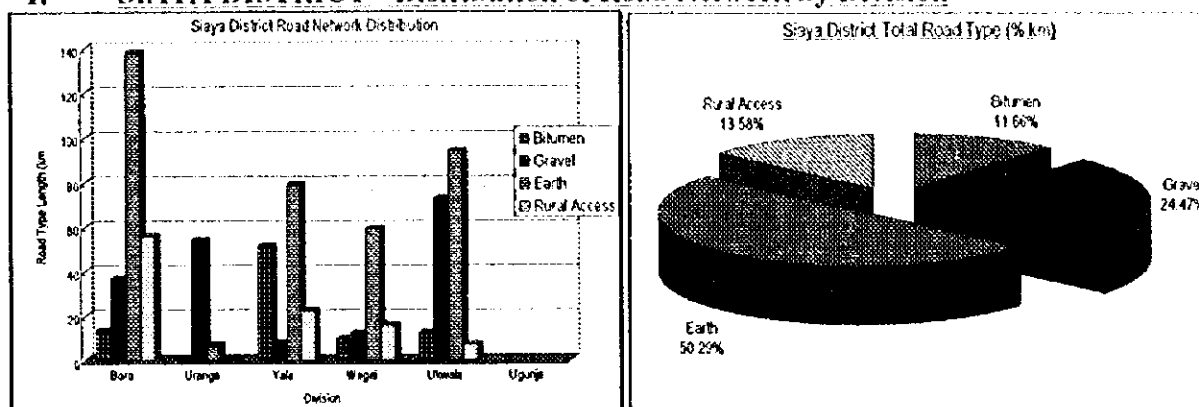
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Appendix 2.1 District Profile

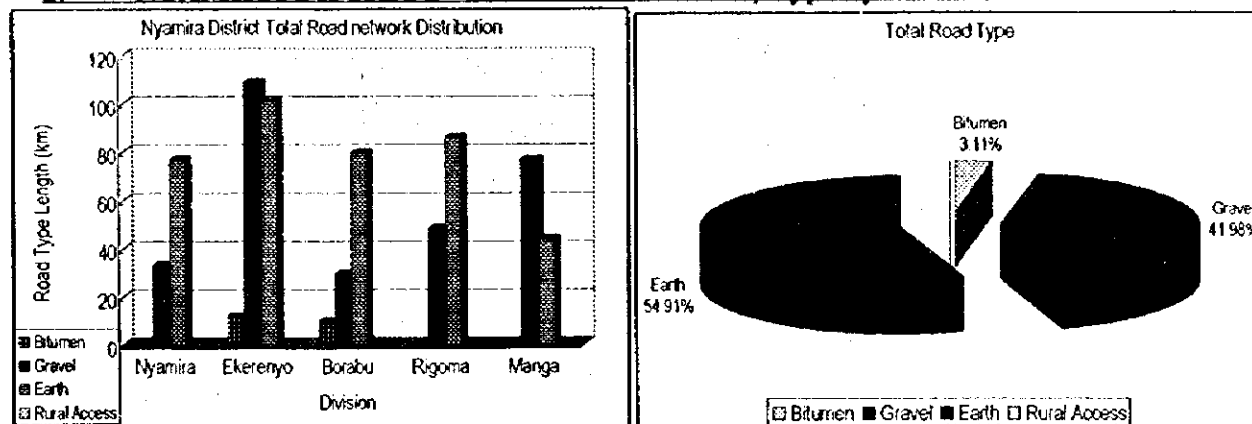
ROAD NETWORK – DISTRICTS (DDPs 1997-2001)

1. SIAYA DISTRICT - Distribution of Road Network by Division



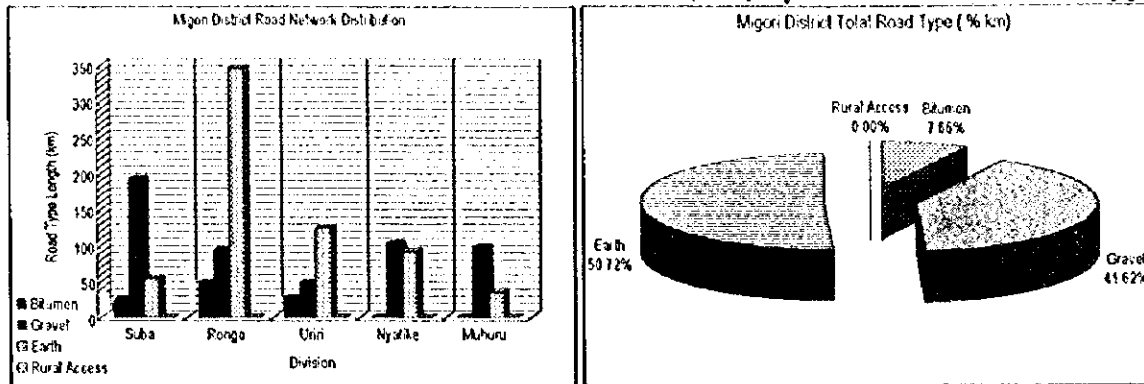
Division	Bitumen	Gravel	Earth	Rural Access	Total
Boro	13.5	36.9	138.1	55.9	244.4
Uranga	0	53.8	7.2	0	61.0
Yala	51.4	8.0	79.0	22.5	160.9
Wagai	10.0	12.5	59.1	16.0	97.6
Ukwala	12.6	72.4	93.9	7.5	186.4
Ugunja					
Total	87.5	183.6	377.3	101.9	750.3

2. NYAMIRA DISTRICT - Distribution of Roads, Type by Division



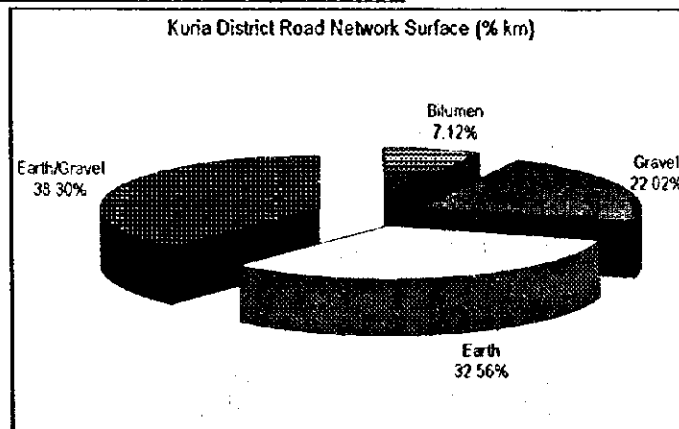
Division	Types of Surface	Road Classification						Total
		B	C	D	E	R	T	
Nyamira	Bitumen	-	-	-	-	-	-	-
	Gravel	-	8.0	-	8.7	13.4	3.0	33.1
	Earthroad	-	-	11.0	18.1	20.0	27.7	76.8
Ekerenyo	Bitumen	-	10.0	-	2.0	-	-	12.0
	Gravel	-	45	25.4	31.5	4.5	2.5	109.4
	Earthroad	-	5	-	40.3	28.4	27.6	96.3
Borabu	Bitumen	10.0	-	-	-	-	-	10.0
	Gravel	-	-	5.0	18.5	2.8	3.2	29.5
	Earthroad	-	-	-	23.0	36.8	20.0	79.8
Rigoma	Bitumen	-	-	-	-	-	-	-
	Gravel	-	-	29.0	16.1	2.0	1.3	48.4
	Earthroad	-	-	22.5	27.9	18.2	17.5	86.1
Manga	Bitumen	-	-	-	-	-	-	-
	Gravel	-	25.2	38.2	7.0	2.0	4.5	76.9
	Earthroad	-	-	4.0	23.0	10.0	7.25	44.25
Total		10.0	88.7	135.1	216.1	138.1	114.1	702.55

3. MIGORI DISTRICT - Roads Network (Km) by Division and Surface Type



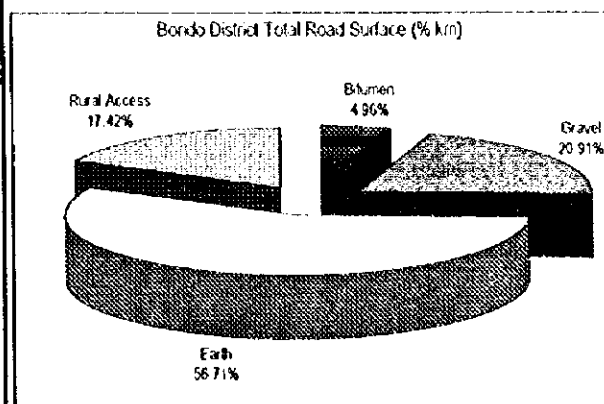
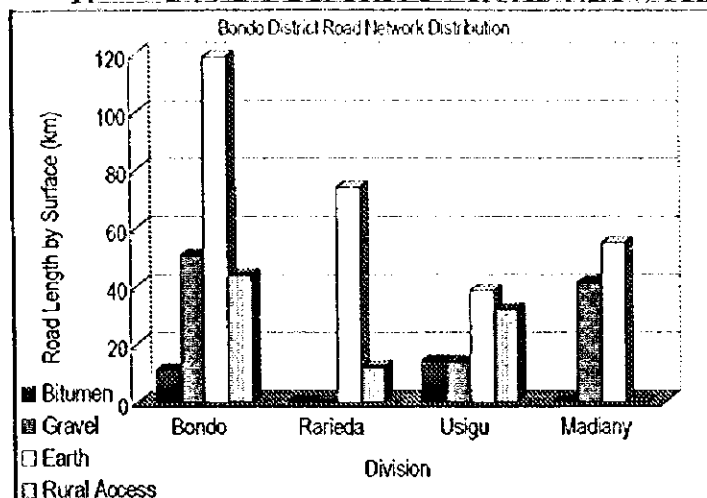
Division	Bitumen	Gravel	Earth	Total
Suba	22.8	191.9	54.6	269.3
Rongo	48.6	93.6	345.6	487.8
Uriri	26.8	48.4	124.6	199.8
Nyatike	Nil	102.1	91.2	193.3
Muhuru	Nil	97.9	34.6	132.5
Total	98.2	535.9	648.6	1282.7

4. KURIA DISTRICT - Road Classification



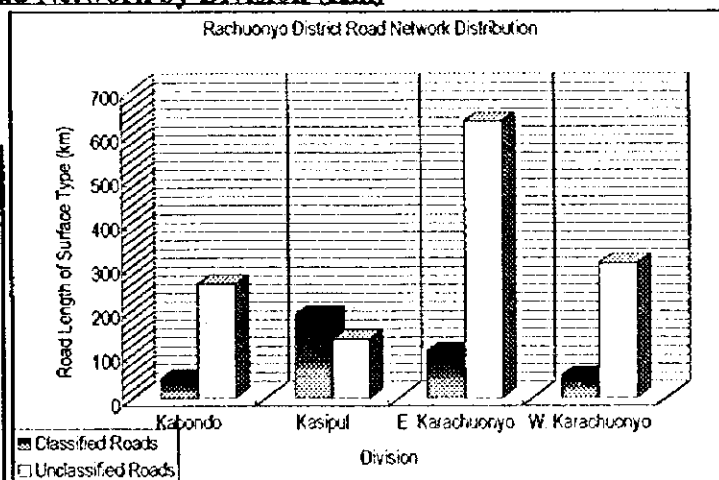
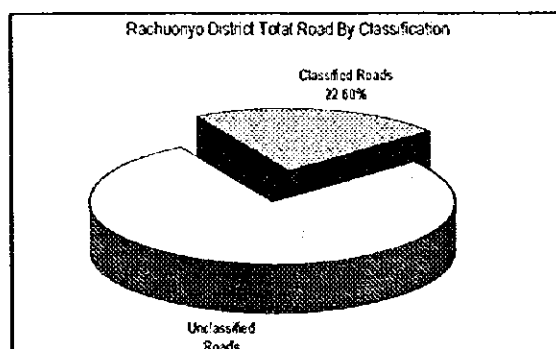
Road No.	Length in Km	Description of Section (from -to)	Road surface type	Maintenance Agency	Remarks
A1	16	Isebania Border Trunk road of which 16km are within Kuria	Bitumen Standard	M.O.P.W & H Roads Department	Recons (IEC Funds) Nov '93 - Mar '96.
C13	20	Nyanchabo to Migori	Gravel	Roads Dept	Proposed for upgrading to Bitumen Standard
D201	29.5	Junction 013 Kebancha - Ntamaru	Gravel	Roads Dept	Serves as an arterial Rd.
E164	20.0	Taranganya - Ikerege	Earth		
E164	6.0	Taranganya - Masangora	Earth	Roads Department	Minor Road
E1003	27	Isibania - Motemorabu	Earth	MOPW&H Roads Department	Security road Kenya /Tanzania Border
E163	22	Senta-Nyamtiro Isibania Senta Tepesi river	Earth/Gravel	Roads Department	Ditto
E163	5	South Tepesi River	Earth/Gravel	Roads Department	Ditto
E1030	8.2	Mabca - Motemorabu	Earth	Roads Department	
E1031	6.8	E1030 Junction - Kamumwamu	Earth	Roads Department	
E1007	5.2	Nyamagana - Junction E166	Earth	Roads Department	
R5	11.7	Siabai-Taragai Gwitembe	Earth/Gravel	Minor roads prog	
R1	8.8	Nyabigori - Kegonga	Earth/Gravel	Minor Roads prog	
R2/3	12.6	Kegonga - Kagitimu Macta	Earth/Gravel	Minor Roads prog	
R4	12.0	Makararangwe - Tagai	Earth/Gravel	Minor Roads prog	
E1004	14	Tom Mboya - Nyamache	Earth/Gravel	Minor Roads prog	

