REPUBLIC OF KENYA

MINISTRY OF ROADS, PUBLIC WORKS & HOUSING

ROADS DEPARTMENT

REHABILITATION AND MAINTENANCE OF MAU SUMMIT-KISUMU ROAD (B1 A1)

THE ENVIRONMENTAL IMPACT ASSESSMENT STUDY REPORT (EIASR)

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ABBREVIATIONS

AADT	=	Average Annual Daily Traffic
ADT	=	Annual Daily Traffic
BOQ	=	Bills of Quantities
CAP	=	Caption
CER	=	Chief Engineer Roads
DDC	=	District Development Committee
DRE	=	District Roads Engineer
DFO	=	District Forestry Officer
DWO	=	District Works Officer
DRO	=	District Roads Officer
EIA	=	Environmental Impact Assessment
EMCA	=	Environmental Management Coordination Act
EMP	=	Environmental Management Plan
EU	=	European Union
FTC	=	Forestry Training College
GOK	=	Government of Kenya
KPC	=	Kenya Pipeline Company
KRB	=	Kenya Roads Board
MORPW&H	=	Ministry of Roads, Public Works & Housing
NES	=	National Environment Secretariat
NEAP	=	National Environmental Action Plan
PRE	=	Provincial Roads Engineer
PWO	=	Provincial Works Officer
RMFLP	=	Roads Maintenance Fuel Levy Fund
RSU	=	Road Safety Unit
TOR	=	Terms of Reference
WB	=	World Bank
KWS	=	Kenya Wildlife Services
MoLS	=	Ministry of Lands and Settlements
ESU	=	Enviromental and Social Unit

EXECUTIVE SUMMARY

I Introduction

The Mau Summit-Kisumu section of the B1 Road serves as an important link with other parts of Kenya, countries of the Great Lakes Region and beyond, connecting these with the Trans-Africa region. Currently, most of the road is seriously deteriorated with some sections virtually at the point of collapse. This has been compounded by the lack/untimely maintenance. The Northern Corridor Road Improvement Project proposes to address the issues of this section. This will be jointly funded by the Kenya Government and International Development Agency (IDA). The project will go along way in achieving and facilitating economic recovery in an effort to alleviate poverty.

The objective of the study is to identify significant environmental and social impacts of the proposed project and the necessary mitigation measures.

II Description of the Project

The Mau Summit-Kericho-Kisumu section of the road B1 and A1 comprise the project area covering about 140km. The project runs in a south westerly direction from Mau Summit Centre at the junction of road A104 and B1 towards Kericho, then in a north westerly direction to Awasi and to the junction of roads A1 and B1 in Ahero and finally to Kisumu (see location map of project road in Appendix 1)

III Baseline Information

The Road Project traverses through four districts of Rift Valley and Nyanza Provinces namely Nakuru, Kericho and Nyando, Kisumu respectively.

The main annual rainfall in these districts varies with rainfall sharply declining with altitude along the west Mau escarpment towards Kisumu. The terrain is rolling and sloping gradually towards Lake Victoria to the west.
The soil and rocks in the environs range from rich volcano soils, igneous and metamorphic rocks in Nakuru, black cotton soil in Kericho and granite rocks in Nyando and Kisumu.

The forests along the project road regulate the hydrological regimes over most the road. The natural vegetation comprises of a mixture of montane forest with dominant tree species such as Podocarpus gracilior, Juniperus procera, Croton macrostachys and Acacia woodlands. Some exotic tree such as pinus patula, Eucalyptus Saligna and others are found in nearby plantations on the roadside.

The main land uses within the road reserve include forest conservation, tea growing, livestock keeping, and crop production (maize, potatoes, vegetables, sorghum, and sugarcane) from Mau Summit to Kisumu.
The main economic activities along the road project is farming which includes tea, sugarcane, maize, pyrethrum, dairy farming and fishing. The business within the project, area include petrol stations, hotels, large-scale sugar and tea plantations.

The road serve as an important communication and commercial link to other parts of the country and beyond. As such, the traffic flow along the project road is high.

The study looks at various Legislation, policy and institutional framework that directly relate to the road project.

IV Anticipated Impacts

The potential impacts of the proposed road rehabilitation and maintenance activities will pose minor environmental problems because the project is only being rehabilitated along the existing alignment.

The positive aspects of the improvement include easier access to social amenities, enhance security, generate employment opportunities, reduce vehicle operating costs, commuter travel time and costs. This will also provide parking bays for heavy vehicle at the weighbridges and adjoining urban centres.

The negative impacts during construction will be soil erosion due to road work activities (such as deviations), dust, air and noise pollution. The significant impacts will result from the disturbance of fauna and flora in their ecosystem through the clearance of areas for constructing camps, road widening, bush clearing, and the material sites.

V Mitigation Measures

Most of the adverse impacts that may result from the proposed improvement of the road project can be mitigated. Soil Erosion caused by major drainage structures can be mitigated by protecting susceptible surface with mulch or fabric and plant vegetation, while for the side drains increasing the number of drain outlets to avoid cascade effect.

Impacts due to earthworks can be reduced by carrying out the work during dry season, routine watering of diversions and installations of mufflers on equipment; roadside tree planting for future physical barriers to noise and to rehabilitate the access roads to acceptable standards.

Possible transmission of communication diseases from workers to local people and vice versa can be mitigated by creating awareness on HIV/IDS and other related diseases and also avail health care services to deal with any incidents.

The detailed cost for off-road environmental mitigation measures, HIV/AIDS awareness, capacity and awareness building and the monitoring, is provided for in Table 8 of the document.

VI Environmental Management Plan (EMP)

The Environmental Management Plan in the road sector is one of the most important outputs of the environmental impact assessment, which ensures that the implemented mitigations are sustainable. It outlines the monitoring frequency, cost measurable and verifiable indicators as well as the individual/institutions to undertake

the required actions. The proposed mitigation measures will be implemented during the rehabilitation and maintenance phases of the project as provided and covered by the contract documents.

Strengthening of the proposed environmental and social unit within the Road Departments will ensure that the environmental management plan is implemented.

Capacity and awareness building will ensure an efficient and effective implementation of the Environmental Management Plan of the project

Monitoring and auditing will be conducted to ensure that negative impacts have been mitigated and minimised.

VII Conclusion and Recommendations

Conclusion

The improvement of the proposed Mau- Summit- Kisumu road rehabilitation project will not only enhance economic growth at local level but also contribute to the national, regional and international economy.

The integration of environmental concerns in the implementation strategy of the World Bank funded project will enhance sustainable development and improve accessibility to potential economic and social sectors.

Recommendations

It is recommended that:-

- All the proposed mitigation measures be implemented.
- Environmental and HIV/Aids sensitisation in the road sector be undertaken by MoRPW&H in collaboration with NEMA, MOH and relevant NGOs
- Sourcing of labour be from the local communities and should involve both men and women.
- Environmental mitigation measures should be incorporated into the road project tender documents and contractual agreements.
- The project proponent should consider allocating small percentage of the implementation budget for environmental and HIV/AIDs sensitisation.
- The key stakeholders in the roads sector should be sensitised on environmental, social, gender and HIV/AIDS issues.
- Capacity and awareness building, mitigation measures and monitoring are essential to the effective implementation of the Environmental Management Plan. To achieve this, key target groups such as road workers, road users and project-affected people must be trained.
- The Environment and Social Unit has to be formally established and strengthened by capacity building (staffing), training, provision of adequate resources and facilities.

CHAPTER 1

1.0 INTRODUCTION

1.1 Background

The existing Mau Summit-Kisumu road was constructed to bitumen standards in 1981 and opened for use in 1983. At this time the government was committed to improving the rural and trunk roads though the secondary and minor roads were deteriorating. However attention was paid to reconstruction of selected failed bitumen road sections and other aged roads. Since then, it has not received any major repairs hence it is now seriously deteriorated in some sections.

The proposed Northern Corridor Transport Improvement Project (NCTIP) serves as an important communication and commercial link with other parts of Kenya, countries of the Great Lakes Region and beyond connecting these with the Trans African Highway.

It is anticipated that the rehabilitated road will be of great national socio-economic benefit. Inevitably it will result in both the positive and negative environmental impacts on varied nature on its environs. For example, improved drainage conditions and destruction of vegetation, which may enhance the performance of the road and pose threats to the Biodiversity respectively. This study attempts to assess both the positive and negative impacts on the environment and makes proposals for effectively mitigating the negative ones. The monitoring and evaluation strategy for the implementation of the mitigation measures shall cater for other unforeseen environmental impacts within and beyond the road reserve.

The chief Engineer Roads constituted a team of experts from Government Agencies to undertake the Environmental Impact Assessment (EIA) of the proposed road project. The EIA study will propose a workable environmental management plan (EMP) to reduce existing impacts and minimize any adverse environmental impacts during and after the rehabilitation This is line with section 58 which requires that an EIA be undertaken prior to implementation of any project.

a. The Purpose for Environmental Impact Assessment

Section 58 of the Environmental Management and Coordination Act of 1999 requires that all projects listed under the second schedule, which includes the transportation thematic area is subjected to Environmental Impact Assessment. Roads maintenance and rehabilitation activities are categorized here hence the need for the Environmental Impact Assessment (EIA).

b. Objectives

The objectives of the environmental impact assessment study include:-

- To collect baseline information on the proposed rehabilitation road project.

- To identify significant environmental and social impacts of the proposed road rehabilitation project.

- To propose the necessary mitigation measures to minimizing the negative environmental impacts.

- To ensure that Environmental Management Plan (EMP) has included appropriate institutional arrangements to implement and monitor mitigation measures, with cost outlays and the requisite Capacity and awareness building.

1.3.2 Justification of the Project

The Government is preparing an Economic Programme of which the key component of the growth strategy is the provision of reliable infrastructure services. The Northern Road Corridor provides linkages and accessibility to the major national towns of economic importance and to the Great Lakes Region.

The current status of Mau Summit Kisumu road (proposed project) is in a pathetic condition. The road is completely damaged and needs to be improved. The purpose of the EIAS is to ensure that environmental consideration are taken into account during the rehabilitation process.

In undertaking EIA the terms of reference (TOR issued by the MORPW and outlined in the annex 8 will be adhered to.

Economic feasibility study for the project is in progress. However, it is clear that traffic flow on the project road will soon increase drastically with emerging changes in regional trade routes through the Great Lakes Region and to the Eastern and Central Africa. Lake Victoria ports at Kisumu will be important gateways to much increased trade flows to other parts of Kenya. The project therefore assumes a much higher strategic significance in both national and regional economy.

c. Source of Funds

The Government of Kenya will finance 30% and the International Development Agency (IDA) will finance the remaining 70%.

CHAPTER 2

2.0 DESCRIPTION OF THE PROJECT

2.1 Location and Extent

The Mau Summit-Kisumu sections of road B1 and A1 comprise the project area covering about 140 Km. The project runs in a South Westerly direction from Mau Summit urban center at the junction of roads A1(4 and B1 to Kericho, then in a north westerly direction to Awasi District headquarter of Nyando at the junction of roads C37 and B1(100Km) and to the junctions of road A1 and B1 in Ahero and finally to Kisumu. (See Appendix 1) Road map of Kenya showing the Mau-Summit- Kisumu section (the proposed rehabilitation project).