5. BONDO DISTRICT – ROAD NETWORK BY DIVISION



Division	Bitumen	Gravel	Earth	Rural Access	Total
Bondo	11.0	50.4	118.9	43.8	224.1
Rarieda	0	0	74.0	12.1	86.1
Usigu	14.0	14.0	38.3	31.9	98.4
Madiany	0	41.0	54.7	0	95.7
Total	25	105.6	285.9	87.8	504.3

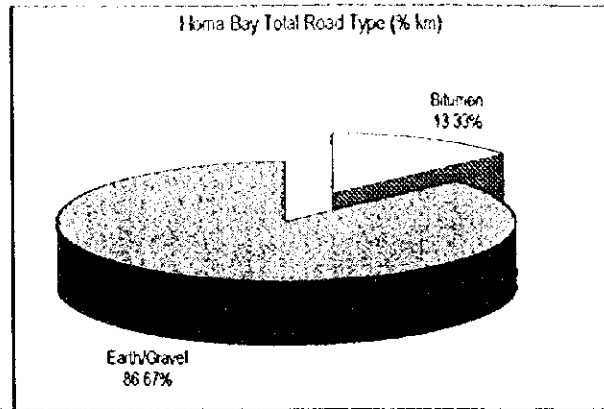
6. RACHUONYO DISTRICT - Road Network by Division (Km)



Division	Classified Roads	Unclassified Roads
Kabondo	43.2	259.2
Kasipul	189.0	134
E. Karachuonyo	105.0	630
W. Karachuonyo	51	306
Total	388.2	1,329.2

Source: District Works Office, Kosele, 1996

7. HOMABAY DISTRICT -- ROAD NETWORK BY TYPE AND CLASS

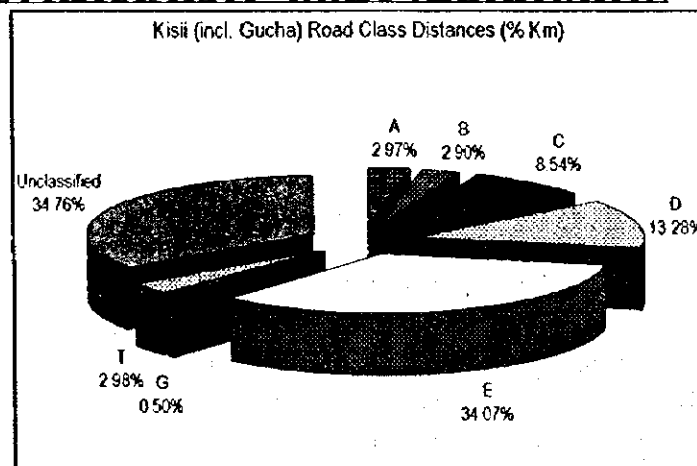


Class	Type	Bitumen Km	Earth/Gravel Km	Total Km
A	Primary Roads	54	64.3	118.3
B	Secondary Roads	-	85.1	85.1
C	Minor Roads	-	201.3	201.3
D	Government Roads	-	0.5	0.5
Total		54	351.2	405.2

HOMABAY DISTRICT ROAD NETWORK BY DIVISION

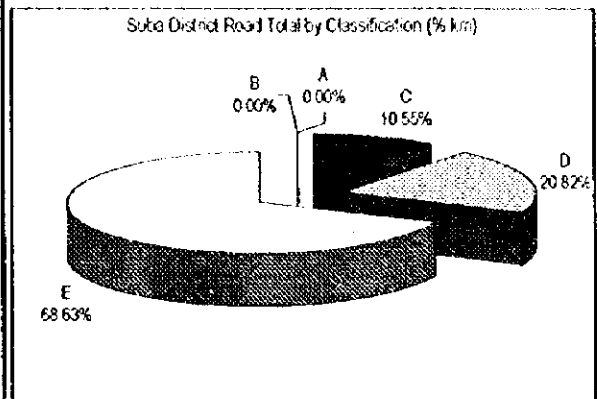
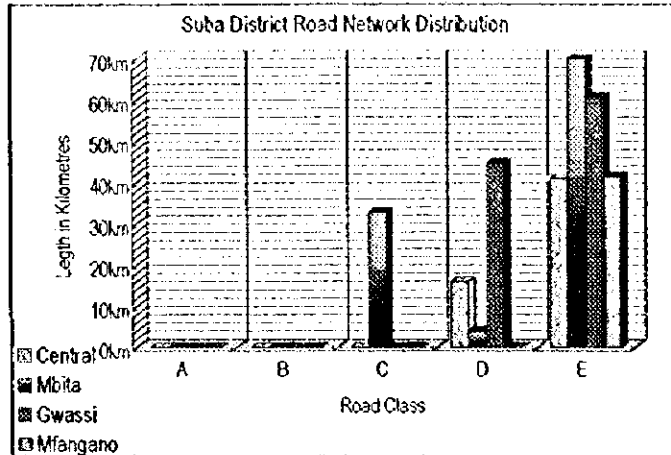
Division	Classified Roads Km.	Unclassified Roads Km.
Rangwe	95.2	97
Asego	75.3	58
Ndhiwa	114.1	113
Nyarongi	120.6	28
Total	405.2	296

8. KISII & GUCHA DISTRICT - ROADS CLASSIFICATION



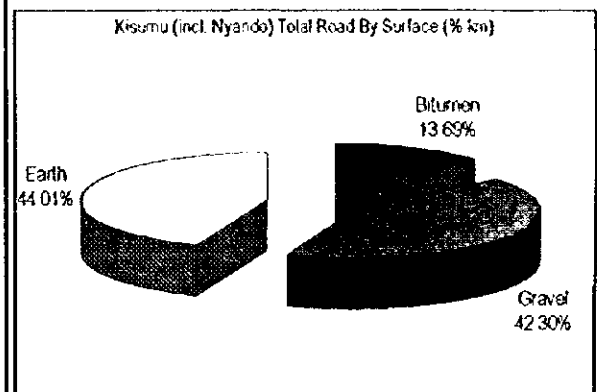
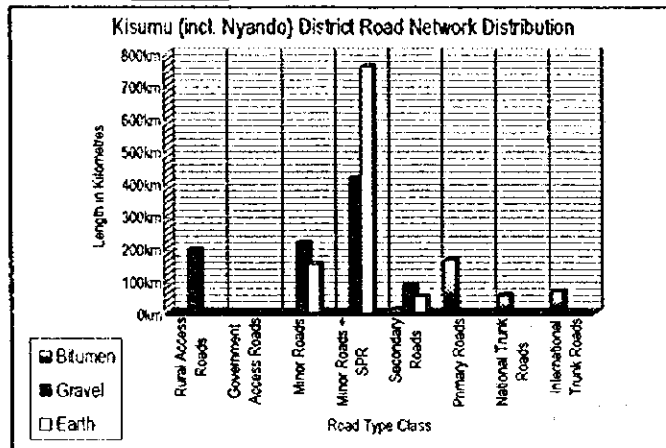
Road Class	Number of Roads	Distant (Km)	Maintaining Agency
A	1	31	GOK/MOPW
B	1	30.2	GOK/MOPW
C	4	89.1	GOK/MOPW
D	8	138.5	GOK/MOPW
E	30	355.3	GOK/MOPW
G	2	5.2	GOK/MOPW
T	4	31.1	Tea Cess
Unclassified	43	362.5	RARP/Local Authority
Total	93	1,042.9	

9. SUBA DISTRICT ROAD CLASSIFICATION BY DIVISION



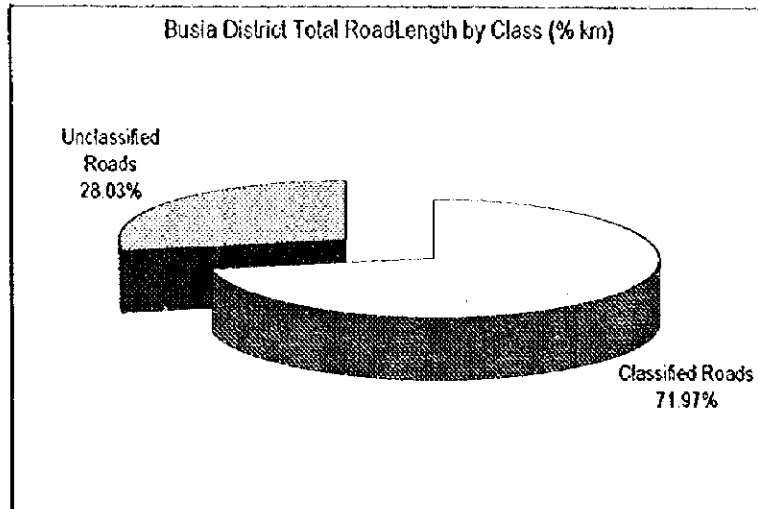
Division	Classification (Kms)				
	A	B	C	D	E
Central	0	0	0	16	41
Mbita	0	0	32.8	4	70
Gwasssi	0	0	0	44.7	60.8
Mfangano	0	0	0	0	41.5
Total	0	0	32.8	64.7	213.3

10. KISUMU/NYANDO DISTRICT - DISTRIBUTION OF ROAD NETWORK BY CLASS



Class of Road		Road Type Length in Kms			
		Bitumen	Gravel	Earth	Total Km
International Trunk Roads	A	68.1	0.0	0.0	68.1
National Trunk Roads	B	55.2	0.0	0.0	55.2
Primary Roads	C	162.7	7.9	0.0	170.6
Secondary Roads	D	12.9	85.2	50.0	148.1
Minor Roads + SPR	E+	0.0	415.1	759.0	1,174.1
Minor Roads	E	0.0	216.0	150.1	366.1
Government Access Roads	G	0.0	3.2	1.6	4.8
Rural Access Roads	R	0.0	195.9	0.0	195.9
Total		298.9	923.3	960.7	2,182.9

11. BUSIA DISTRICT



Total Network	532.7
Tarmached	27 km (Busia – Kisumu)
Classified roads	377.5 km
Unclassified roads	147 km

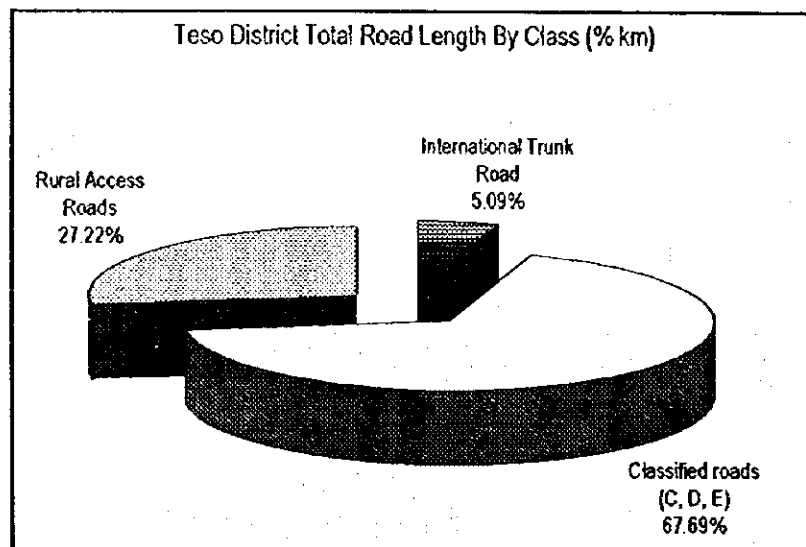
ROAD COVERAGE BY DIVISION

Nambale – well served with classified and unclassified

Funyula – Well served with access roads compared to classified.

Butula & Budalangi – Least served

12. TESO ROADS



1 International Trunk road (14.1 km) A104 Webuye – Tororo
 Classified roads 187.5 km (classes C, D and E)
 Rural access roads 75.4 km

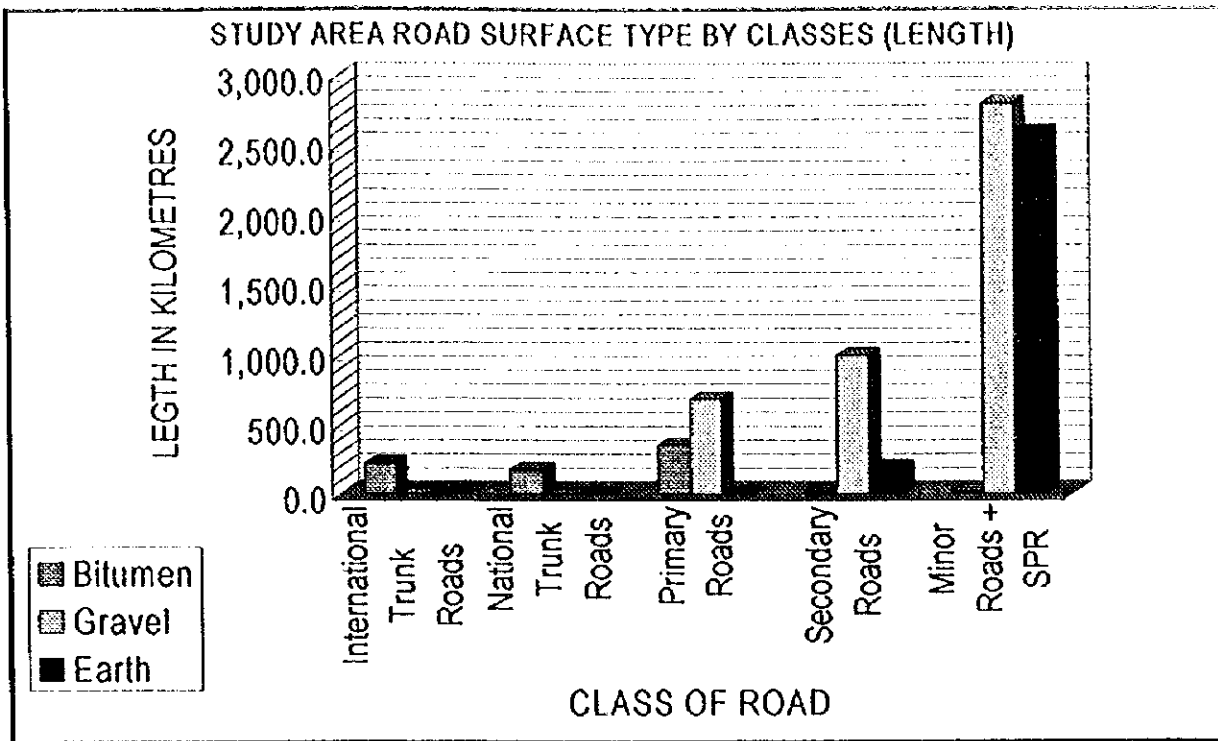
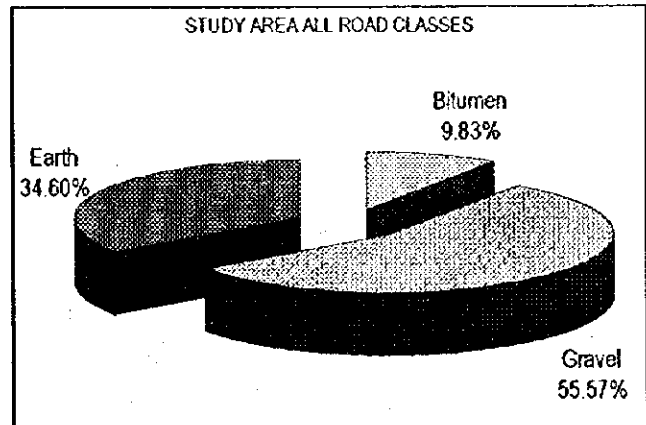
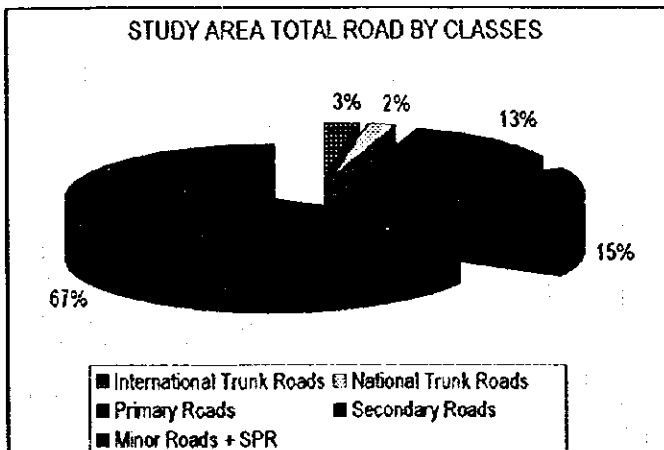
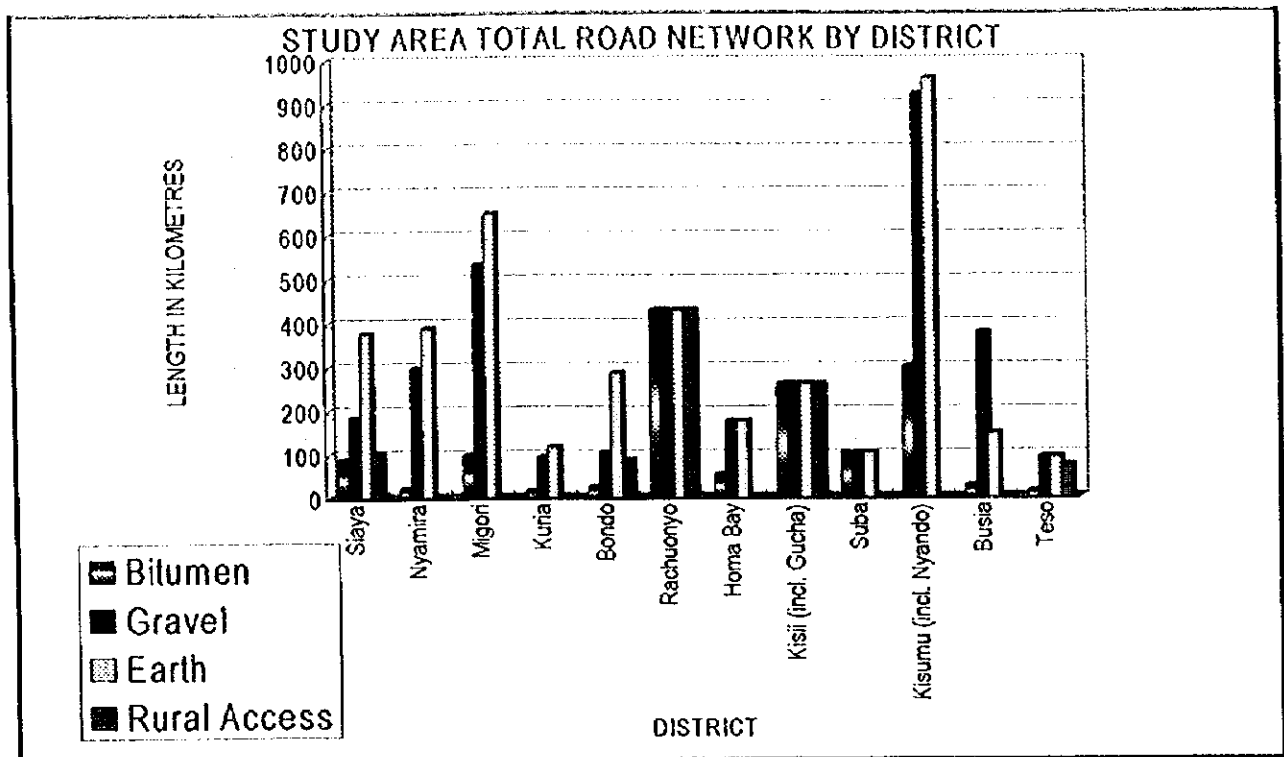


Table 0 Road Length of all classified roads by surface type
 Area Covered : STUDY AREA Total Road Length in km

Class of Road		Surface Type			TOTAL (km)
		Bitumen	Gravel	Earth	
International Trunk Roads	A	225.2	0.0	0.0	225.2
National Trunk Roads	B	179.9	0.0	0.0	179.9
Primary Roads	C	354.8	685.1	0.0	1,039.9
Secondary Roads	D	16.9	999.5	196.8	1,213.2
Minor Roads + SPR	E+	17.2	2,804.4	2,598.1	5,419.7
ALL CLASSES		794.0	4,489.0	2,794.9	8,077.9

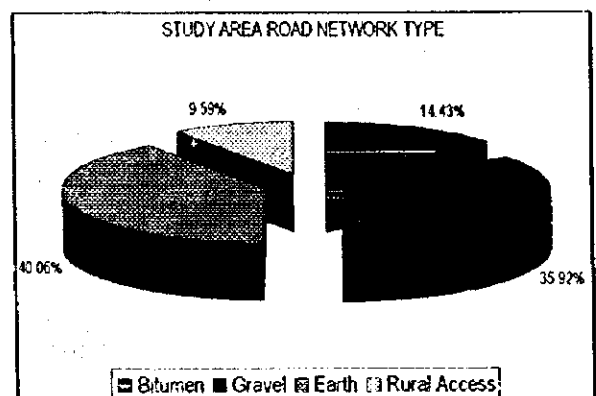
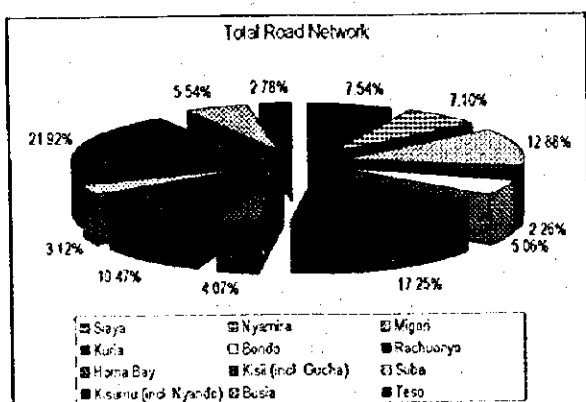
Source: Schedule Of Classified Roads, MOPW&H 1995





STUDY AREA					
District	Bitumen	Gravel	Earth	Rural Access	Total Road Network
Siaya	87.5	183.6	377.3	101.9	750.3
Nyamira	22	296.8	388.25	0	707.05
Migori	98.2	533.9	650.6	0	1,282.7
Kuria	16	92.55	116.25	0	224.8
Bondo	25	105.4	285.9	87.8	504.1
Rachuonyo	429.35	429.35	429.35	429.35	1,717.4
Homa Bay	54	175.6	175.6	0	405.2
Kisii (incl. Gucha)	260.73	260.73	260.73	260.73	1,042.9
Suba	103.6	103.6	103.6	0	310.8
Kisumu (incl. Nyando)	298.9	923.3	960.7	0	2,182.9
Busia	27	377.5	147	0	551.5
Teso	14.1	93.75	93.75	75.4	277
Total	1,436.38	3,576.1	3,989.0	955.18	9,956.67

Source: District Development Plans 1997-2001



AGRO-ECOLOGICAL ZONES - DISTRICTS

1. HOMA BAY - AGRO - ECOLOGICAL ZONES

Six Agro-ecological zones; Upper midlands UM1 & UM3 and lower midlands LM1, LM2, LM3 & LM4

ZONE	TOTAL AREA	DIVISIONS
LM3	46,400 ha	Rangwe, Asego, Ndhiwa, Nyarongi
LM2	37,600 ha	Rangwe, Asego, Ndhiwa, Nyarongi
LM1	6,000 ha	Eastern Rangwe, Eastern Ndhiwa
LM4	2,800 ha	South-western Nyarongi
UM3	4,600 ha	Ndhiwa, Nyarongi
UM1	300 ha	Eatern (tip), Rangwe

2. SUBA DISTRICT - AGRO - ECOLOGICAL ZONES

Five Agro-ecological zones;

DIVISION	UM4 Km ²	LM3 Km ²	LM4 Km ²	LM5 Km ²	UM3 Km ²	TOTAL
Central	16	-	-	59	32	107
Mbira	-	40	171	46	-	257
Gwasi	-	-	61	67	-	128
Mfangano	-	-	-	38	-	38
TOTAL (KM²)	16	40	232	210	32	530

3. BUSIA DISTRICT - AGRO - ECOLOGICAL ZONES

Four Agro-ecological zones; LM1, LM2, LM3 AND LM4 all being lower midlands

DIVISION	LM1	LM2	LM3	LM4	TOTAL AREA (KM ²)
Nambale/Matayos	18,240	4,560	-	-	22,800
Butula	25,175	1,325	-	-	26,500
Fungula	-	2,560	20,480	2,460	25,600
Budalangi	-	-	7,680	11,520	19,200
Township	1,900	-	-	-	1,900
Matayos	9,900	6,600	-	-	16,500
TOTALS	* 55,215	15,045	28,160	13,980	112,500

4. SIAYA/BONDO DISTRICTS - AGRO - ECOLOGICAL ZONES

Five Agro-ecological zones; LM1 - LM5, Yala Division has 30 Km² of UM

Zone	Total Area	Divisions
Semi-dry midland Zones (LM4 & LM5)		Lower parts of the district along shores of Lake Victoria; Madiany, Rarieda, Usingu
LM3		Middle parts of the district Bondo, Upper Rarieda, Lower Boro
LM2 & LM1		Northern Divisions of the district: Ukwala, Wagai, Yala, Ugunja, Upper Boro.
UM	30 Km ²	Pockets of Yala Division

5. NYAMIRA DISTRICT - AGRO - ECOLOGICAL ZONES

Division	LH ₁	LH ₂	UM ₁	UM _{2,3}	LM	LM ₂
Mango/Rigoma	179	-	152	-	-	21
Borabu	52	200	-	-	-	-
Nyamira/Ekeranyo	210	175	135	20	-	-

LH₁ = Lower Highland Tea - Dairy zone, LH₂ = Lower Highland maize - Wheat/Pyrethrum zone

UM₁ = Upper midland coffee - Tea zone, UM_{2,3} = Upper midland coffee zone

LM₁ = Lower midland sugar, LM₂ = Marginal sugar cane zone.