2.2 General layout

The road can be split into five homogenous sections as follows:

Section 1: from Km 0 to Km 40 (Mau Summit to Chepsir)

This section features some of the most serious degradation. Many borrow pits have yet to be adequately rehabilitated. Non-rehabilitated steep cuttings and resulting gullies by the roadside pose serious visual intrusion. It is most likely that there will be extra lane for the climbing section between Km 32 and Km 36. There will be some involuntary resettlement impacts in this section of the road. This construction is likely to exert additional negative environmental impacts.

Section 2: from Km 40 to Km 55 (Chepsir to Kericho town)
This section has tea plantations on both sides of the road. In much of the section, tea is grown right into the road reserve. There are visual intrusion problems in some sections without any trees in the landscape.

Section 3: from Km 55 to Km 70 Sotik/Kisumu junction to the beginning of Mau Escarpment in Senetwet area)
The climbing section from Km 67 to 81 has one of the worst accidents records in the history of Kenyan roads. It requires that road signs be installed to reduce the rate of accidents. Escarpment biodiversity has been impoverished around the existing road. New constructions, which are under consideration, pose further threat to this biodiversity. Specific measures are proposed to mitigate biodiversity loss in this section.

Section 4: from Km 70 to Km 100 (Senetwet area to Awasi)

This section has a few old borrow pits, which are yet to be rehabilitated. Many blocked drainage structures have caused roadside water ponding. There has been serious loss of biodiversity, particularly in Awas area. Specific proposals are made to mitigate this biodiversity loss.

CHAPTER 3

3.0 BASELINE INFORMATION

3.1 General

The Road Project will pass through four districts, two each in Nyanza and Rift Valley Provinces respectively namely; Nakuru, Kericho, Nyando and Kisumu.

The riding surface is fair in some sections though the road has ruts, potholes, eroded edges, worn-out shoulders, incumbent drainage and bush as well as human encroachment throughout the whole 140km stretch. (See Appendix I- the photographs highlighting areas of environmental issues).

3.2 Natural Environment

3.2.1 Climate

The mean annual rainfall in the four districts varies from 560 mm to 2000 mm. Rainfall sharply declines with altitude along the West Mau escarpment towards Kisumu (on Lake Victoria shores). In the road corridor, annual rainfall ranges from some 1000 mm at Awasi to some 2000 mm in Kericho area.

The temperature varies from Mau Summit to the base of Mau Escarpment with average values of 15^0 C to 25^0 C and for Awasi and Kisumu sections with average values of 22^0 C to 33^0 C for the Awasi –Mau Summit section.

3.2.2 Topography and Geology

The terrain is rolling and sloping gradually towards Lake Victoria to the West. A hilly shelf is found between the Mau escarpment and the lowlands in Kisumu District.

To the Northeast are the Tinderet Hills and Mau Escarpment and between them is the undulating land around Londiani. To the Northwest are the hilly areas of Kipkelion and Chichila rolling towards Koru while the Mau ranges to the East. In the centre of these hills lies the Kericho plateau. The Awasi end of the road is in the Kano plains and the Kisumu town section is in down warped lowland surrounding the Nyanza Gulf at the tip of Lake Victoria.

The soils and rocks found in the environs range from rich volcanic soils, igneous and metamorphic rocks in Nakuru, black cotton soil in Kericho and granite rocks in Nyando and Kisumu.

3.2.3 Water Catchments and Drainage

The forests of Chepalungu, Londiani, Masaita, Kericho, and Lower West Mau Escarpment serve vital water catchment functions. A typical view of high natural forest, is shown in Appendix 2. These forests regulate the hydrological regimes nearly through the entire stretch of the road.

Apart from recent forest fires and scheduled felling of trees in the Londiani and Masaita forests, these important forests catchments are on gazetted government land and are protected from encroachment.

The rivers, which drain from Mau Summit and upper Kericho discharge into River Nyando and onto Lake Victoria. River Kibinges and others, which drain other parts of Kericho discharge into River Miriu and into Lake Victoria. The main permanent rivers draining through the road sections are River Nyando on top of the escarpment and River Senetwet at the bottom of Mau Escarpment. Systems draining from lowland Kericho and Nyando district discharge into seasonal ponds and swamps.
The major drainage problems on the existing road have been identified at:

(i) Sections about Km. 17 and 22 (blocked drainage)

(ii) The Sotik/Kisumu junction within Kericho township (blocked drainage)

(iii) Sections about Km. 86 and 88 (blocked drainage)

The proposed rehabilitation road project will follow the existing alignment and, thus does not affect the forests of Chepalungu, Londiani, Masaita, Kericho and Lower West Mau Escarpment. The wetlands are north of the project near Kisumu-Ahero where the highlands give way to flat plains near Lake Victoria. Canals have been constructed in the existing road to ensure free flow of water and migratory marine life to Lake Victoria. The new road will improve and maintain these facilities. Protection works have also been included to prevent erosion from occurring along the channels.

In particular, the proposed road rehabilitation project needs to address the artificial swamp around the junction of Kisii and Kisumu roads, which has negatively affected natural vegetation and land use.

3.2.4 Bio-diversity

3.2.4.1 Flora

The natural vegetation in Nakuru and Kericho districts comprise mixtures of montane forest with dominant tree species such as Podocarpus gracilior, Juniperus procera, Croton macrostachys, and Acacia woodlands. However, within the road corridor, much of this natural vegetation has been cleared for forest plantations and agricultural developments. Some exotic tree species found in nearby plantations and on roadside include Pinus patula, Cupressus lusitanica, Eucalyptus saligna, Grevillea robusta and species.

3.2.4.2 Fauna

The fauna of this area includes small (antelopes) and big animals and forest birds in the forested area. The rodents (rabbits and rats), reptiles (snakes, lizards, gecko), amphibians (frogs), water birds (kingstock, ducks, geese), weaverbirds and insects (Photograph III).

3.2.5 Forestry

Within and neighboring the road reserve are:-

(i) Masaita Nature Reserve and Forest (jointly managed with the Kenya Forestry Training College - Londiani).

(ii) Mt. Blackett Nature Reserve and;

(iii) Kericho Arboretum. These conservation areas are important biodiversity reserves for the country. So far, the existing road has not adversely affected these conservation areas. (See appendix 1 the project area showing the Natural Environment.)

3.3. Population and Settlement Patterns

The existing road has already made remarkable positive impact among surrounding populations. For example, Makutano, Chesenendet, Chepsir, Kimugu, Kapsoit, Kaitui, and Awasi, Ahero, Nyamasaria have attracted settlements in the last ten years. On market days, the populations on the road at these centers already pose danger to motorists, (see appendix 2). With increasing economic activities and urban settlements in areas like Chesenendet, health, social welfare, and other urban amenities have been rapidly developed in the last five years.

3.3.1 Land Use

The main land uses within the road reserve include forest conservation and plantation management, tea growing, livestock production, and crop production (maize, potatoes, vegetables and sugar cane) from Mau-Summit to Awasi. From Awasi to Kisumu town the main land use are sugar cane and rice growing (cash crops) and sorghum and millet, while free range livestock grazing is also common along the road reserves.

There is intensive large-scale and small-scale tea growing along the section Km. 35 to Km. 65. Beyond Km. 65 to the end of the road, sugar cane growing is the main land use.

The section between about Km. 17 and Km.35 has small-scale to large-scale dairy farms with improved pastures. The section beyond Km. 81 has extensive grazing largely with local cattle. (appendix 2)

3.3.2 Economic Activities

The main economic activities along the road project include the growing of tea, maize, sugarcane, pyrethrum, dairy farming and fishing. Several small-scale businesses such as bicycles and car repairs, barber/saloon shops are practiced along the project area.

The large-scale businesses within the project area include petrol stations, Hotels, wholesale shops, industries, large-scale sugar and tea plantations.

The proposed rehabilitation road project's main economic activity is transportation of goods and people nationally and regionally. (Appendix 2).

3.4 Current Conditions of the Road

In section 1, the road exhibits general pavement distress. Apart from few potholes, the riding surface is still in medium to sound conditions. The road shoulders are worn out and, in a few cases; the road edges are also eroded.

The same conditions described for section1 hold for section 2.

In section 3, there is serious drainage problem at the Sotik/Kisumu junction, which calls for major road re-design. Otherwise, the same conditions described for section1 hold.

In section 4, thus and the flat topography have seriously affected the drainage. Here the carriageway has become the drainage channel resulting in ponding of water on the carriageway and roadsides.

3.5 Traffic Flow Statistics Along The Project Road (AADT)

Tables 1 (a) and (b) shows traffic flow and summary on the various road section based on recent sample counts.

Table 1(a) Traffic flow statistics along the project roads.

		Light goods		Medium goods		Heavy goods			
Section	**Cars**	**Matatu**	**Other**	**Tanker**	**Other**	**Tanker**	**Other**	**Buses**	**Total**
Mau Summit – Kericho	1112	581	617	21	25	47	214	279	3126
Kericho Town	2240	1090	1065	18	36	42	170	249	5210
Kericho - Awasi	791	599	388	33	13	30	171	203	2404
Awasi	1381	690	65	138	75	138	69	13	2569

It is apparent from the figures that the various road sections serve very important communication and commercial linkages to other parts of the country and beyond.

Table 1(b) Summary of traffic between Mau-Summit-Awasi Roads in the month of April 2003

RD NO.	CENSUS POINT &LOCATION	YEAR	CARS	LIGHT GOODS	MEDIUM GOODS	HEAVY GOODS	BUSES	TOTAL
B1/1	WEST OF JUNCTION WITH A104-TOTAL	2003	703	739	237	186	227	2092
B1/4	NORTH EAST OF KEDOWA	2003	926	1105	147	226	403	2807
B1/5	SOUTH WEST OF KEDOWA	2003	926	1105	154	229	403	2817
B1/11	SOUTH WEST OF JUNCTION WITH C25 KAPSOIT	2003	1315	1030	123	150	334	3002
B1/12	NORTH WEST OF JUNCTION WITH C25 KAPSOIT	2003	1064	692	111	146	329	2332
B1/13	SOUTH OF JUNCTION WITH C34	2003	681	520	90	211	264	1774
B1/14	NORTH WEST OF JUNCTION WITH C34	2003	685	495	104	200	265	1749
B1/15	SOUTH WEST OF JUNCTION WITH C37(AWASI)	2003	857	329	117	159	276	1726
B1/16	NORTH WEST OF JUNCTION WITH C37(AWASI)	2003	527	803	189	158	268	1951

3.6 Existing Road Operational Impacts

3.6.0 Siltation and pollution

Soil erosion is serious in some sections leading to siltation of streams and rivers. So far, no major road related pollution has been documented.

3.6.1 Induced development

Of the developments, which have been induced by the existing road, the most noticeable has been the rapidly growing urban centers at locations such as Chesenendet and Kedowa along the road.

3.6.2 Noise and atmospheric pollution

Some evidence of atmospheric pollution is showing on avenue trees on the road section through Kericho town. So far, little noise and atmospheric pollution have been reported for other sections.

3.6.3 Health

No major health problems, directly connected with the existing road, have been reported so far, except in the areas where road accidents occur.

3.6.4 Accident Statistics along the Project Road.

Table 2 shows reported accidents, based on police stations records on various sections of the road, as averaged over the three years of 1996, 1997 and 1999. For example, the figures show that the climbing section between Km 67 to Km 81 (Kaitui) has had the worst history of accidents followed by Kedowa. These happen to be sections with steep climbs for which road design calls for serious reviews to reduce accidents.