6. MIGORI DISTRICT - AGRO-ECOLOGICAL ZONES

ZONE	DIVISION
UM1	Eastern Rongo
UM2-3	Uriri
LM1-2	Rongo, parts of Uriri, parts of Suba west
LM3	Suba East, Suba West, Nyatike
LM4	Lower Nyatike, Karungu, Uriri
LM5	Western Nyatike, Muhuru

**7. GUCHIA DISTRICT - TOPOGRAPHY, AGRO-ECOLOGICAL ZONES
ARABLE & CROPPED LAND**

Division	Altitude M	Soil	AEZ	Cropped land sq.km	Land not cropped sq.km	Non Arable land sq.km	Total area sq.km
Ogembo	1525-1970	Nitosols & Phaeozems	UM1	77.0	92.2	43.0	212.2
Sameta & Nyamache	1510-2060	Nitosol & Phaeozems	UM1	100.0	87.2	49.5	236.7
Nyacheki and Nyamarambe	1460 - 1830	Nitosols	UM1 & M2	131.0	32.7	44.5	208.2
Total				308.0	212.2	137.0	657.1

**8. KISHI DISTRICT - POTENTIAL, SOIL CLASSIFICATION, AND
AGRO-ECOLOGICAL ZONES**

DIVISION	ALTITUDE (M)	SOILS	A.E.Z	CROPPED LAND Sq. km	NON-CROPPED LAND	NON-ARABLE LAND Sq.km	TOTAL AREA Sq.km
SUNEKA	1420-1755	Feral soil & Luvisols	UM, LM2	78.4	20.0	25.0	123.4
MARANI / MOSOCHO	1525-1985	Nitosols & Composals	UM1	76.0	76.0	60.0	212.0
KEUMBU	1675-2000	Nitosols & Phaeozems	UM7 LM2	89.0	30.5	29.8	149.3
MASABA	1890-2180	Nitosols		39.0	90.0	31.3	160.3
TOTAL				282.4	216.5	146.1	645.0

9. NYANDO DISTRICT - AGRO-ECOLOGICAL ZONES BY DIVISION

DIVISION	UM3	LM1	LM2	LM3	LM4	OTHER
Nyabondo / Kadibo	47	--	52	431	129	8
Muhoroni / Miwani	24	6	337	--	--	--

10. RACHUONYO DISTRICT - AGRO, ECOLOGICAL ZONES

ZONE	AREA	DIVISIONS
UM1		Western parts of Kasipal and Kabondo Division.
UM2 - 3		Small section of south-east Kabondo
LM2		Covers Western parts of District in Kasipul and Kabondo
LM3		
LM4		

**11. TESO DISTRICT - AGRO - ECOLOGICAL ZONES
(ARABLE LAND ONLY)**

Lower Midlands LM1 - LM3

DIVISION	LM1 (KM ²)	LM2 (KM ²)	LM3 (KM ²)	TOTAL AREA
AMUKURA / CHAKOL	85	180	8	273
AMAGORO / ANGURAI	-	81	87	168
TOTALS	85 (16%)	261 (~50%)	95 (18%)	441

12. KURIA DISTRICT - AGRO-ECOLOGICAL ZONES BY DIVISION

Division	Type of Ecological Zone
Kehancha	Upper Midland - (UM2)
	Upper Midland - (UM3)
	Lower midland - (LM2)
Mabera	Lower midland - (LM3)
Ntimau	Upper Midland - (UM2)
	Lower midland - (LM2)
Kegonga	Upper Midland - (UM2)
	Upper Midland - (UM3)
	Lower midland - (LM2)

Source: District Agriculture Office, Kehancha, 1996

13. KISUMU DISTRICT - AGRO-ECOLOGICAL ZONES

Division	UM3	LM1	LM2	LM3	LM4	Other
Maseno	26	149	236	7	-	-
Winam	-	-	-	38	56	-

EDUCATION FACILITIES - DISTRICTS

1. SUBA DISTRICT - Distribution of Education Facilities

Divisions	Pre-primary	Primary	Secondary	Youth Poly.
Central	11	25	2	2
Mbita	55	66	4	2
Gwasssi	34	50	2	1
Mfangano	13	21	1	1
Total	113	162	9	6

2. BUSIA DISTRICT - Distribution of Education Facilities

Division	No. of Pre-primary	No. of Primary	No of Secondary	No. of Y/Poly	No. of FTCs	No of FLTCs
Nambale	38	35	4	3	1	-
Butula	58	60	8	2	-	1
Funyula	62	61	6	1	-	2
Budalangi	32	31	5	1	-	-
Matayos	51	38	4	1	-	-
Total	241	225	27	8	1	3

3. SIAYA/BONDO DISTRICT - PRIMARY & SECONDARY ENROLMENT (1995)

Institution	No.	Enrolment	T/P Ratio	Drop out Rates	
				Boys	Girls
Primary	606	184,165	1:32	43%	44%
Secondary	82	16,740	1:18	24%	30%

T/P Ratio – Teacher to pupil ratio

4. NYAMIRA DISTRICT - Distribution of Education Facilities and Numbers Enrolled by Division

Division	Pre-primary (No.)	Enrolment	Primary (No)	Enrolment	Secondary (No.)	Enrolment	Youth Poly. (No.)	Enrolment
Nyamira	9	4563	94	37877	18	5388	6	325
Ekerenyo	114	5112	115	35438	14	3468	8	398
Berabu	50	1855	47	12229	11	3628	2	144
Rigoma	82	3797	67	24288	21	4548	4	110
Manga	64	3020	61	21760	16	4427	4	186
Total	409	18347	383	130592	80	21459	24	1163

5. **MIGORI DISTRICT - Education and Training Institutions by Type and Division**

Division	Pre-primary	Primary School	Secondary	TTC	Poly.
Suba East	73	50	7	1	2
Suba West	53	40	2	0	1
Uriri	63	61	7	0	1
Rongo	66	66	10	1	2
Awendo	76	69	7	0	1
Muhuru	9	9	1	0	0
Nyatike	65	88	4	0	1
Karungu	9	10	2	0	1
Total	414	393	40	2	9

6. **KURIA DISTRICT - Education Facilities in the District**

Division	Pre-primary	Primary	Secondary	Youth Polytechnics
Mabera	50	45	4	3
Kehancha	48	39	2	1
Kegonga	32	27	2	2
Niimaru	15	15	2	1
Total	145	126	10	7

7. **GUCHA DISTRICT - Distribution of Education Facilities by Type and Division**

Division	Pre-primary	Primary	Secondary	Y/Poly	INST	TTC	University College	FTC
Ogembo	51	52	15	3	-	-	-	-
Sameta	35	37	11	-	-	-	-	-
Nyamache	55	55	16	6	-	-	-	-
Kenyena	62	64	19	4	-	-	-	-
Nyacheiki	39	39	7	-	-	-	-	-
Nyamarambe	96	98	21	3	-	-	-	-
Total	338	345	89	16	-	-	-	-

INST = Institute of Science & Technology

FTC = Farmers Training College

TTC = Teachers Training College

8. **KISHI DISTRICT - Distribution of Education Facilities by Type and Division**

Division	Pre-primary	Primary	Secondary	Y/Poly.	INST	TTC	FTC	University College
Masaba	77	77	27	6	-	-	-	
Keumbu	100	83	22	5	1	1	1	
Suneka	46	49	12	4	-	-	-	
Mosocho	39	39	8	1	-	1	-	
Marani	55	55	11	5	-	-	-	
Total	317	303	80	21	1	2	1	

9. **RACHUONYO DISTRICT - Primary School by Division**

Division	No. of Schools	No. of Pupil by sex			No of Teachers by sex		
		M	F	Total	M	F	Total
Kabondo	53	7,227	6,497	13,724	344	123	467
Kasipul	102	17,932	16,432	34,364	685	360	1,045
E/Karachuonyo	89	10,635	9,799	20,434	511	191	702
W/Karachuonyo	71	7,036	6,289	13,325	407	114	521
Total	315	42,830	39,017	81,847	1947	788	2,735

Source: District Education Office, Kosele

10. **RACHUONYO - Pre-Primary Schools by Division**

Division	No. of Schools	No. of Teachers			Enrolment		
		Trained	Untrained	Total	Boys	Girls	Total
Kabondo	19	17	8	25	1,306	1433	2,739
Kasipul	59	14	50	64	1,195	1315	2,510
E. Karachuonyo	70	30	47	77	1,644	1466	3,110
W. Karachuonyo	43	14	42	56	1,420	1225	2,645
Total	191	75	147	222	5,565	5439	11,004

Source: District Education Office, Kosele, 1996

11. RACHUONYO - Secondary School by Catchment Area and Divisions

Division	Type	Number of Schools
Kabondo	Provincial Day	1
Kasipul	Provincial Boarding	3
	Provincial Day	4
	District Day	5
	Private	4
E. Karachuonyo	Provincial Boarding	2
	Provincial Day	1
	District Day	5
W. Karachuonyo	Provincial Boarding	1
	Provincial Day	3
	District Day	1
	Private	1
Total		31

Source: District Education Office, Kosele, 1996

10. TESO DISTRICT - PRIMARY & SECONDARY ENROLMENT

DIVISION	No. of Primary Schools	Enrolment (Total)	% Utilisation	No. of Secondary Schools	Enrolment (Total)	% Utilisation
Amagoro / Angurai	54	16,182	55	9	1,619	83
Amukara / Chakol	54	19,980	57	6	1,365	87
TOTALS	108	36,162		15	2,984	

DEO 1996

There is low utilisation of available facilities in the primary education sector (average 56%)

Enrolment in secondary schools is low

There is much higher drop out rate at the primary school level than at the secondary school level. Reasons include pregnancy, lack of fees, business influences and early marriages

Total number of teachers in primary school in 1996 was 1,204 giving a teacher: pupil ration of 1:30.

12. KISUMU/NYANDO – Distribution of Education Facilities by Division

Division	Pre-primary	Primary	Secondary	National Polytechnic	Technical Training Institutes	Youth Polytechnic	University
Maseno	106	138	21	0	0	1	1
Miwani	56	73	2	0	0	2	0
Kadibo	45	38	7	0	0	1	0
Upper Nyakach	70	80	14	0	0	2	0
Lower Nyakach	50	58	10	0	0	2	0
Winam	213	128	20	1	1	10	0
Nyando	46	51	3	0	0	5	0
Muhoroni	69	45	4	0	0	2	0
Total	655	611	81	1	1	25	1

13. KISUMU/NYANDO – Enrolment in Primary and Secondary Schools, 1996

Division	Primary	Secondary
Winam	53,025	6,680
Maseno	31,050	4,593
Kadibo	11,645	982
Nyando	14,444	1,333
Muhoroni	14,034	900
Miwani	13,913	370
Lower Nyakach	12,465	1,248
Upper Nyakach	17,340	2,567
Total	167,916	18,673

14. HOMA BAY DISTRICT – Primary School Divisional Distribution

Division	No. of Schools	No of Pupils by sex		Total	No. of Teachers by sex		Total	No of Classes	Teacher /Pupil Ratio
		F	M		F	M			
Rangwe	105	11,639	10,491	22130	657	219	876	815	1:25
Asego	66	9,090	8,479	17569	368	277	645	602	1:27
Ndhiwa	89	10,292	8,997	19,289	532	127	659	716	1:29
Nyarongi	43	5,259	4,242	9501	276	42	318	354	1:30
Total	303	36,280	32,209	68,489	1833	665	2498	2487	115

15. HOMA BAY - Distribution of Secondary Schools by Category and Division

Category	Rangwe	Asego	Ndhiwa	Nyarongi
Area of Catchment				
Provincial Boarding	2	2	-	-
Provincial Day	3	1	3	-
District Boarding	-	-	-	1
District Day	3	1	4	2
Private	-	1	-	-
Sub-Total	8	5	7	3

WATER SUPPLY - DISTRICTS

1. SUBA DISTRICT - Water Facilities

Divisions	Water Suppliers		Bore holes		Dams
	GOK	Private	Operational	Dry	
Central	0	0	7	5	7
Mbita	1	2	3	11	9
Gwasssi	2	1	14	0	2
Mfangano	0	0	4	0	0
Total	3	3	28	16	18

2. BUSIA DISTRICT - Distribution of Water Facilities

Division	GOK	Self-help	Inst.	CC	Communal	Total
Nambale	1	0	1	1	149	152
Matayos	3	0	0	1	85	89
Funyula	4	1	0	0	131	136
Budalangi	2	0	2	0	120	124
Butula	1	1	4	3	242	251
Total	11	2	7	5	727	752

3. NYAMIRA DISTRICT - Distribution of Water Facilities by Type and Division

Division	Piped water supply	Bore hole	Protected well	Unprotected Wells	Protected Springs	Unprotected springs	Dam/pan
Nyamira	2	-	2	27	194	1205	-
Ekerenyo	1	6	3	69	55	500	-
Borabu	6	15	1	46	13	240	14
Rigoma	2	1	14	32	100	687	-
Manga	4	1	6	78	170	600	-
Total	15	23	26	252	532	3232	14

4. GUCHA DISTRICT - Distribution of Water Facilities by Division

Division	Water supplies	Improved Springs	Bore Holes	Wells
Ogembo	3	170	-	1
Sameta	2	38	-	-
Nyamache	4	65	-	-
Kenyenya	2	109	-	-
Nyacheki	-	19	-	-
Nyamarambe	8	127	2	5
Total	8	528	2	5

5. **KISHI DISTRICT - Distribution of Water Facilities**

Division	Water Supplies	Improved Springs	Bore Holes	Wells
Keumbu	2	23	1	-
Suneka	1	41	-	-
Masaba	3	96	-	-
Marani	3	202	-	-
Mosocho	6	48	1	-
Total	15	410	1	0

6. **RACHUONYO DISTRICT - Water Facilities by Division and sponsoring Agency**

Division	Institutional Water supplies	GOK	Community	Divisional Total
Kabondo	1	0	0	1
Kasipul	5	1	0	6
E/Karachuonyo	2	1	1	4
W/Karachuonyo	1	1	0	2
Total	9	3	1	13

Source: District Water Office, Koscle, 1996

7. **TESO DISTRICT - Water Supply**

DIVISION	NO. OF PIPED WATER FACILITIES	NO. OF BORE HOLES
AMAGORO	3	45
ANGURAI	4	
AMUKURA	4	14
CHAKOL	3	57
TOTALS	10	59

The Northern part of the district suffers relatively acute shortages of water compared to the other parts, Completion of the giant Malaba - Kocholia water supply is expected to improve the situation, not only in this area but, indeed, in the entire district.

Most of the existing water supplies are operating below capacity (mainly) due to lack of maintenance.

8. **KISUMU/NYANDO DISTRICT - Distribution of Water Facilities By Division & Type**

Division	Piped Schemes	Wells/Bore holes	Protected Springs	Population Served
Maseno	2	53	10	73,750
Winam	3	21	8	91,362
Muhoroni	8	5	3	22,099
Upper Nyakach	1	11	5	29,099
Lower Nyakach	1	62	0	49,429
Kadibo	1	72	0	21,600
Nyando	4	108	0	48,686
Miwani	1	55	0	20,560
Total	21	387	26	356,585

9. **KURIA DISTRICT - Water Facilities By Type And Size Of The Population Served**

Division	Water Facility	No.	Population Served	Intensity of Usage	Remarks
1. Mabera	Protected Springs	21	5000	Over utilized	Only source of clean water
	Dams	2			
	Piped water Supplies	2	800	Normal	Water not clean for domestic use
	Hand dug well	19	2,000	Under utilized	
	Roof Catchment	5		Over utilized	
2. Kehancha	Protected springs	12	6,000	Over utilized	Clean water source
	Dams	3		Under utilized	
		Piped water	3	10,000	Normal
	Hand dug wells	6	600	Under utilized	Yields low for institutions
	Roof catchment		600	Over utilized	

10. **HOMA BAY DISTRICT - Average Walking Distance To Water Points By Division**

Divisions	Dry Season	Wet Season
Rangwe	5 to 10 km	5 to 7 kms
Asego	5 to 10 km	5 to 7 kms
Ndhiwa	10 to 15 km	7 to 9 kms
Nyarongi	10 to 15 km	7 to 9 kms

11. MIGORI DISTRICT – Distribution Of Water Facilities By Divisions

Divisions	Piped Schemes	Boreholes	Wells	Springs	Dams
Uri	3	0	75	47	6
Nyatike	3	5	25	5	12
Muhuru	0	0	0	0	5
Karangu	2	3	19	2	6
Rongo	1	4	47	15	2
Suba East	3	7	67	3	2
Suba West	0	6	60	2	1
Awendo	2	4	40	15	0
Total	14	29	333	89	34

12. SIAYA/BONDO DISTRICT – Distribution Of Water Facilities By Division

Division	Piped Water Supply	Bore holes	Shallow Wells	Dams	Protected Springs
Ukwala	7	177	108	7	8
Ugunja	10	88	38	1	67
Uranga	13	64	22	7	0
Boro	1	18	124	35	44
Bondo	3	38	8	17	2
Rarieda	4	53	11	28	2
Yala	5	13	32	0	27
Wagai	1	49	74	9	20
Madiany	19	18	1	30	1
Usigu	5	7	0	4	0
Total	68	525	418	138	171

STUDY AREA

SOIL CLASSIFICATION BY DISTRICTS

1. HOMABAY DISTRICT - SOIL CLASSIFICATION

REGION	SOIL CHARACTERISTICS	PARENT ROCK
Lake Shore lowlands (Rangwe, Asego)	Alluvial Soils, mainly sandy loam soils, well drained	
Eastern Rangwe	Well drained loam and brown clay soils	
Upper Rangwe	Nitosols	
Other areas all over the district	Plain soils, arenosols Vertisols, loth osols and Verticlas	

2. SUBA DISTRICT - SOIL CLASSIFICATION

REGION	SOIL CHARACTERISTICS	PARENT ROCK
Lake shore lowlands (Mbita & Mfangano)	Alluvial soils, mainly sandy loam's	Basalt rock
Mountain/Hill areas (Gwasi)	-	Indifferent fertility (aromite, Quartz)
Lambure Valley	Chronic and Malic solvents Alluvial gravel's and superficial deposits	Sediments from ashes
Rusinga Island	Niolene deposits	

3. BUSIA DISTRICT - SOIL CLASSIFICATION

	REGION	SOIL CHARACTERISTICS	PARENT ROCK
i	Around Busia & Somia Hills	Moderately deep, generally rocky and stony consisting of well drained red clays of low natural fertility	Intermediate and basic ingenious rocks, sedimentary rocks and collurium
ii	Uplands (Nambale - Butula)	Well drained, deep brownish sandy with moderate water holding capacity	"
iii	Bottom lands (Busalangi - part Funyula adjoining Lake Victoria)	Poorly drained, deep firm and clay type, frequently flooded	Recent alluvial deposits and collurium

4. SIAYA & BONDO DISTRICTS - SOIL CLASSIFICATION

REGION	SOIL CHARACTERISTICS	PARENT ROCK
Southern parts (Usingu, Bondo, Raricda, Madiany)	Mainly black cotton soils with a lot of clay	
North Western parts (Ukwala, Ugunja, Uranya, Boro)	Red volcanic soils with sandy loam's	

5. NYAMIRA DISTRICT - Soil Characteristics

The soil types are friable clay, sandy loam and rich clay loam.

Valley bottom soils are used for making bricks and tiles

6. MIGORI DISTRICT - SOIL CLASSIFICATION

- The soils vary in texture from division to division and from one area of a particular division to the other.
- Volcanic soils are found to the north of River Migori.
- Black cotton soils are found in Karungu Division and contain adequate nutrients suitable for cropping.
- Poorly drained heavy clay soils are found in the river valleys and lake shore areas.

7. GUCHA DISTRICT – SOIL CLASSIFICATION (from Agro-ecological zones)

Soil
Nitosols & Phaeozems
Nitosol & Phaeozems
Nitosols

8. **KISII DISTRICT – SOIL CLASSIFICATION**
(from Agro-ecological zones)

SOILS
Feral soil & Luvisols
Nitosols & Composals
Nitosols & Phaeozems
Nitosols

9. **KISUMU DISTRICT - SOIL CLASSIFICATION**

Predominantly lake sediments, usually sandy clay soils

REGION	SOIL CHARACTERISTICS	PARENT ROCK
Maseno, Kajulu	High fertility soils	
Uplands	Sandy Soils;	Intermediate Igneous rocks
Slightly elevated grounds and red mount plans	Clay soils of moderate fertility; deep but poorly drained	
North Western Kisumu	Low fertility soils with rock base not more than 80 cm from surface	Granite extension of rocks Kakamega uplands
Lake Victoria ridges and fringes of winam gulf plains	Black cotton soils	
Upper zones	Residual of volcanic soils	

10. **NYANDO DISTRICT - SOIL CLASSIFICATION**

Predominantly swamps-associated dark soils

REGION	SOIL CHARACTERISTICS	PARENT ROCK
Kano plains	Dark brown and grey soils, poorly drained; deep and firm.	
Muhoroni & Nyabondo	High fertility soils	
Uplands	Sandy Soils;	Intermediate Igneous rocks
Slightly elevated grounds and red mount plans	Clay soils of moderate fertility; deep but poorly drained	
Western part of Kano plains	Black cotton soils	
Upper zones	Residual of volcanic soils	

11. RACHUONYO DISTRICT – SOIL CLASSIFICATION

Region	Soil Characteristics	Developed On
Lake lowlands (East & West Karachuonyo)	Alluvial, sandy and loamy	
Eastern Region (uplands) (Kapsipul & Kabondo)	Highly productive, well-drained loam and brown clay soils	

12. TESO DISTRICT - SOIL CLASSIFICATION

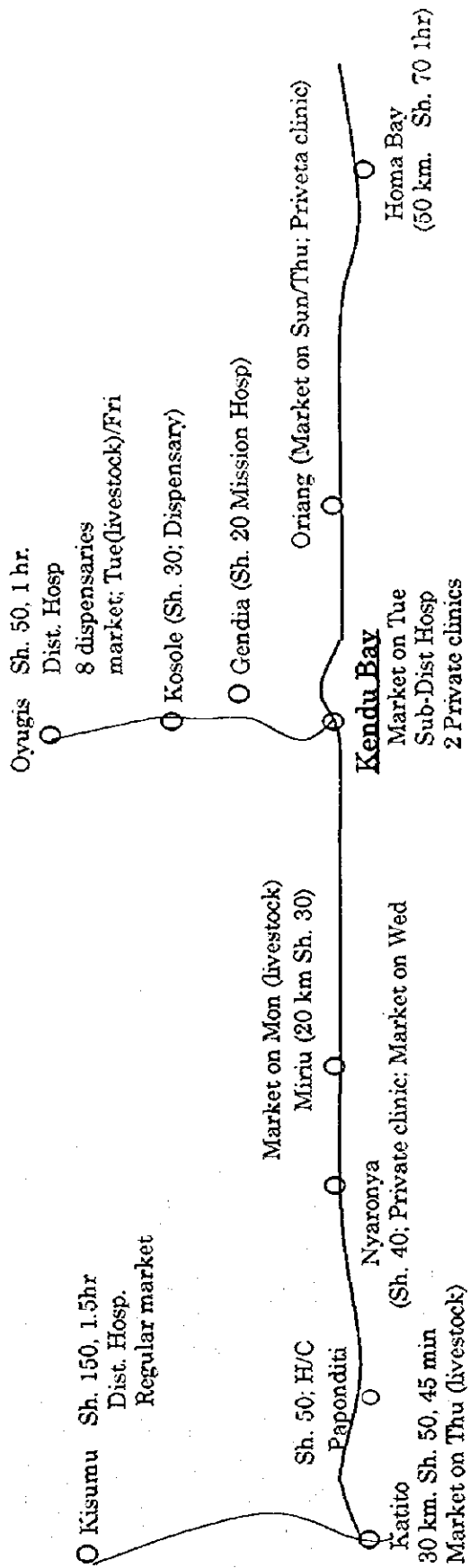
REGION	SOIL CHARACTERISTICS	DEVELOPED ON
Northern (Kochalia - Chamasiri)	Well drained sandy, clay, loam to sandy clay	Granite rocks
Central (Kamuriai - Amukura)	Well drained shallow to very deep friable sandy clay, clay loam to clay Some parts have imperfectly to poorly drained deep to very deep friable form clay, sandy clay, cracking clay	Granite rocks
Southern (Alupe)	Imperfectly poorly drained to well drained, moderately deep to deep sandy clay loam's to clays overlying petroplinthite in shallow parts	Sandy stones

13. KURIA DISTRICT - SOIL CLASSIFICATION

- The main soil types found in the District are deep well drained silty clays and loams of the nitochamic forestalls (red murrum type) mainly found in Ntimaru and Kegonga Divisions.
- Ferralic camb soils (dark murrum with sandy loam) are found widely in Mabera.
- Humic arisols with lithsols (sandy soil with humus and rock outcrops) mainly found in Kehancha.
- Poorly drained planosols are found in valley bottoms.
- Lithsols with rock out-crops are found in the hill side slopes.