Table 2 Accidents Reported at Various Road Locations

Location of accident	Average No. of accidents (1996, 1997, 1999)	Casualty	Fatal
Kaisugu	4	3	1
Kapsoit	9	5	4
Brooke Bond	5	4	1
Rorei	1	-	1
Kaitui	16	12	4
Kapkorech	2	-	2
Torit	1	1	-
Kedowa	11	8	3
Samutet	7	4	3
Chepsir	8	5	3
Kapkatum	1	-	1
Mau Tea	1	1	-
Kapkatongor	5	4	1
Kipsitet	4	1	3
Kericho	6	5	1
Kisumu/Kisii Junction	2	2	-
Muhoroni Junction	2	2	28

Table 3. Accidents reported along Road A1

AHERO AREA ROAD A1	NUMBER OF ACCIDENTS						
	1996	1997	1998	1999	2000	TOTAL	MEAN
Awasi	3	4	4	2	4	17	3.4
Ayoyo	1	13	3	3	5	25	5
Holo	1	4	2	1	1	9	1.8
Ahero Town Area	12	9	10	4	10	45	9
Rae	5	2	8	4	4	23	4.6
Rabuor	8	4	7	3	3	26	5.2
Kisii Junction	6	0	4	1	3	14	2.8
Karowe	4	4	4	2	3	19	3.8
Rela	10	7	12	4	10	43	8.6
Police Station	1	0	2	0	1	4	0.8
Katito	2	6	6	3	3	20	4
Nyando Bridge	0	2	1	2	4	9	1.8
Okona	0	1	2	0	0	3	0.6
Total	**53**	**56**	**65**	**29**	**51**	**257**	**51.2**

Table 4 Causes of Accidents Reported along Road A1, Ahero Area

AHERO AREA A1 ROAD					
	AYOYO	**AHERO TOWN**	**RAE**	**RELA**	**ABUOR**
Drivers	4	11	17	22	1
Pedestrians	5	17	2	2	
Passengers	0	0	0	8	
Pedal Cyclists	6	10	2	5	
Obstruction	0	0	0	0	
Animals	1	0	0	0	
Road Defects	0	1	0	0	
Vehicle Defects	4	0	2	6	
Other Causes	1	0	1	1	
Unknown	0	0	0	0	
Total	**21**	**39**	**24**	**44**	**22**

CHAPTER 4

4.0 LEGISLATION, POLICY AND INSTITUTIONAL FRAMEWORK

The policy, legal and institutional framework listed in the chapter specifically relates to the road sub-sector.

The outline of the various International Conventions and Treaties, National Legislation Policies, National Development Strategy, Institutional framework of the MoRPW&H and in particular the Roads Department.

4.1 International Conventions and Treaties

The applicable international conventions and treaties are as stated below:

- The Ramsar Convention on wetlands of international importance (1971) is reminiscent as the road network traverses through wetland areas within the study area. It emphasizes that storm water drainages at stream crossings should be well planned to reduce frequency of flooding and to enhance surface flow and groundwater recharges.

- The Cities Convention on Trade of Endangered Species (1973) is important because the roads sector facilitates movement of the animals and plants species or their product prohibited under this convention.

- The Basel Convention on the Control of Trans-Boundary Movement of Hazardous wastes and their disposal (1989). The proposed project being an international trunk road is likely to facilitate the transportation of hazardous wastes.

- The Convention on Biological Diversity (1992) is important because the programme activities impact on flora and fauna. It mandated that routing of roads be done in accordance with Physical Planning Act Cap 286 that had been prepared taking into account the uniqueness of various ecological zones while avoiding the environmentally sensitive and geologically unstable areas.

4.2 National Legislation Policies

- The Traffic Act Cap 403 of the Laws of Kenya, Section 91 declares it illegal to erect any structure within or interfere with the road reserves

- The Crop Production and Livestock Development Act, Cap 321. Improvement of the proposed section of Mau Summit-Kisumu Road is likely to endanger livestock crossing the road and destroy crops within the road reserve. Notwithstanding the economic value of the crops to their owners, the resultant vegetation cover serves as an erosion deterrent in the road environment. Provision of animal crossing areas, installation of appropriate road signs and relevant awareness campaigns shall be incorporated in the project.

- The Water Act Cap 372 -states that the off-road drainage system shall be so channelled to blend with the natural watercourses and not interfere with the private water reservoirs.

- The Trust Land Act Cap 28 and the Physical Planning Act Cap 286 -states that while giving due considerations to the rights and obligations of landowners, there shall be compensation wherever a materials site, diversion or realignment results into relocation of settlement or any change of user whatsoever of privately owned land parcels.

- Physical Planning Act Cap 286. The land use planning of human settlements along the road reserves requires enforcement of road reserve standards especially the width, provision of facilities such as Bus Bays and open air market among others.

- Agriculture Act Cap 318- the road sector once improved will enhance accessibility and marketing of Agricultural produce. Any crops damaged during the rehabilitation will be compensated using rates compiled in liaison with the local agricultural officers as provided for in this act.

- Public Health Act, Cap 242 -states that Road rehabilitation and maintenance works are likely to pollute the drinking water sources result of any oil spillages. The improved network will positively facilitate speedy movement to the health facilities.

- The Kenya Roads Board Act, 1999. This Act encourages participation of all stakeholders in the road sector during the planning, design, construction and maintenance. Once the provisions of the Act are adequately addressed, ownership and sustainability will be ensured.

- Environmental Management and Co-ordination Act 1999. The National Environment Management Authority (NEMA) as an institution was established by the Act to supervise and coordinate Environmental Management in Kenya. Its main responsibilities are monitoring the state of the Environment; Advising the National Environment Committee and the Government on issues of Environmental Policy and Legislation. It also Coordinates and harmonizes environmental sectoral interests, promoting the integration of environmental concerns in development, planning and overseeing compliance with environmental laws, regulation, impact assessments and standards, creating environmental education and awareness. This Act ensures stakeholders participation for sustainable management of the natural resources. It calls for Environmental Impact assessment (EIA) (under section 58) to guide the implementation of environmentally sound decisions. It is under this provision that the current study is being undertaken

4.3 National Development strategy

The National Development Strategy was formulated on realization that Development was concentrated in Urban Centres leading to rural-Urban migration. This led to the situation where the old and sickly people were left in the villages while the young

people went to Urban Centres in search of employment for better status. The urban transport, and infrastructure, strategy plays a bigger role in socio-economic development.

To reverse the trend, District Focus for Rural Development Strategy was formulated so as to take development closer to the rural areas and enable people at the grass roots make decisions to govern their livelihood and also participate in decision-making. Today the approach in force is a combination of the above two strategies.

4.4 Institutional Framework

The Ministry of Roads, Public Works and Housing consists of several departments. The Roads Department is responsible for the maintenance of the major roads (that is A, B, and C) while the Kenya Wildlife services (KWS) is responsible for the maintenance of the roads within the National Parks and Game Reserves. The District Roads Committees are responsible for the maintenance of secondary, minor, special purpose, adopted streets and all unclassified roads in the districts.

4.5.1 Project Implementation Strategy

The establishment of the Kenya Roads Board by an Act of Parliament cited as the Kenya Roads Board Act, 1999 whose purpose for which the Board was established is to oversee the road network in Kenya and thereby co-ordinate its development, rehabilitation and maintenance and to be the principal advisor to the Government on all matters related thereto. The Act provides for the participation of all stakeholders.

CHAPTER 5

5.0 ENVIRONMENTAL IMPACT ASSESSMENT AND MITIGATION MEASURES

5.1 General

Environmental Impact Assessment (EIA) is used as a tool to guide environmentally sustainable decisions. It is envisaged that the road rehabilitation will generate undesirable environmental and social impacts hence the need to subject such projects to Environmental Impact Assessment.

This chapter analyses the potential impacts of the proposed road rehabilitation and subsequent maintenance activities discussed in Chapter 2 and the baseline information contained in Chapter 3.

5.2 Impact Assessment Process

The Assessment Process was participatory in nature and involved the following stakeholders amongst others:-

- Road users of Rift Valley and Nyanza Provinces
- Road Engineers
- Material Officers
- And respective district works Engineers and Roads Officers
- Farmers
- Traders
- Transporters

5.3 Identification of Environmental Impacts

In order to identify the potential impacts, the study team ensured that most of the stakeholders were involved in the exercise. Scoping discussions were held with various interested and affected parties within the road environs during the fieldwork. In discussions held at Provincial Works Offices, key environmental issues relating to road maintenance and rehabilitation activities were identified.

The study team used non-structured questions to solicit for information. The potential impacts of the Mau Summit-Kisumu Road rehabilitation Project fall under two broad categories of Bio-Physical (Natural) and Socio-Economic environments. The experts used the matrix in Table 5 below to analyze these impacts. Project activities are listed in the columns while the environmental parameters are reflected in the rows. Through brainstorming sessions and use of the road sector checklist contained in the Kenyan EIA draft guidelines and administrative procedures, potential impacts were identified.

Table 5- Impacts of Road Rehabilitation and Maintenance Activities and Environmental Parameters During and After Rehabilitation

PROJECT ACTIVITY	ENVIRONMENTAL PARAMETERS							
	BIO-PHYSICAL				SOCIO-ECONOMIC			
	Soil	Water	Flora	Fauna	Economy	Employment	Tourism	Health
A. REHABILITATION (During Construction)								
1. Site Clearance within the Road Reserve	1	1	h+ h-	h+ h-	h+	m- h+	h+ h-	h+
2. Reshaping and stabilization of shoulders	m-	1	m-	m-	h+	m+	h+	m+
3. Culverting according to Specifications	h+ m-	H+	1	1	h+	m+	h+	m+
4. Excavation of Material Sites	h-	h-	h-	h+	h+	h+	h-	h-
5. Bridges, Box Culverts and Drifts.	h+	1	1	1	h+	h+	h+	None
6. Drains or Ditches	1+	1+	1+	1	m+	h+	h+	h+
7. Protection Works, Gabions, Stone Pitching, Scour Checks	h+	h+	h+ m-	h-	h+	h+	h+	h+
8. Surfacing (Spot Patching Resealing or Re-carpeting)	No ne	1	None	1	1	1	h+	m+
B. ROUTINE MAINTENANCE (After Construction)								
1. Bush clearing	1	1	h-	1	h+	h+	h+	h+
2. Culvert Cleaning and Headwall Repair	m+	1+	1	1	h+	h-	1	1+
3. Drainage or Ditch De-Siltation	m+	m+	1	1	m+	1	h+	m+
4. Installation of Access Culverts	m+	m+	1	1	m+	1	h+	m+
5. Pothole patching	1	1	None	None	h+	1	h+	h+
6. Encroachment Control	h+	1+	m+	None	Nor e	1	h+	M+
7. Fast driving	1	1	1		h+	h+	m+	h-

The identified potential impacts were rated in Table 5 above as positive or negative (+/-) depending on the eminent benefit or loss. These were further subjectively quantified as low (1), medium (m) or high (h) respectively.

5.4 Road Rehabilitation and Maintenance Potential Impacts

The following are the identified positive impacts from the proposed project.

5.4.1 Positive Impacts

- Landscaped Road Environment
- Easier access to social amenities
- Enhanced security
- Positive foreign cultural values
- Enhanced non-motorist traffic safety (wider Pedestrian and cyclist paths)
- Generated Employment opportunities.
- Enhanced accessibility
- Increased commerce
- Reduced vehicle operating costs, commuter travel time and costs
- Heavy vehicle parking bays at the Weighbridge and in abutting urban centres

5.4.2 Negative Impacts

The following are the identified negative impacts from the proposed project.