Appendix 2.2 Community Needs Survey

Socio-economic Profile
Kendu Bay, East Karachuonyo Division; Rachuonyo District

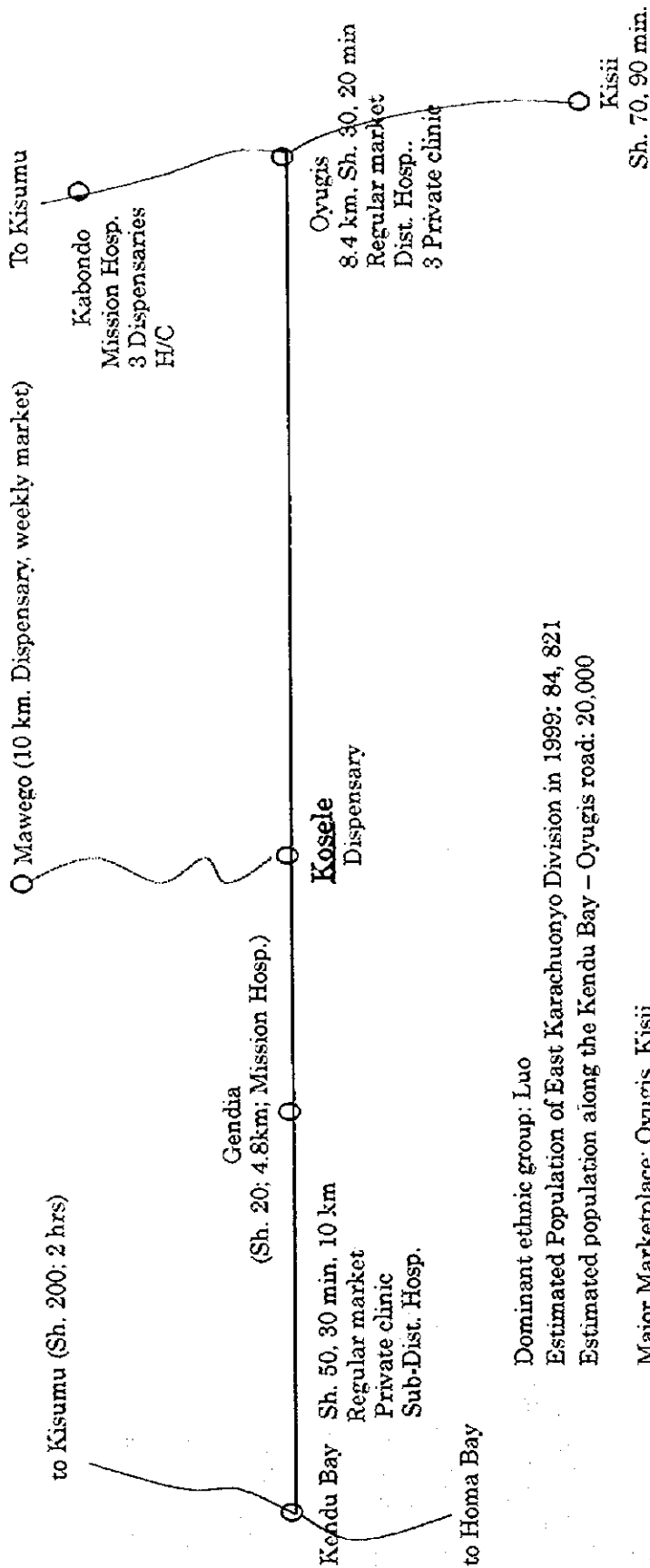


Dominant Ethnic Group: Luo (majority of residents of Kendu Bay is Muslim)
 Estimated Population of East Karachuonyo Division in 1999: 84, 821
 Road towards Katito repaired in late 1980s

Major marketplace: Oyugis, Kisumu
 In serious case, people go to Gendia Mission Hosp. (20 min. drive)
 About 20 matatu services towards Kisumu/Homa Bay, about 10 to Oyugis
 Source of water: lake, wells
 Milk: supplied y local farmers

Food Crop: maize, millet (produced once a year, mostly consumed locally)
 yam (all through the year), tomato, onion (once a year; partially marketed)
 Cash Crop: Cotton, followed by ground-nuts
 Fishery: engaged by more than 80% of local population
 Livestock: cattle, goat, sheep, chicken

**Socio-economic Profile
Kosele Market, East Karachuonyo Division; Rachuonyo District**



Dominant ethnic group: Luo

Estimated Population of East Karachuonyo Division in 1999: 84, 821

Estimated population along the Kendu Bay – Oyugis road: 20,000

Major Marketplace: Oyugis, Kisii

In severe cases, people visit Gendia Mission Hosp.

10 matatu services going through Kosele a day

Source of water: Kotunga river (some residents make 6 km to reach there)

(20 liter of water is sold at Sh. 20 in Kosele town)

Milk: supplied by local farmers

Major food crop: maize (produced twice an year; millet (produced once a year; locally consumed)

beans (locally consumed)

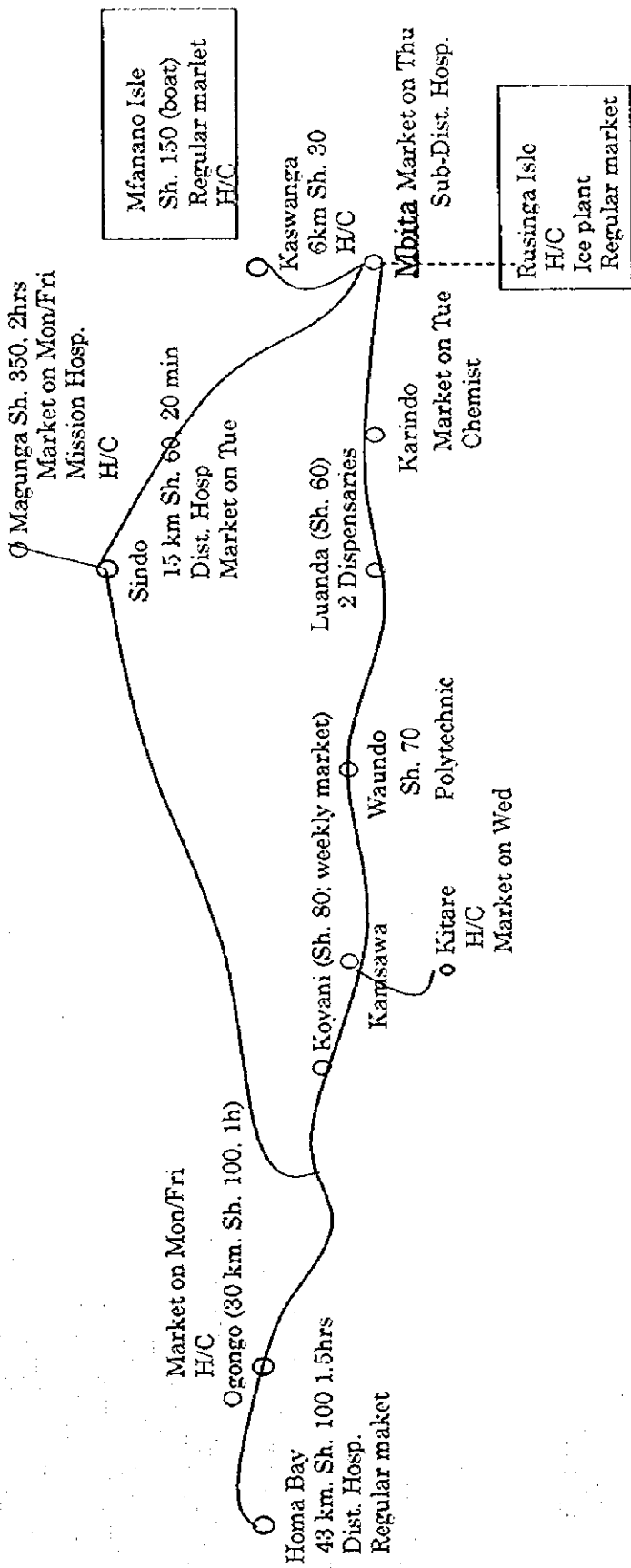
Major cash crop: cotton, followed by tea, ground-buts, yam

Livestock: cattle (5 on average), chicken, goat, sheep, bee-hive

Fishery: in Kendu Bay and at several fishing ponds within the Division

Socio-economic Profile

Mbita town, Mbita Division, Suba District,



Dominant ethnic group: Luo
 Estimated population of Mbita Division: 150,000

Major marketplace: Homa Bay, Kisumu

In serious case, people go to Dist. Hosp. in Homa Bay or even to Dist. Hosp. in Kisii and in Migoli
 About 17 matatu services a day to H/Bay

When it rains, matatu fare to H/Bay hikes to Sh. 200; Waundo Sh. 120

Source of water: lake (causing problems, esp. typhoid as water get polluted recently)

Milk: supplied from the surrounding area

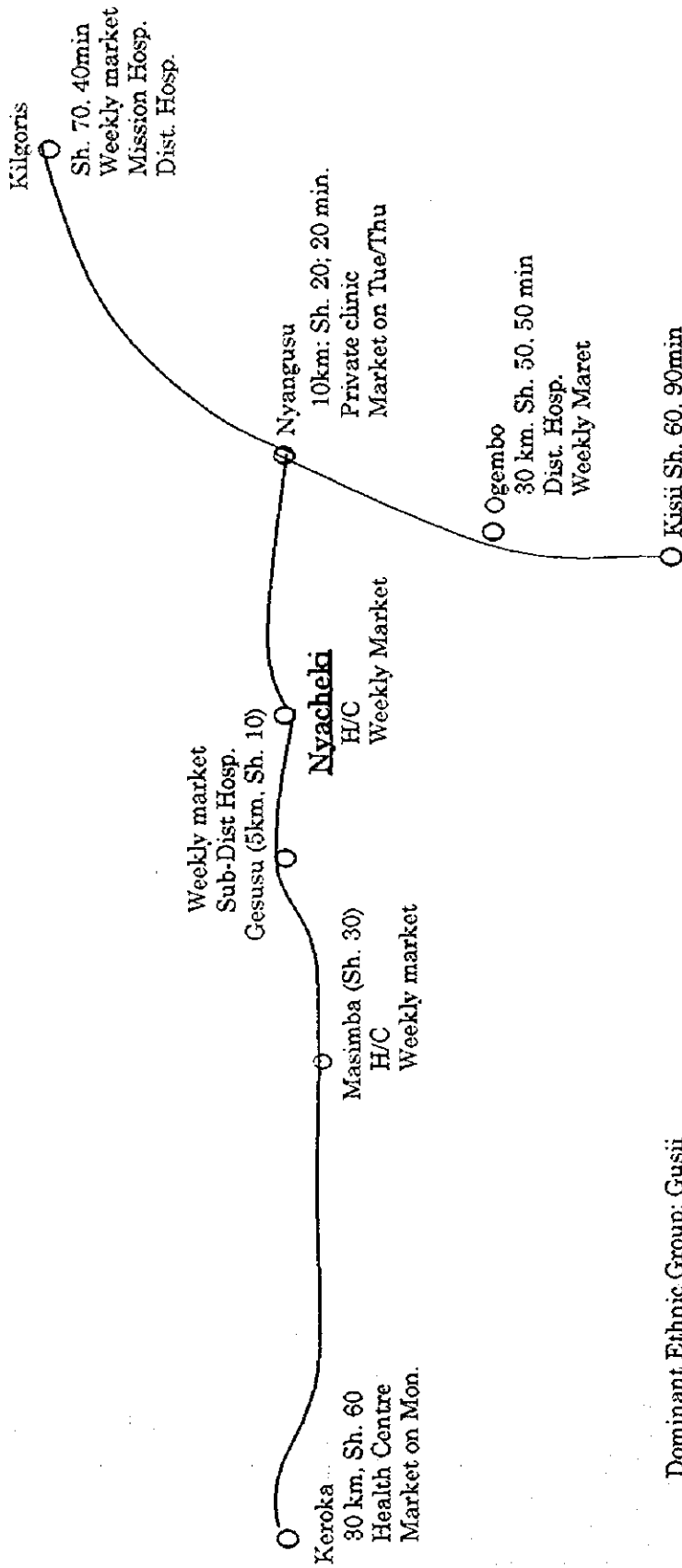
Food crop: Maize, Millet, Yam, onion, tomato (produced once a year. all consumed locally)

Cash crop: no significant production of cash crop

Livestock: cattle, sheep, goat, chicken

Fishery: 17 Fish landing beach along H/Bay - Mbita road

Socio-economic Profile
Nyacheki town, Nyacheki Division, Gucha District



Dominant Ethnic Group: Gusii
 Estimated Population of Nyacheki Division of 1998: 70,000

Major marketplace: Kisii

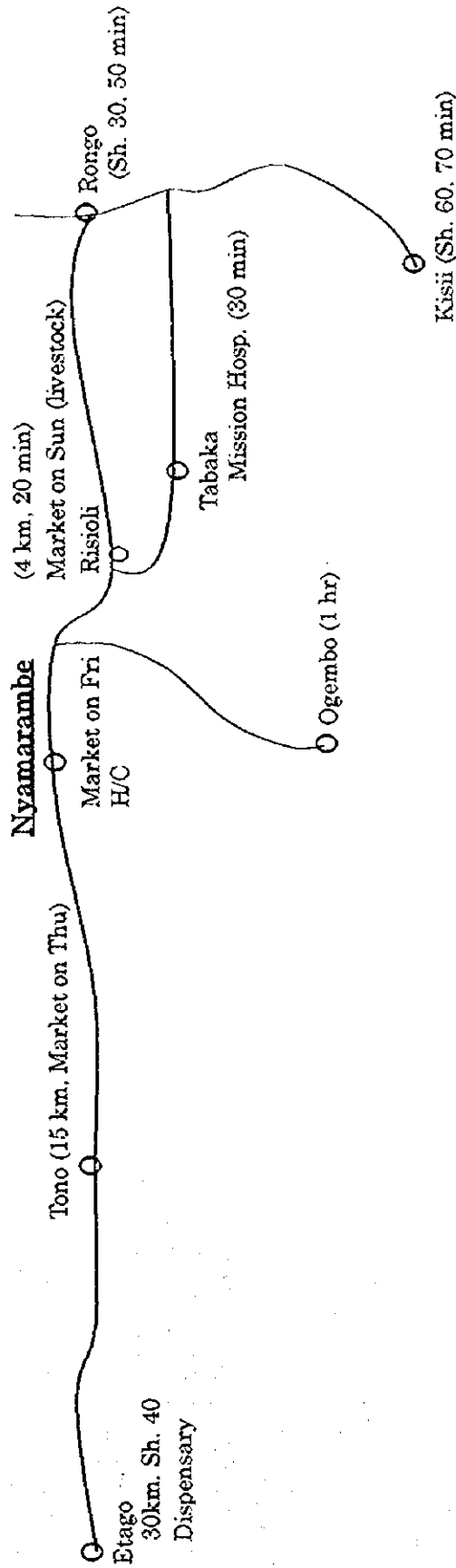
In serious case, people go to Gesusu Sub-Dist. Hosp or even Kisii Dist. Hosp.
 About 6 matatu services a day to Nyangusu, 10 straight to Kisii
 (a lot of matatu available bet. Nyangusu and Ogemobo)

Source of water: river nearby (some need to make 2km to nearest river)
 Milk: supplied locally and from Kisii

Food crop: Maize, beans (produced twice a year, mostly consumed locally)
 Banana, yam, potato (consumed locally)

Cash crop: Tea, followed by coffee and pyrethrum
 Livestock: cattle (3 on average), goat, sheep, chicken

Socio-economic Profile
Nyamarambe, Nyamarambe Division, Gucha District



Dominant Ethnic Group: Gusii
 Estimated Population of Nyamarambe Division of 1999: 60,000

Major marketplace: Kisii

In severe case, people visit Tabaka Mission Hosp. or Kisii District Hosp.