- Increased litter
- Negative cultural influence (Resultant increase in promiscuity in the local community)
- Displacement of human settlement
- Noise, Gaseous and Dust pollution
- Traffic disruption and accidents
- Water pollution by oil spillages and contamination from raw concrete and fragments of demolished structures
- Disturbance of water flows
- Soil Erosion
- Landscape disturbance

- Haphazard movement of livestock to relocated watering points
- Disturbance of Fauna and Flora in their natural ecosystem
- Operational hazards of road workers (danger posed by careless motorists)
- Pollution by waste materials from drains clearing and pavement reconstruction discharged into rivers.
- Encroachment by upcoming generated infrastructures such as markets and other business premises.

5.5 Proposed Environmental Mitigation Measures

The proposed environmental mitigation measures will minimize anticipated negative impacts arising from the project activities tabulated in Table 6. These are those likely to cause environmental degradation.

TABLE 6.Environmental mitigation measures.

PROJECT ACTIVITY	POTENTIAL IMPACTS	MITIGATION MEASURES
A. REHABILITATION		
1.Site clearance of the road reserve	Destruction of terrestrial wildlife habitats.	Routine maintenance to discourage habitation of plants and animals species.
2. Earthworks	Local dust and noise emanating from the activities. Landslide, slumps, slips, and other mass movement. Alteration of surface drainage and subsoil drainage. Destruction of terrestrial wildlife habitats and wetlands Secondary impacts caused by access to the materials sites such as damage to farms.	Routine watering of diversions and installations of mufflers on equipment. Roadside tree planting for future physical barriers to noise. Provide ear and nose masks for the workers Provide drainage works as needed to reduce risks. Design of adequate drainage works. Install subsurface runoff filter drains. Discourage site clearance beyond the road reserve during both routine and periodic maintenance. Create awareness on importance of bio-diversity amongst the road maintenance workers. Realignment to avoid wetlands where these were not considered important during the initial road planning and construction. Rehabilitation of the access road to acceptable standards.
3.Reshaping	Local dust and noise emanating from the activities.	Routine watering of diversions and installation of mufflers on equipment. Roadside tree planting for future physical barriers to noise. Provide drainage works as needed to reduce risks.
4.Excavation of Materials Sites	Open quarry sites. Local dust and noise. Landscape disfiguration, deep cuts, fills and quarries. Landslides, slumps, slips, and other mass movement. Creation of temporary breeding sites such as malaria, typhoid and bilharzias. Destruction of terrestrial wildlife habitats.	Reshape the quarry and replant. Routine watering of diversion roads. Use and architectural design to blend landscape. Provide drainage works as needed to reduce risks. Avoid materials' extraction in human settlement areas where possible. Avoid use of stagnant water for drinking by provision of wells. Recycle material sites into cattle watering points where possible Routine maintenance to discourage habitation of plant and animal species.
5.Major Drainage Structure (Bridges, Box Culvert, Drifts)	increased sediments in streams affected by erosion during rehabilitation. Erosion of lands below the road bed receiving concentrated outflow from covered or open drains. Watering where the water table is high.	Protect susceptible surfaces with mulch or fabric, and plant vegetation on erodible surfaces. Increased number of drain outlets drains so as to avoid cascade effect. Incorporate filter sub drains below the sub-base or at the formation level.

PROJECT ACTIVITY	POTENTIAL IMPACTS	MITIGATION MEASURES
6.Minor Drainage Structure (Access/cross Culverts &Side/mitre/cutoff Drains)	Erosion of Lands below the roads bed receiving concentrated outflow from covered or open drains. Creation of temporary breeding habitats for mosquito vectors.	Increased number of drain outlet or mitre drains so as to avoid cascade effect. Avoid materials' extraction in human settlement areas where possible.
7.Protection Works	Soil Erosion.	Gabions, stone pitching, scour checks, grassing and tree planting.
8.Resurfacing (potholes patching, resealing and recarpeting)	Human and traffic conflict Local dust, noise and gaseous emission from the operation equipment.	Ensure road safety of the road workers through use of adequate warning signs. Enforce air and noise pollution standards.
9.Site camp	Poor sanitation and solid waste disposal in maintenance camps. Soil and water contamination through accidental spillage of oil, grease and fuel in the mechanical plant workshop and along the road. Possible transmission of communicable diseases from workers to local population and vice versa.	Provide adequate located and well maintained sanitary and solid waste disposals facilities such as VIP latrines. Collect, recycle and re-use oils for treating wood e.g. fencing posts. Proper training and sensitization of mechanical staff. Avoid accidental spillage through good mechanical practices and proper storage. Create awareness on HIV/AIDS and other related diseases. Avail health care services
B. ROUTINE MAINTENANCE		
1.Bush Clearing	Minimal impacts	None
2.Culverts cleaning &headwall repairs	Minimal impacts	None
3.Drain/ditch de-siltation	Minimal impacts	None
4.Installation of additive access culvert	Minimal impacts	None
5.Pothole patching	Air and noise pollution from vehicle operation, in populated areas traversed by the road	Include physical barriers to reduce noise levels. Enforce air and noise standards.
6.Encroachment along the road reserve	Encroachment of the road through mushrooming of unplanned structures along the road reserves. Human traffic conflict.	Enforce section 91 of the Traffic Act, CAP 403 of the Laws of Kenya.
7.Material /equipment store	Soil and water contamination by oil, grease, fuel and plant equipment.	Collect and recycle lubricants to avoid accidental spills though good practices.
8.Maintained Camp	Poor sanitation and solid waste disposal in maintained camps. Soil and water contamination through accidental spillage of oil, grease and fuel in the mechanical plant workshop and along the road Possible transmission of communicable diseases from workers to local population and vice versa.	Provide adequately located and maintained latrines Collect, recycle and re-use oils for treating wood e.g. fencing posts. Proper training and sensitization of mechanical staff. Avoid accidental spillage through good mechanical practices and proper storage. Create awareness on HIV/AIDS and other related diseases. Avail health care services.

C. ROAD OPERATION		
1.Road Operation	Air pollution from gaseous emissions	Provide dusk masks to the workers during operations and enforce air pollution standards. Create awareness on proper litter disposal
	Roadside litter.	Provide for disposal facilities. Encourage anti littering laws and regulations.
	Possible transmission of communicable diseases from workers to local people and vice versa.	Create awareness on HIV/AIDs and other related diseases. Avai health care services.
	Noise pollution from vehicle operation.	Promote road side tree planting. enforce noise pollution standards.
	Accident risks associated with traffic and transport.	Design and implement road safety measures.
	Accident spillage of oil and toxic materials.	Put in place emergency services to control accidental incidences.
	Disturbance of the river hydraulics and aquatic under the bridges and box culverts downstream caused by off-road siltation into the river	ensure proper mitigation measures are instituted uphill to reduce downhill siltation.
	Erosion of adjacent farms.	River training with adequate protection works put in place.
	Wearing of the road surface by cattle, human and vehicular traffic and subsequent use of the side slopes and adjacent farms as carriageways for passage or traffic	Enforce sustainable maintenance of the road and avoid diversions if any.
	Facilitation of access to protected and gazetted areas leading to poaching and deforestation.	Enforce physical planting regulation on new developments through the Physicals Planning and Forest Departments and other relevant agencies like the KWS

5.5.1 Environmental Mitigation Measures in Road Contractual Agreements

Project Specifications should include clauses on Environmental concerns. In this World Bank funded Project the environmental clauses amongst others would refer to:-

(i) The contractor shall submit to the Roads Engineer a camp and site office plan defining all facilities to be created.

(ii) The Contractor shall limit environmental degradation through minimal oil spillages, reducing dust and gaseous emissions and so on.

(iii) The contractor to restore all excavated materials sites including quarries by:-

- Preserving trees during materials stockpiling

- Selectively planting trees and grass and leveling stipped ground to facilitate water percolation and check water pond ng
- Ensuring safety measures for local residents where a quarry has been identified as a watering point for livestock and people
- Planting trees at project ecologically vulnerable sites and maintaining them for a specified period.

To ensure that these mitigation measures are included in the actual works, the Engineering Design has incorporated them in the Bill of Quantities and subsequent Engineer's estimate bills in accordance with the Standard Specifications for the Road and Bridge Works (MOTC-1986). The actual activities will be detailed in the Special Specifications while the Special Programme and Environment Unit in the Roads Department will carry out monitoring. The table below is an illustration of the same and should be modified to suit the environmental management plan.

CHAPTER 7

7.0 ENVIRONMENTAL MANAGEMENT PLAN

7.1 General

The Environmental Management Plan (EMP) is the synthesis of all proposed mitigation and monitoring actions, set to a time-line with specific responsibility assigned and follow-up actions defined.

The EMP outlined in table 8 below is in respect of the environmental issues, which have been derived from the potential impacts whose mitigation measures are tabulated in chapter 5. It recognizes similarities in environmental impacts of the road maintenance and rehabilitation activities within the proposed road section.

7.2 Monitoring and Auditing

Environmental monitoring establishes benchmarks to judge the nature and magnitude of potential environmental and social impacts.

Some of the key parameters for monitoring and auditing of the Road Project maintenance programme include the following inter alia: -

- Soil erosion and siltation.
- Oil spillages
- Dust and gaseous emissions.
- Water quality
- Bush encroachment
- Traffic accidents
- Traffic flow
- Noise and vibration
- Change in biodiversity
- Socio-economic change
- Land use changes.

Table 8: ENVIRONMENTAL MANAGEMENT PLAN

ENVIRONMENTAL CONCERNS	MITIGATION MEASURES	RESPONSIBILITY DURING REHABILITATION & MAINTENANCE	MONITORING MEANS	MONITORING FREQUENCY
1. Soil Erosion	Grassing Scour Checks Gabbion Works Cut-water Drains Culverting	Project Engineer Supervision Consultant Approved Contractor Roads Dept. MoRPW & H – Environment. Unit	During Rehabilitation Routine and Periodic maintenance.	Two (2) times a year throughout the project life.
2. Air pollution by dust	Regular watering of the diversion road Encourage use of dust masks Optimal Choices of quarry locations minimizing haulage distance	Project Engineer Supervision Consultant Approved Contractor Roads Dept. MoRPW & H – Environment. Unit	Surprise checks During Rehabilitation	Bi-Annually
3. Noise	Roadside tree planting Enforcement of Standards	Project Engineer Supervision Consultant Approved Contractor Roads Dept. MoRPW & H – Environment. Unit	During Rehabilitation Maintenance	Bi-Annually
4. Conservation of Bio-Diversity (Vegetation)	Create awareness on importance of bio-diversity amongst the road maintenance workers. Discourage site clearance beyond the road reserve.	Project Engineer Supervision Consultant Approved Contractor Roads Dept. MoRPW & H – Environment. Unit. Provincial Environmental Officer Provincial Administration.	During routine and periodic maintenance	Bi-Annually
5. Health and Sanitation	Provide adequately located and maintained latrines. Create awareness on HIV/AIDS and other related diseases. Avail health care services Provide drinking water wells. Control of Malaria and Schistomiasis	Project Engineer Supervision Consultant Approved Contractor Roads Dept. MoRPW & H – Environment. Unit. Provincial Administration Water dept. MOE & Local NGOs Public Health Dept. -MOH	during routine and periodic maintenance	Bi-Annually

TABLE 8: ENVIRONMENTAL MANAGEMENT PLAN CONT'D

ENVIRONMENTAL CONCERNS	MITIGATION MEASURES	RESPONSIBILITY DURING REHABILITATION & MAINTENANCE	MONITORING MEANS	MONITORING FREQUENCY
6. Impeded drainage and or inefficiency of drainage	Desiltation Repair of Drainage Structures	Project Engineer Supervision Consultant Approved Contractor	During Rehabilitation and Maintenance	Monthly
7. Material Sites (a) Unrehabilitated	Rehabilitation of the Material Sites to the satisfaction of the owner by creation of water points, earth dams and farms and controlled fencing and tree planting.	Project Engineer Supervision Consultant Approved Contractor Quarry owner Roads Dept. MoRPW&H-Environment. Unit Provincial Environmental Officer. PDE.	During rehabilitation	Monthly
(b) Rehabilitation	Proper Quarrying Techniques. Uniform training of supervisory personnel.	Project Engineer Supervision Consultant Approved Contractor Roads Dept. MoRPW&H –Envi. Unit PDE, DEO	During rehabilitation	Monthly
8. Temporary Mosquito Breeding Sites	Where possible avoid materials' extraction in human settlement areas. Create awareness on the dangers posed by stagnant water.	Project Engineer Supervision Consultant Approved Contractor Roads Dept. MoRPW&H-	During Rehabilitation and Maintenance	Monthly
9. Traffic Accidents	Provision of proper road safety elements such as adequate shoulders, road signs and furniture.	Project Engineer Contractor Road Safety unit Traffic Police Department	During Rehabilitation and Maintenance	Monthly
10. Increased vehicular traffic	Encourage use of public transport. Driver sensitization on road safety.	OTC, Roads Dept. MoRPW&H RSU Traffic Police Dept. The Media	During Rehabilitation	Daily
1. Encroachment along the Classified Road Reserve.	Awareness campaigns. Enforcement of Section 91 of the Traffic Act, Cap 403 of the Laws of Kenya.	CER PWOs DWOs Roads Dept. MoRPW&H-RSU Provincial Administration Traffic Police Dept. The Media	During Routine Maintenance	Daily

Table 7- Bill Items showing Specification Environmental Action Plans

** Item No.	Description	Unit	Quantity	Rate (Kshs)	Amount (KShs)
1.18	Provide a prime cost sum of 0.5% of the total cost of the project for off road environmental mitigation measures to be used as directed by the Engineer.	Kshs.	9,894,333.00		9,894,333.00
1.19	Include percentage of item 1.18 for Contractor's overheads and profit	%	15%		1,484,149.95
*5.08	Top soiling of side slope in fills	M^2	116,962	44.75	5,234,049.50
*5.09	Grass over side slopes in fills and cuts	M^2	116,962	33.40	3,906,530.80
*5.10	Backfilling of Quarries as directed by the Engineer to the recommended of the EAI	Ls	2,000,000		2,000,000.00
20.08	Provide and erect environmental awareness billboards at urban centers as directed by the Engineers.	No.	12	855.09	10,261.08
*20.09(a)	Provide and erect 1.5m chain-link fences upheld with 2m cemented and treated wooden posts at 2m intervals around quarries.	M-Length	1,000,000		1,000,000.00
(b)	Fence up the road reserve on main roads as directed by the Engineer.	Km	140	40,000.00	5,600,000.00
20.10	Provide and erect wooden gates as directed by the Engineer.	No	10	6,000.00	60,000.00
20.11	Provide, plant, water and tender tree seedlings until firmly established as directed by the Engineer as EIA specification.	No.	4,000	1,623.00	6,492,000.00
20.12	HIV/AIDS awareness	***LS			3,000,000.00
20.13	Capacity and awareness building	LS			3,132,600.00
	The monitoring is done during implementation and maintenance period which will cost 10% of the total implementation of mitigation measures	10%	Sub total 1		29,673,344.03
			15% Contingencies		4,451,001.60
			Sub Total 2		**34,124,345.63**
					3,412,434.56
			TOTAL		**37,536,780.20**

* These items are inbuilt in the Tender Document.

** Itemized as per Ministry of Transport and Communication's Standard Specification for Road and Bridge construction of 1986.

*** Ls – Lump sum

It is crucial that a record of all mitigation measures implemented be availed by the Contractor through the supervision Consultant to the Chief Engineer Roads for purposes of future mitigation monitoring and evaluation.

CHAPTER 6

6.0 Analysis of alternatives

This chapter analyses alternatives in terms of project site, design, rehabilitation techniques and "no rehabilitation alternatives"

6.1 Project Sitting

The proposed project alignment if changed will encroach into private land causing conflicts and compensation. It is therefore, advisable not to change the existing road alignment.

6.2 Project Design

Roads are designed to improve safety, riding comfort and enhance socio-economy of the regions. In areas of potential accident risks realignment may be required and might result in major financial and environmental degradation. To ensure that the existing alignment is followed the study team recommends that adequate signage be installed in such accident prone sections and also additional climbing lane be included in the steep long sections. The existing road alignment should however be maintained.

6.3 Rehabilitation Techniques

The available techniques to improve the proposed road project are use of heavy machinery or labour intensive. The implications of using a labour intensive approach will have certain limitation which include, inability to excavate some activities and slow progress. From a positive perspective labour intensive techniques are environmentally friendly compared to the use of heavy machinery. In respect to the rehabilitation of Mau Summit-Kisumu section of the road, it is recommended that a combination of both labour intensive and machinery be employed for speed implementation of the project.

6.5 No Rehabilitation Alternative.

The no rehabilitation alternative would imply that the road be left in its present state. This action is unacceptable in that commuters will continue using the road while at the same time avoiding driving into the ditches or potholes. This continued use would encourage off road driving into people's private property a potential for accidents and conflicts due to encroachment. Soil erosion, complete removal of existing road surface or carriageway, ruts and gullies would be the results of maintaining the status quo. It is the considered opinion of the experts that the "no rehabilitation alternative" is not the preferred option.

TABLE 8: ENVIRONMENTAL MANAGEMENT PLAN CONT'D

ENVIRONMENTAL CONCERNS	MITIGATION MEASURES	RESPONSIBILITY DURING REHABILITATION & MAINTENANCE	MONITORING MEANS	MONITORING FREQUENCY
2. Liter along the Roadside	Create awareness on the importance of a clean environment. Install permanent litterbins (Concrete) as part of the road furniture at preset intervals to be emptied regularly.	Project Engineer Supervision Consultant Approved Contractor Roads Dept. MoRPW&H-Environment. Unit Provincial Environmental Officer. Provincial Administration The Media	During Rehabilitation and maintenance	Weekly
3. Soil and water contamination through accidental spillage of oil, grease and fuel in the mechanical plant workshop and along the road.	Collect, recycle and re-use oils for treating wood e.g Fencing posts. avoid accidental spillage through good mechanical practices and proper storage. Proper training and sensitization of mechanical staff.	Project Engineer Supervision Consultant Contractor's Mechanical Team Roads Dept. MoRPW&H-Environment. Unit PDE, PEO.	During Rehabilitation	Two (2) times a year throughout the project life
4. Possible Collusion of Vehicles with Livestock.	Introduce animal crossing signs and bumps before and after the crossing corridor.	Project Engineer Approved Contractor Supervision Consultant Roads Dept. MoRPW&H –Environment Unit. PDE MOAL-Provincial Livestock Officer	During Rehabilitation	Two (2) times a year throughout the project life
5. Restrictive sight distances where road traverses hilly terrain.	Use Engineering Design to improve the Existing alignment.	Project Engineer Approved Contractor Supervision Consultant Roads Design Section –MoRPW&H	Before and During Rehabilitation	As and when Required
6. Characteristic edge failure along the existing road.	Use Engineering Design and Materials Quality Control to ensure homogeneity of the pavement structure through the shoulders and carriageway.	Project Engineer Approved Contractor Supervision Consultant Roads Design Section –MoRPW&H	Before and During Rehabilitation	As and when Required
7. Lack of Road Signs and other Road Furniture	Install sufficient and adequate road furniture especially road signs	Project Engineer Approved Contractor Supervision Consultant Roads Design Section –MoRPW &H	During Rehabilitation and Maintenance	As and when Required

7.3 Programme Decommissioning

Decommissioning refers to the final disposal of the project and associated materials at the expiry of the project life span. In respect to roads, decommissioning is not anticipated. Obsolete equipment and dismantled camp materials will however be salvaged and kept in the two Provincial Mechanical Workshops.

7.4 Proposal to Establish an Environment and Social Unit (ESU)

The Unit as it is currently known as Special Programme and Environment has been coordinating and supervising on a Ad-hoc basis for the last several years in the Ministry of Roads, Public Works and Housing (MoRPW&H) within the Department of Roads .
However, this denomination of the unit does not fully capture the mandate of the unit's objectives. Therefore the need to address environmental and social aspects of all road's projects. Hence it is proposed that the unit be named as the Environmental and Social Unit.

7.4.1 Unit Objectives

The objectives of the Unit are:

- to achieve a comprehensive policy in terms of environmental management.
- to integrate environmental and social concerns into the road works activities.
- to created awareness within the Roads Department as to the importance of environmental management in road construction, rehabilitation, improvement and maintenance activities.
- to strengthen the capacity within the Ministry of Roads, Public Works and Housing to be able to handle environmental and social issues pertaining to the road sub-sector.
- to form a focal point for coordination for both government and non-governmental organization.

7.4.2 Role of the Unit

The role of the Environmental and Social Unit will be to: -

- develop environmental road sub-sector standards and guidelines
- ensure compliance With Environmental Management and Coordination Act of 1999, and Environmental Impact Assessment and Audit Regulation of 2003 as it relates to the road sub-sector
- review and update roads department document e.g. Standard Specification and Contract Documents
- participate in Inspection for Certificate of Substantial Completion carried out by the roads department
- screen proposed road rehabilitation project to determine Environmental Impact Assessment requirements
- review environmental impact assessment reports that have been prepared
- set up a system for continuous monitoring and periodic surveillance

- audit road rehabilitation, improvement and maintenance activities
- liaise with government, parastatal and non-governmental organizations concerned with environmental issues with a view to addressing common priorities
- create awareness and sensitize the public with regard to proposed road projects, their potential impacts and the need for planning in the event that people are going to be affected
- ensure compliance of the road sub-sector EIA to public consultation and disclose procedures as required by Environmental Management and Coordination Act (EMCA) and World Bank safeguard policies
- set up a computerized environment database relevant to the road works activities.

7.4.3 Establishment and Strengthening the Unit

The ESU needs to be strengthened by recruiting personnel in order to achieve its objectives and to be operational. The following proposal would comprise professionals required for the Unit

1. Environmentalist – Head
2. Environmental Impact Assessment Specialist
3. Roads Engineer with EIA experience
4. Sociologist.
5. Information Technology expert
6. Two Secretaries
7. Two Drivers
8. One Messenger

7.5 Capacity Building

Capacity building and creating awareness is necessary for the effective and efficient implementation of the Environmental Management Plan of the road project. The Environmental and Social Unit in the MoRPW&H, Roads Department will be responsible for capacity building, creating awareness and ensure mitigation measures are implemented and monitoring is carried out.

This will be achieve by involve and training the key target groups at all levels which can be broadly divided into three groups as shown below:

Group A Road Workers:

This group consists of Engineers (Resident, Provincial, Project,) Contractors, Supervisors, Site Agents, Site Managers and the Environmental and Social Unit in the MoRPW&H. These are the top management staff concerned with road construction and maintenance.