About 8 – 10 matatu services to Kisii, though the number reduced to 4 in rainy season

Matatu fare to Kisii can hike up to Sh. 100 in rainy season

Source of water: nearby river

Milk: supplied by local farmers (though not enough)

Food crop: Maize, beans (produced twice a year, mostly locally consumed)

Tomato, banana, onion (mostly locally consumed)

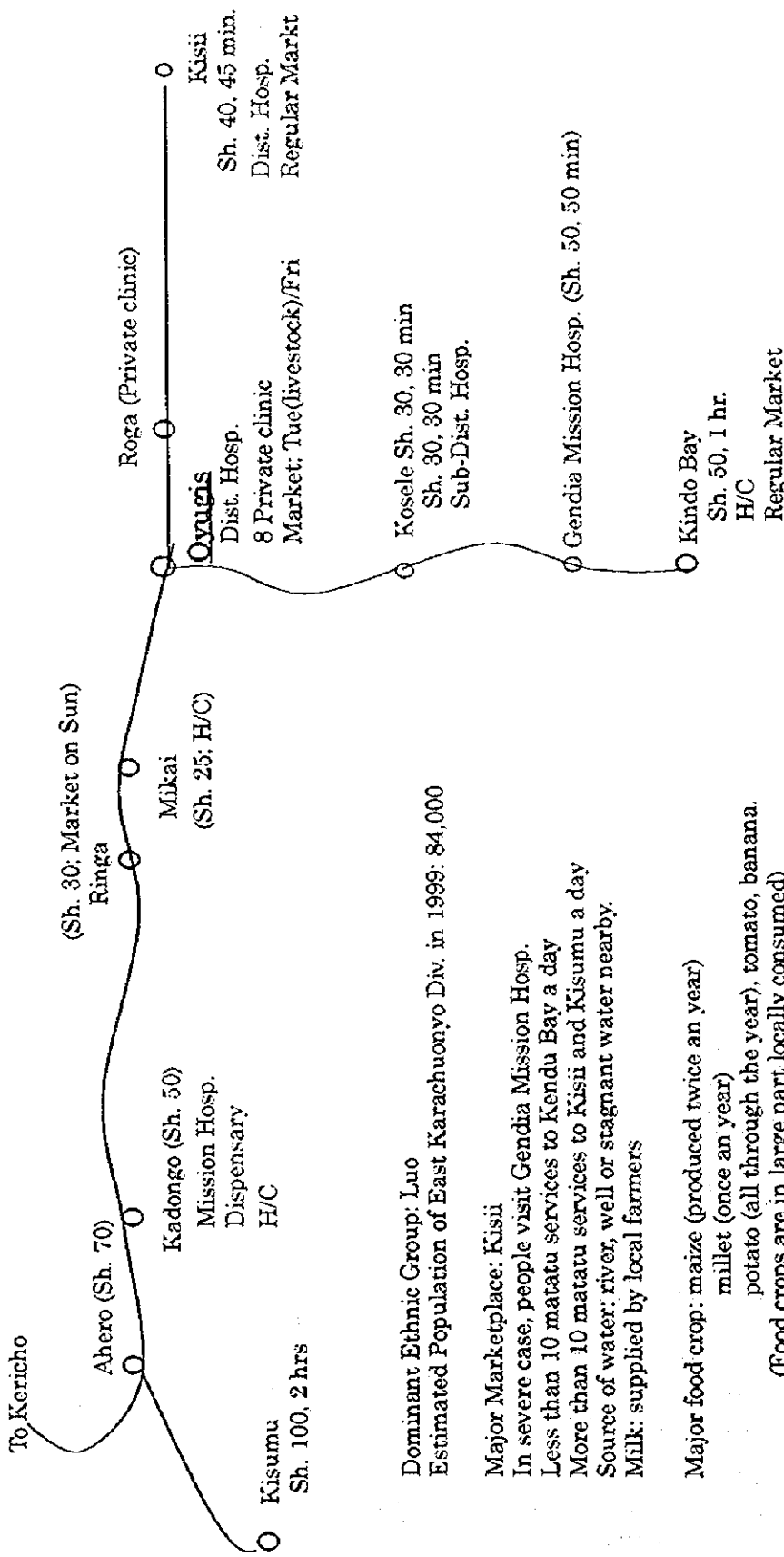
Red-onion (partially consumed)

Cash crop: Sugarcane, followed by tea and coffee

Livestock: cattle (2 on average), goat, sheep, chicken

Extraction of soap stone as a major source of cash income

Socio-economic Profile
Oyugis (West Kamagaku Location); East Karachuonyo Division; Rachuonyo District



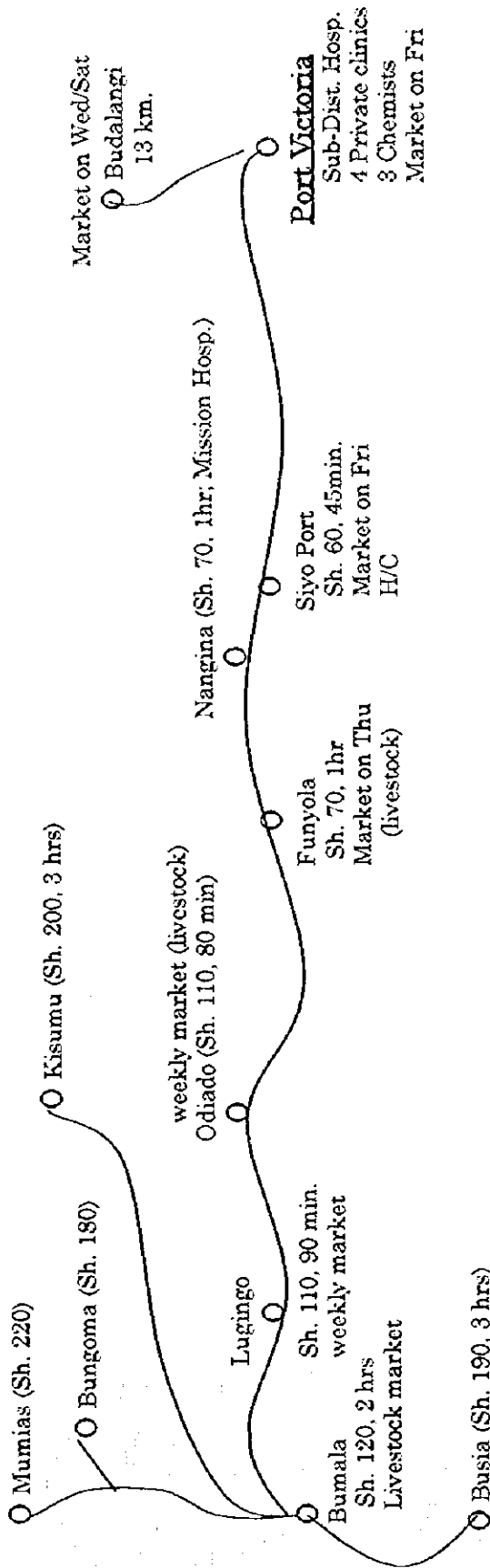
Dominant Ethnic Group: Luo
 Estimated Population of East Karachuonyo Div. in 1999: 84,000

Major Marketplace: Kisi
 In severe case, people visit Gendia Mission Hosp.
 Less than 10 matatu services to Kendu Bay a day
 More than 10 matatu services to Kisi and Kisumu a day
 Source of water: river, well or stagnant water nearby.
 Milk: supplied by local farmers

Major food crop: maize (produced twice an year)
 millet (once an year)
 potato (all through the year), tomato, banana.

Major cash crop: coffee, followed by sugarcane, pineapple and cotton
 (the later three crops are produced in plantation). Tea not very common
 Livestock: cattle (6 to 10 on average), goat, sheep, chicken
 Fishery: some go to Kendu Bay by bicycle to do fishing

**Socio-economic Profile
Port Victoria, Budalangi Division, Busia District**

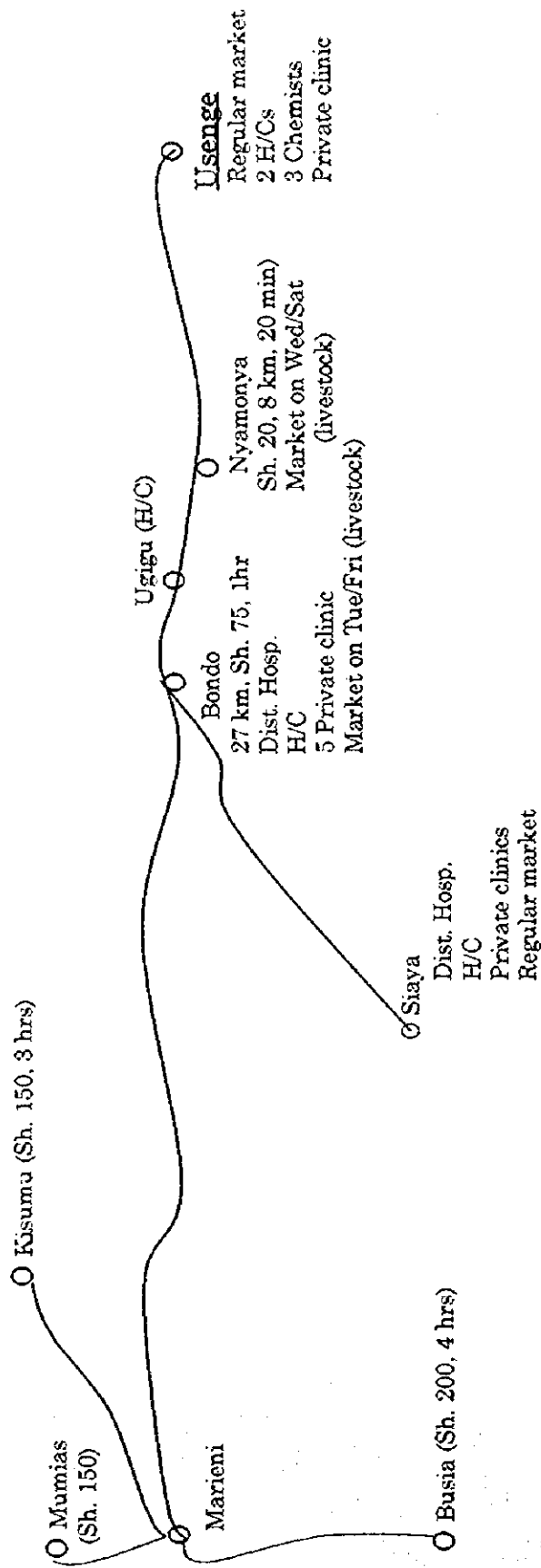


Dominant Ethnic Group: Luhya
 Estimated Population of Budalangi Division in 1999: 50,000
 Estimated population of residents along the P/Victoria - Bumala Road: 16,000

Major marketplace: Busia and Kisumu, Bumala
 In severe case, people go to Mission Hosp. in Nangina or Dist. Hosp. of Busia
 About 15 matatu services a day towards Bumala
 When it rains, matatu fare hikes up to Sh. 300 to Busia, Sh. 400 to Kisumu, Sh. 100 to Funyola and Sh. 75 to Siyo Port
 Source of water: lake
 Milk: brought in from outside (though still not enough)

Food Crop: Maize, Millet (produced twice a year, almost all consumed)
 Beans, Groundnuts (produced twice a year: half marketed locally
 Rice: groups near the lake produce about 4 times a year, about half marketed
 Livestock: most people do not keep cattle (due to land shortage, resulting in severe milk shortage esp. during rainy season)
 Fishery: Omena, Niloperch (majority sold to outside market), tilapia is not very abundant here

Socio-economic Profile
Usenge town, Usigu Division, Siaya District



Predominant Ethnic Group: Luo
 Estimated Population of Usigu Division of 1999: 44,000

Major marketplace: Kisumu, Busia, Siaya, Mumias
 In severe case, people go to Dist. Hosp. in Bondo
 There are frequent matatu services towards Marieni.
 Source of water: lake
 Milk: largely brought in from outside

Food crop: Maize, beans, sorghum (produced once a year mostly locally consumed)
 Cash crop: cotton
 Fishery: Omena, Niloperch, Tilapia (majority sold to outside market)

Discussion Guide for Focus Group Discussion

A. On how the road in the area utilized?

1. (on the availability of matatu) Is there any matatu services available within the area? If not, how far is the nearest matatu stop?
2. (on the frequency of the use of matatu) How often do you use matatu and for what purposes?
3. (on the relationships with outside towns) Is there any transportation means that regularly goes through the area (like a truck come visiting the area collecting milk)? If any, what is it and what is the purpose?
4. (continued) What visiting out, which town do you usually visit with which means of transportation (inc. on foot) for what purposes? List the destination and the means of transportation for each purpose?
5. (on the visit to hospitals) Which hospitals do you visit when you or some of your family member has got severe diseases? Which one when disease is not very severe? How much and how long does it take to reach there? Are the costs expensive?
6. (on the supply of commodities) How about the supply of commodities esp. medical equipment like drug? Where do you buy commodities not locally available? How do you go there?
7. (on the access to public institutions) Do you find any problem in terms of the means of transportation to go to public institutions like schools/hospitals?