Group B Road Users: Transport Associations

Examples include the Truck Drivers Association, and Matatu Drivers Association. For this group of people the road is their livelihood.

Group C Project Affected People (PAP), Casual (skilled or unskilled) labourers.

Traders and farmers. These people have businesses (e.g. kiosks, offices, schools, etc.) that can potentially be affected by the road, or they live by the road.

Training Objectives

Training will be based on modules aimed at:

(a) Developing awareness of the need to consider environmental issues during construction, operation and maintenance of roads

(b) Creating awareness and understanding the environmental legal framework pertaining to roads

(c) Developing skills for;
(i) Identification and assessment of environmental impacts of road projects
(ii)Incorporation of mitigation measures at all stages of road development
(iii)Reviewing EIA reports and incorporating measures into the decision making process

Table 9.1 below presents the recommended topic modules and costs for each of the three target groups necessary to implement the Environmental Management Plan.

Table 9.1 Recommended topic modules and costs for each of the target groups

Topic modules	Target Group	No. of participants	No. of days	Cost per unit (Kshs)	Cost in (Kshs)
1. Understanding of EIA legislation in Kenya 2. Develope awareness of the environmental implications of roads and procedures for assessing them 3. Develope awareness and understanding of the human resource and institutional arrangements for managing environmental impact studies 4. Develope an understanding of how policy can be developed and incorporated into environmental management 5. Importance of incorporating mitigation measures during road planning and design and implementing an environmental monitoring programme 6. Impart skills on environmental auditing and monitoring during road construction and maintenance	Group A Road Workers	22	33	7,500	495,000
1. General understanding of EIA legislation in Kenya 2. Sensitisation on health (STDs including HIV/AIDS), littering, solid and liquid waste management	Group B Road Users	26	3	5,500	429,000
1. Brief overview of EIA legislation in Kenya 2. Sensitisation on health (STDs including HIV/AIDS), littering, solid and liquid waste management 3. Implications of encroachment onto the road reserve	Group C PAP	450	2	2,000	1,800,000
				Sub Total	2,724,000
				15% contingency	408,600
				Total	3,132,600

Table 9.2 presents a breakdown of the target groups for training necessary to implement the environmental management plan during construction.

	Category	Number of people
Supervision		
Group A	Engineers	3
	Provincial Engineer	1
	Project Engineer	1
	Resident Engineer	1
	Assistant Engineers	6
Group B	Surveyor	2
	Inspector of Works	8
Group C	Casuals/unskilled	30
	Sub Total	52
Contractor		
Group A	Site Engineer	2
	Site Agent	2
	Site Manager	6
Group B	Foremen	16
Group C	Labourers	400
	Sub Total	426

Target Group	Cost per day (Kshs)	Days	Number of participants	Cost per target group (Kshs)
Group A	7,500	3	22	495,000
Group B	5,500	3	26	429,000
Group C	2,000	2	430	1,720,000
			Total	2,644,000

CHAPTER 8

8.0 CONCLUSION AND RECOMMENDATIONS

8.1 Conclusion

The improvement of the proposed Mau- Summit- Kisumu road rehabilitation project will not only enhance economic growth at local level but also contribute to the national, regional and international economy.

The integration of environmental and social concerns in the implementation strategy of the World Bank funded project will enhance sustainable development and improve accessibility to potential economic and social sectors.

8.2 Recommendations

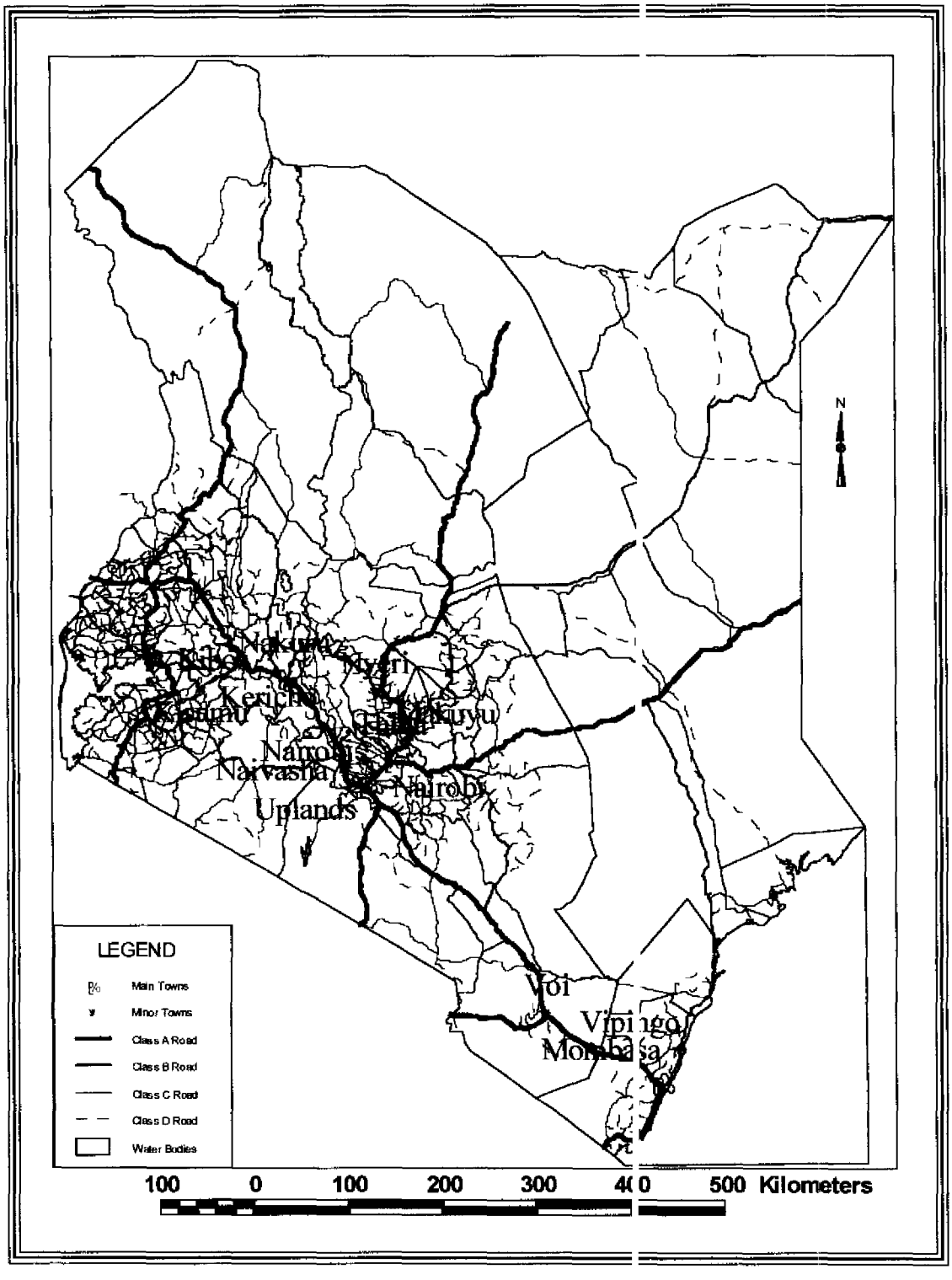
It is recommended that:-

- All the proposed mitigation measures be implemented.
- Environmental and HIV/Aids sensitization in the road sector be undertaken by MoRPW&H in collaboration with, MOH and relevant NGOs
- Sourcing of labour be from the local communities and should include both men and women.
- Environmental mitigation measures should be incorporated in the Project Road tender documents and contractual agreements.
- The project proponent should consider allocating a small percentage of the implementation budget for environmental and HIV/AIDs sensitization.
- The key stakeholders in the roads sector should be sensitized on environmental, social, gender and HIV/AIDS issues.
- Capacity building, creating awareness, implementing mitigation measures and monitoring are essential for the efficient and effective implementation of the Environmental Management Plan. To achieve this, key target groups such as road workers, road users and project-affected people must be trained.
- The Environment and Social Unit has to be formally established and strengthened by capacity building (staffing), training, provision of adequate resources and facilities.