B. On regional socio-economic structure

1. (on cash income) How about the average cash income? How much poor people get; how about the rich people?
2. (continued) What is the major source of cash income? Is it the sole source of income? If not, what is the other source(s) of income and the share among the total cash income
3. (on the-job-in-Nairobi) If anyone of the family member is working in Nairobi, does s/he send some money back home? If so, when and how much? How significant is it as a source of cash income?
4. (on the disposal of agricultural/fishery products) Do you consume some of the agricultural/fishery products that you produce? If so, how much out of the

total products do you consume?

5. (continued) Do you sell them at the local market and if so, at how much do you sell them? How much out of the total products do you sell to outside market?

6. (continued) Do some outside agents come to buy these products, or do you go out to sell them? If you go out to sell yourself, where do you go by which means of transportation with how much the fare?

7. (on the employment in agriculture/fishery) Is there within the locality the opportunity of wage employment in agriculture/fisher? If so, is it regular or seasonal? If seasonal, when?

8. (continued) When do you employ labor force in agricultural production? Is there labor exchange that does not involve payment by money? Is there class relations, like rich people employing poor people?

9. (continued) Are men employed more often than women are? How about the duration of one contract of employment? How many hours a day an employee is supposed to work, on how much the wage?

10. (to be asked in the women-only discussion) Where do you usually buy drug? If at local kiosk, is there always enough supply of drugs?

11. (women-only issue continued) Where do you obtain water and milk? Is it within walking distance? Who produce cash crop/fish, men or women?

C. On community group

1. What is the area of activity community group(s) are engaged in? On which social nexus (e.g. gender, class, church, economic activity, assets, etc.)?

2. Is there a community group recently collapsed? If there is, how did it collapse?

3. Is there a community group that has survived long? If there is, what is its major activity/social nexus? Why do you think this group last long?

4. Is there any local community group that has been involved in the management of public utility like road or well?

D. How the road condition around the locality influence the access to and from outside market? (people are encouraged to discuss their own actual experiences)

E. Is it possible for a local community group to participate in road management/maintenance? If possible, on what condition (people are encouraged to discuss freely)

Market Survey

1. Retail price of one loaf of bread:
2. Wholesale price of one loaf of bread:
3. Where and from whom do you obtain? Is the supply stable?

4. Retail price of milk:
5. Where and from whom do you obtain milk? Is the supply stable?

6. Retail price of malarquine:
7. Wholesale price of malarquine:
8. Where and from whom do you obtain malarquine? Is the supply stable?

9. Retail price of 'Action'(painkiller):
10. Wholesale price of 'Action':
11. Where and from whom do you obtain 'Action'? Is the supply stable?

12. Retail price of unga (maize flour):
13. Wholesale price of unga:
14. Where and from whom do you obtain unga? Is the supply stable?

15. Retail price of fish (nileperch):
16. Wholesale price of fish (nileperch)
17. Where and from whom do you obtain fish? Is the supply stable?

18. Retail price of sugar (500g):
19. Wholesale price of sugar
20. Where and from whom do you obtain fish? Is the supply stable?

21. Retail price of 'Omo' (detergent):
22. Wholesale price of 'Omo':
23. Where and from whom do you obtain 'Omo'? Is the supply stable?

**Appendix 2.3 Environment Impact Assessment:
Check List for Road Project**

Check List for Road Project

i) Source of Impact

The transportation sector falls into three sub-sectors, that is, air, land and water transport. Some of the programmes and projects in this sector that may lead to significant environmental impacts include the following:

- Road transport network and related facilities

ii) Project Units

- Labour (skilled and unskilled)
- Machinery (e.g. excavators, dredger, and earth-moving equipments)
- Construction materials (e.g. gravel, stones), steel and cement
- Fuels and lubricants
- Land
- Capital

iii) Project Activities

Route/ Site Selection

- Surveying project route/ site
- Seismic and ground stability testing
- Land acquisition
- Resettlement

Project Construction

- Establishing related works and supporting infrastructure (e.g. construction camps, clearing of vegetation, impounding, river regulation and/or diversion, diking, access roads)
- Raw materials acquisition (e.g. dredging, mining quarrying, water abstraction)
- Excavation works and land filling
- Transportation of raw materials, machinery and labour to site
- Transportation of waste materials from site

- Rehabilitation of affected surfaces including areas from which some raw materials have been obtained (e.g. quarries and mines)
- Construction supervision
- Levelling and landscaping

Project Operations

- Route/site maintenance including rehabilitation
- Storage and warehouse of goods including oil products
- Servicing of machinery and equipments
- Removal of wastes (e.g. domestic sewage, spillages, bilge, ballast, antifouling materials and dredging spoils)

iv) Areas of Project Impacts

Although the development of transport infrastructure enhances communication and economic activities, transport programmes and projects have the potential to impact on the following:

The Natural Environment

- Areas supporting critical and fragile habitats (e.g. wetlands, forests, coral reefs)
- Protected areas
- Areas supporting significant biodiversity
- Air
- Areas of scenic beauty
- Degraded environments
- Cultural and historical sites
- Lakes, rivers and other surface water bodies
- Terrestrial and aquatic flora and fauna
- Rocks and soils
- Groundwater aquifers
- Wildlife habitats and migration routes

The Human Environment

- Human settlements in proximity to the project
- Human population
- Land tenure system
- Existing land-use to be displaced/converted (e.g. settlements, farms, pastoral land, recreational areas, forest reserves)
- Existing provision of goods and services (e.g. market, health, education, commerce)
- Traditional livelihoods (e.g. fishing, farming, pastoralism)
- Cultural practices and values
- Public health and safety
- Gender characteristics
- Labour market and availability
- Existing infrastructure facilities and services (e.g. housing, water supply, means of communications, sewerage, electricity)
- Increase in foreign exchange earnings

v) Environmental Impacts

Transport programmes and projects may lead to a variety of environmental impacts including the following:

General Impacts on Natural Environment

- Loss of vegetation
- Loss or degradation of wildlife habitats
- Loss of areas of scenic beauty
- Creation of an impervious surface
- Alteration of storm drainage patterns and recharge of groundwater aquifers
- Loss of biodiversity
- Water, air and land pollution
- Incidences in ground vibrations

- Loss of natural routes for migratory species
- Noise pollution
- Soil erosion
- Salt intrusion
- Invasion of alien species of flora and fauna
- Accumulation of inorganic and organic materials
- Eutrophication
- Loss/degradation of historical and cultural sites

Specific Impacts on Natural Environment

Impacts on air/climate

- Increase in gaseous emissions
- Increase in particulate matter
- Increase in ambient temperature
- Global climate change, modification of micro and meso climate
- Increase in frequency and intensity of photochemical smog (particularly in urban areas)

Impacts on Inland Aquatic Ecosystems

- Surface water pollution
- Change in hydrology
- Change in groundwater recharge
- Contamination of groundwater
- Eutrophication
- Degradation of estuarine and freshwater habitats
- Obstruction of migratory fish
- Increase in water salinity
- Siltation of water bodies
- Loss and degradation of wetlands

Impacts on Marine Environment

- Interference with the natural sea currents
- Coastal erosion and siltation
- Loss/degradation of biodiversity in the coral reef and lagoon
- Pollution of the sea

Impacts on Human Environment

- Creation of employment and increase in income
- Enhancement of communication, handling, and storage
- Introduction of secondary developments
- Enrichment of social and cultural values
- Enhancement of technology transfer
- Loss of land and its uses
- Improvement of goods and services
- Enhanced capacity of the existing infrastructure facilities to support increasing demands
- Change in the land value/prices
- Displacement and the need for resettlement
- Increasing noise and air pollution in proximity to the project and/or along the route
- Social and cultural disruption and/or erosion
- Increase in disease transmission
- Creation of habitats for disease vectors through stagnant water in borrow pits and quarries
- Contamination of surface and groundwater
- Increase in traffic accidents on land
- Accident risks during construction
- Increased risks of hazardous chemicals and toxic substances
- Occupational health risks to workers

vi) Environmental Guidelines/Standards

Environmental guidelines/standards are important in all considerations of road transportation. They are also important for the site selection for related facilities. The guidelines are applicable in the project implementation, operations, rehabilitation and decommissioning.

National Legislation

- Traffic Act, Cap. 403
- Maritime Zones Act, Cap. 371
- Merchants Shipping Act, Cap. 389
- Land Planning Act, Cap. 303
- Land Acquisition Act, Cap. 295
- Local Government Act, Cap. 265
- The Agriculture Act, Cap. 318
- The Water Act, Cap. 372
- The Mining Act, Cap. 306
- The Public Health Act, Cap. 242
- The Forests Act, Cap. 385
- Coast Development Authority Act
- Lake Basin Development Authority Act, Cap. 441
- Wildlife (Conservation and Management) Act, Cap. 376
- The Petroleum (Exploration and Production) Act, Cap. 308
- The Fisheries Act No. 5 of 1989
- The Coast Development Authority Act No. 20 of 1990
- The Radiations Protection Act, Cap. 243
- The Factories Act, Cap. 514
- The National Museums Act, Cap. 215
- The Antiques and Monuments Act, Cap. 215
- The Clean Air Act*

- The Air Quality Standards
- The National Drinking Water Standards
- The National Effluent (wastewater) Discharge Standards

International Guidelines that may be applied

- Highway Design Code
- WHO Air Quality and Emission Guidelines
- WHO Drinking Water Quality Guidelines (1993)
- WHO Environmental Guidelines and Standards for Industrial Discharge (1983)
- The International Maritime Organisation (IMO) Guidelines

International Conventions Applicable

- CITE Convention on Trade in Endangered Species
- The Ramsar Convention on Wetlands of International Importance especially as Waterfowl Habitat
- The Convention on Biodiversity (1992)
- The World Heritage Convention
- The United National Framework Convention on Climate Change (1992)
- The Vienna Convention for the Protection of the Ozone Layer
- The United Nations Convention on the Law of the Sea (1982)
- The Convention of Pollution of the Sea by Oil Convention on the High Seas
- The Convention concerning the Protection of Workers against Occupational Hazards in the Working Environment
- The London Convention of Maritime Pollution by Dumping of Wastes and Other Matters
- The London Convention for the Prevention of Pollution from Ships
- The Basel Convention on Control of Trans-boundary Movement of Hazardous Wastes (1989)
- The Bamako Convention on the Ban of Trans-boundary Movement of Hazardous Wastes into the Continent of Africa (1994)

- The Eastern Africa Regional Seas Convention

vii) Mitigation Measures

The main objectives of mitigation measures is to minimise the severity of negative impacts arising from development projects in the transportation sector. For programmes and projects in this sector, the following mitigation measures may be applied:

Mitigation Measures Related to Routing and Site Selection

- Routing for roads should be done in accordance with physical plans that should be prepared, taking into account the uniqueness of various ecological zones.
- Activities in the transportation sector should avoid environmentally sensitive and geologically unstable areas.
- Migratory routes for animals, including fish and birds, should not be interfered with. Also, migratory corridors and fish ladders should be provided.
- Avoid historical and cultural sites
- Provide alternative routing and project sites in the project designs
- Establish buffer zones along transport corridors
- Provide for the needs of the affected communities, including health, socio-economic and transport matters
- Promote public awareness on the project and its implications

Mitigation Measures Related to Route/Site Preparations and Construction

- Limit earth movement in the dry season
- Dispose dredged material in areas meant for rehabilitation
- Balance cut and fill to avoid deposition
- Provide for adequate drainage
- Borrow pits should be rehabilitated
- Exposed slope should be revegetated to minimise soil erosion and landslides
- Storm drainage and stream crossings should be well planned to reduce frequency of flooding and enhance surface flow and groundwater recharges

- Spillages should be contained and safely disposed
- Highway designs should provide for cut and fill that blends with the surrounding landscape
- After construction, all unwanted structures, wastes, and unused materials should be removed to facilitate the recovery of the affected area to its original status
- Control dust and noise
- Compensate communities for land and other resources taken from them at project sites

Mitigation Measures Related to Route/Site Operation

- Plan for contingency
- Provide a maintenance plan for the infrastructure, machinery and equipments
- Strict compliance with the relevant environmental regulations in this sector
- Provide for efficient traffic management particularly in the urban centres
- Provide for collection, recycling, treatment and safe disposal of wastes
- Provide shoreline receptors to receive wastes from ships
- Provide training on handling and maintenance of machinery and equipment
- Provide adequate services, including water supply, sewerage, and health services
- Promote Research and Development

viii) Environmental Monitoring and Auditing

Environmental Monitoring and Auditing in the transportation sector, like in many other sectors, is an important tool in determining compliance with the mitigation measures recommended for projects and programmes in this sector. It will be also necessary in the improvement of the mitigation measures undertaken or proposed for existing and future projects and programmes in transportation.

The monitoring and auditing in the sector may involve:

- Gaseous discharges from various machines and equipment used in the project and/or programme

- Gaseous compositions at designated points to determine air quality trends
- Monitoring indicators of micro-climate changes
- Water quality trends
- Monitoring biological indicators
- Monitoring health problems they may be associated with the project implementation
- Monitoring soil, vegetation and animal changes in proximity to the project