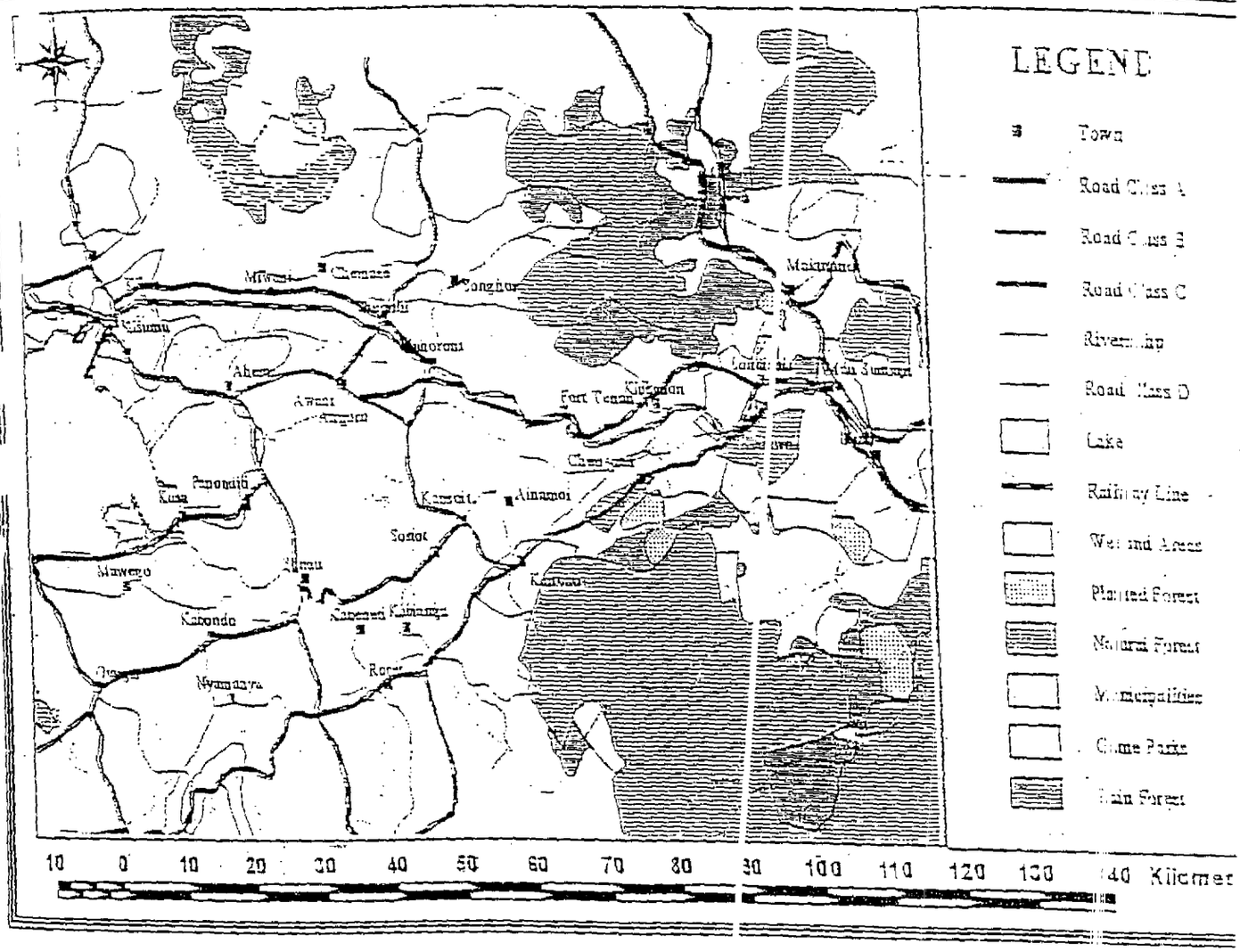
APPENDICES

APPENDIX 1: MAPS

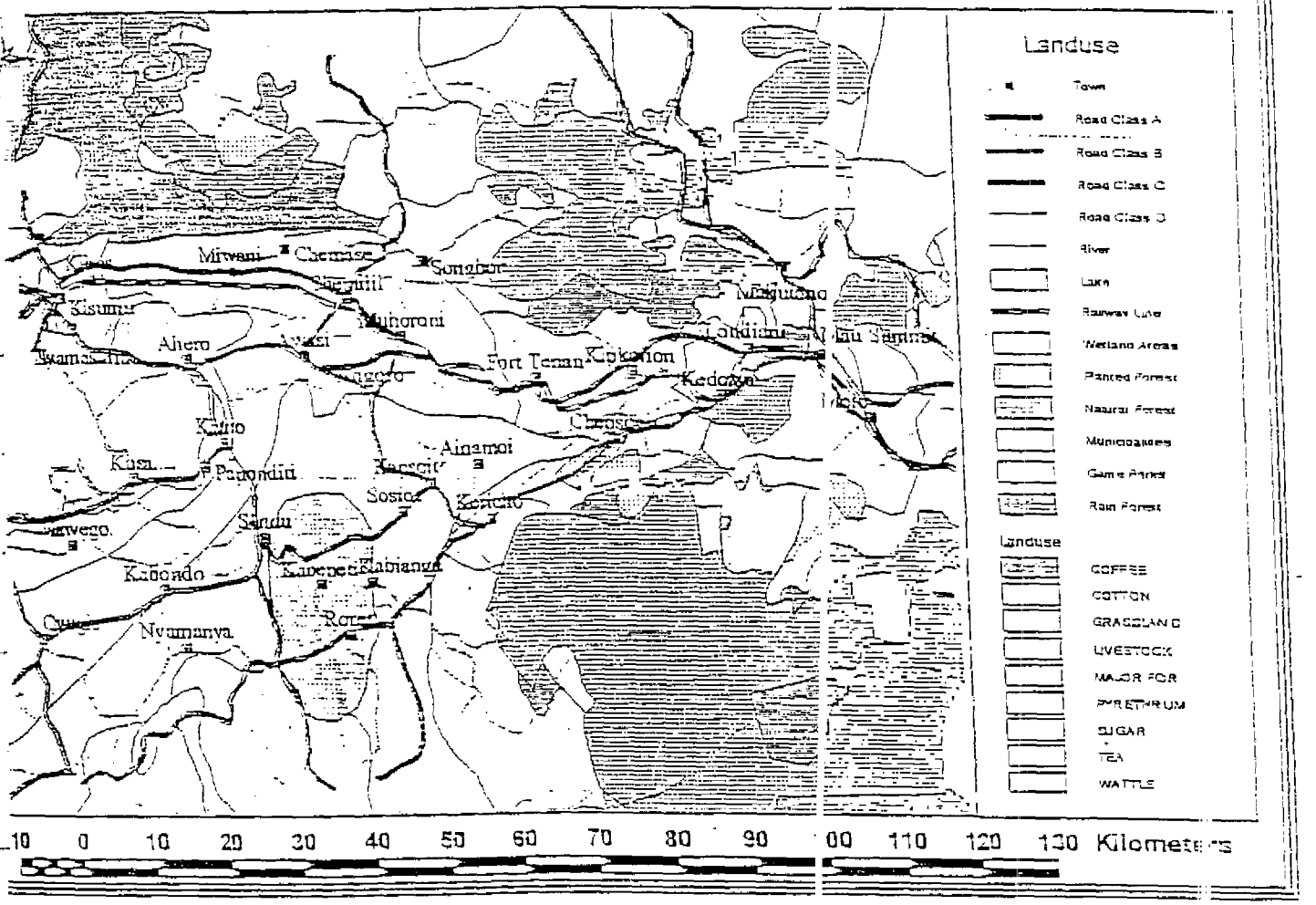
ROAD NETWORK IN KENYA



KISUMU- AWASI- MAU SUMMIT ROAD- NATIJRAL ENVIRONMENT

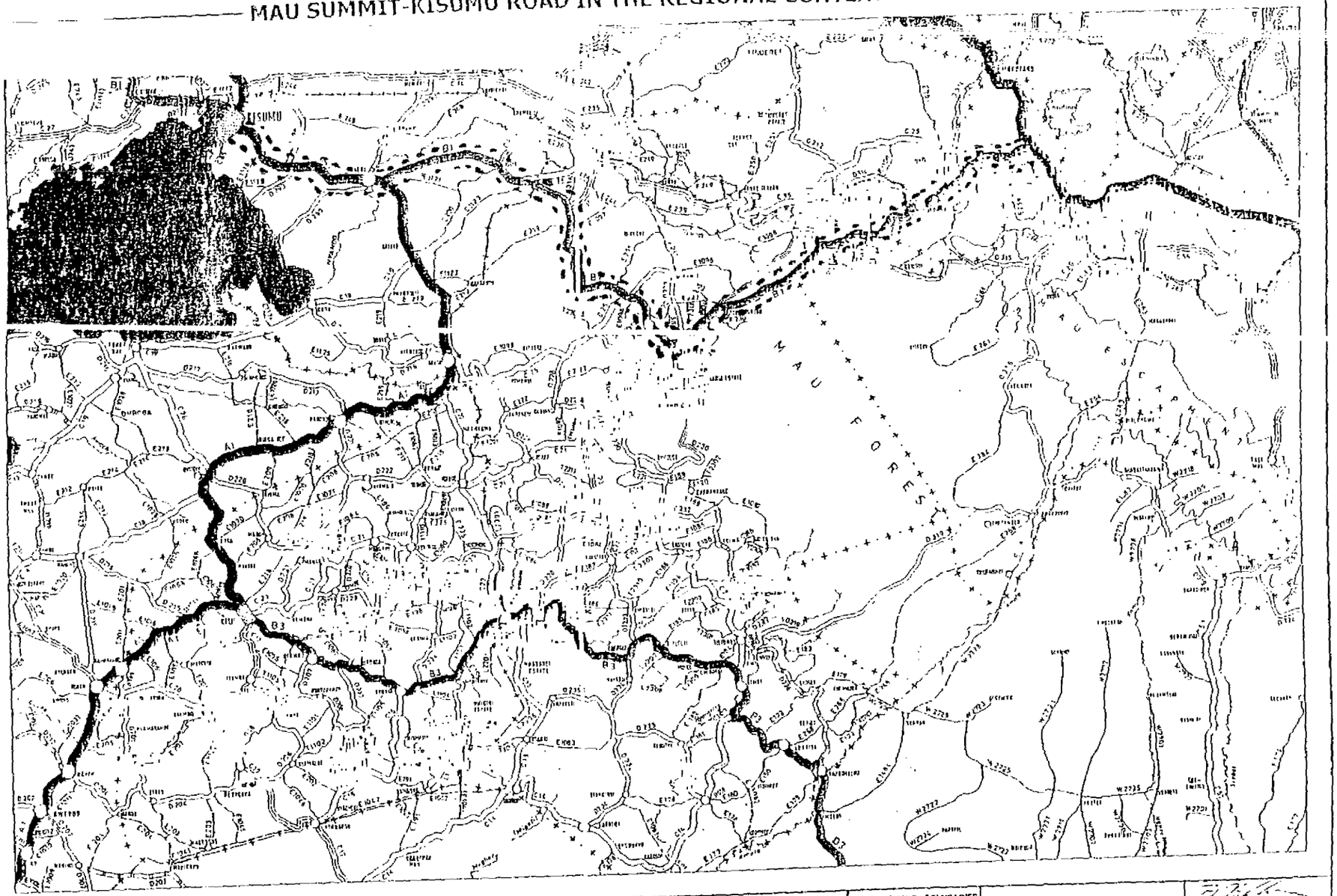


KISUMU - AWASI - MAU SUMMIT ROAD: LANDUSE



Location of the Proposed Project

MAU SUMMIT-KISUMU ROAD IN THE REGIONAL CONTEXT



LEGEND

ROAD CLASS

ROAD SURFACE — HARD, GRAVEL, EARTH/TRACK, PROPOSED

INTERNATIONAL TOWN ROAD A

INTERNATIONAL BOUNDARY

PROVINCIAL BOUNDARY

DISTRICT BOUNDARY

NATIONAL PARK BOUNDARY

RIVERS AND STREAMS

ADMINISTRATIVE BOUNDARIES

REVISIONS

DATE | DESCRIPTION | SIGN

MAINTENANCE BRANCH
ROADS DEPARTMENT
EAST AFRICAN ENGINEERING CONSULTANTS
MAINTENANCE BRANCH
ROADS DEPARTMENT

M/S/6

ROAD MAP OF KENYA

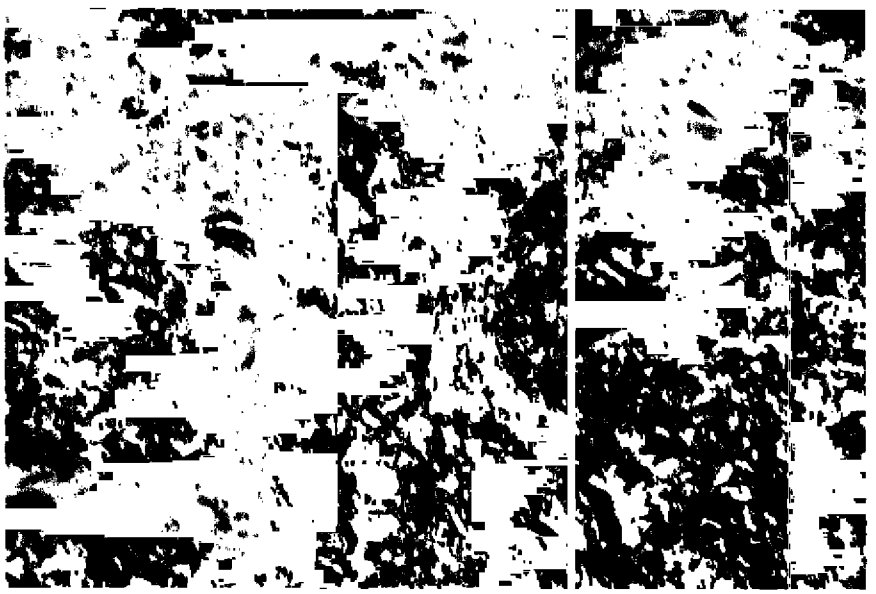
KISUMU

CHIEF SUPT ENG (MAINTENANCE)
M O T C C KENYA
JULY 1987

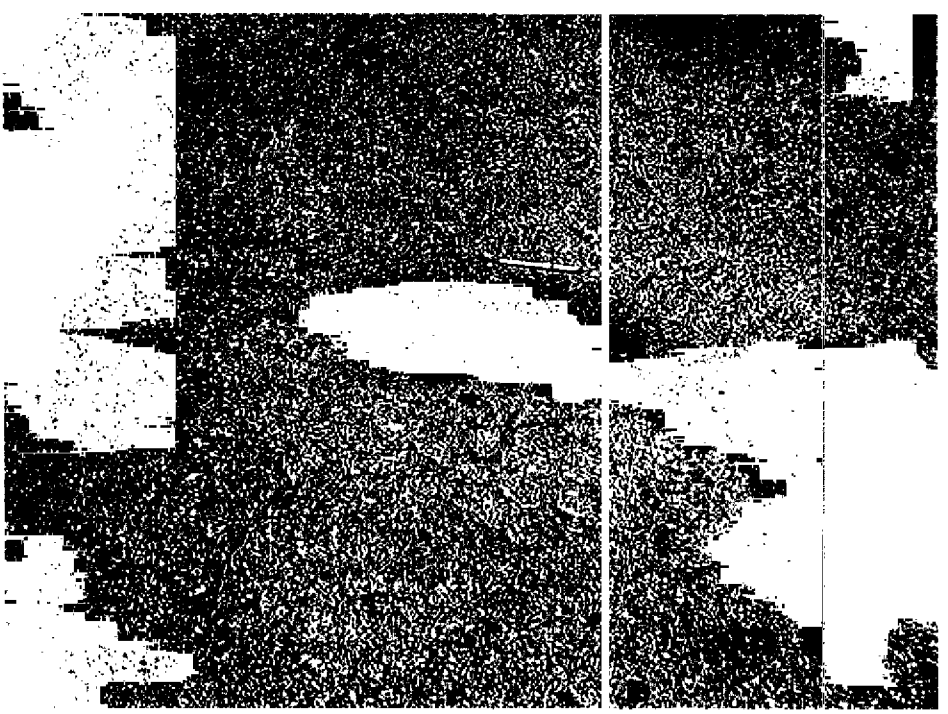
APPENDIX 2: PHOTOGRAPHS

1. **Road Status**
2. **Road Use and Users**
3. **Road Conflict**
4. **Environmental Issues**

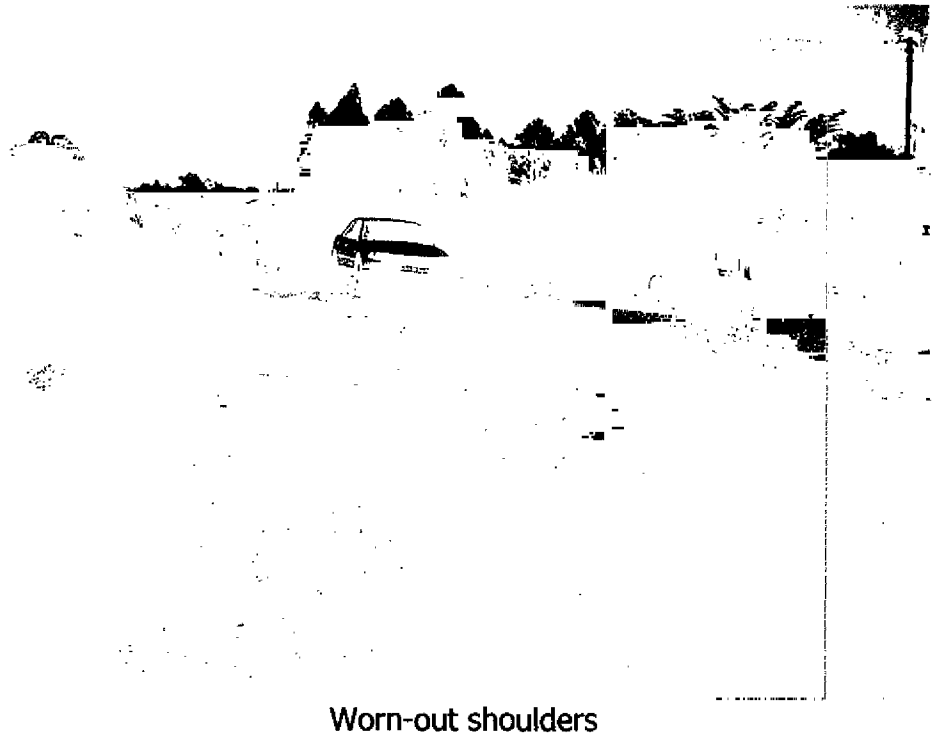
ROAD STATUS



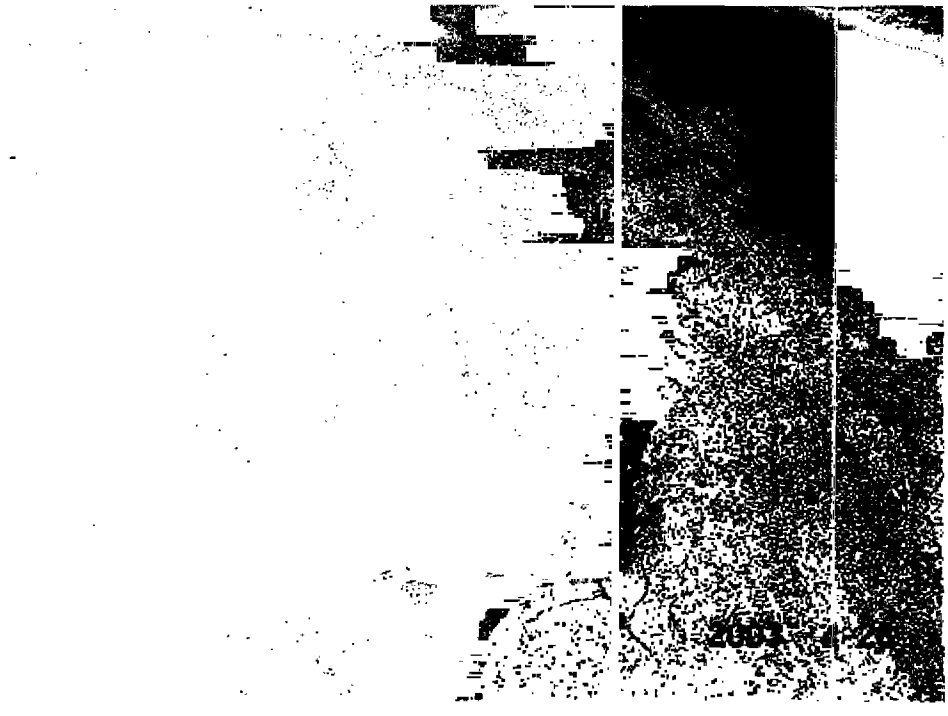
Section showing Road Failure



Section of the Road with a Pothole a ong the B1 Road

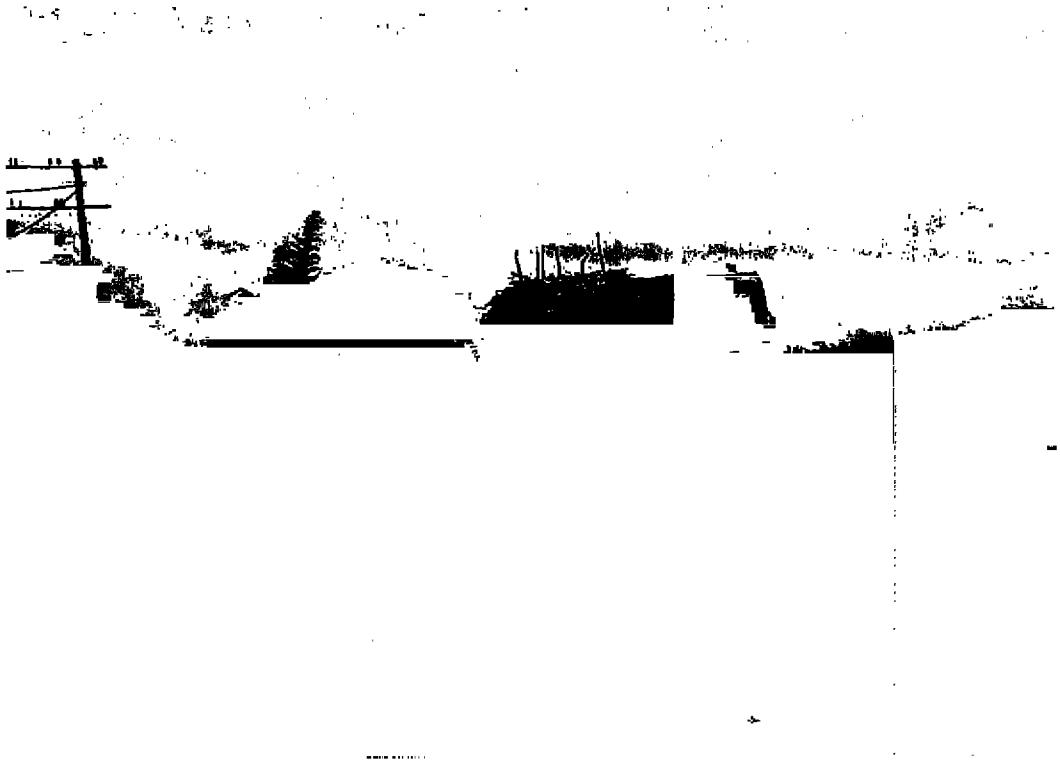


Worn-out shoulders

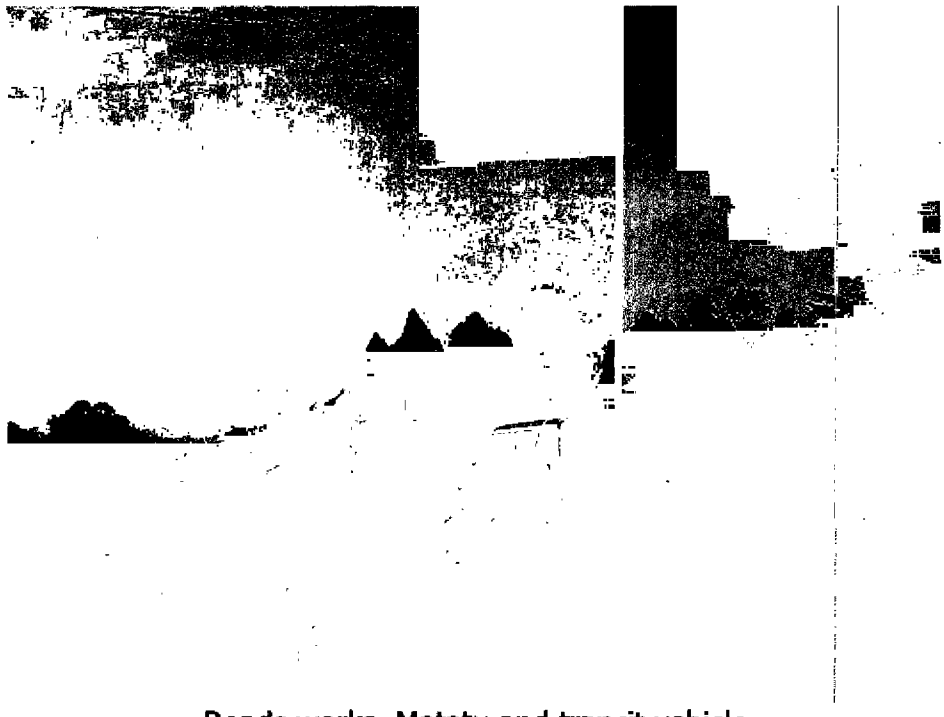


Worn-out shoulders

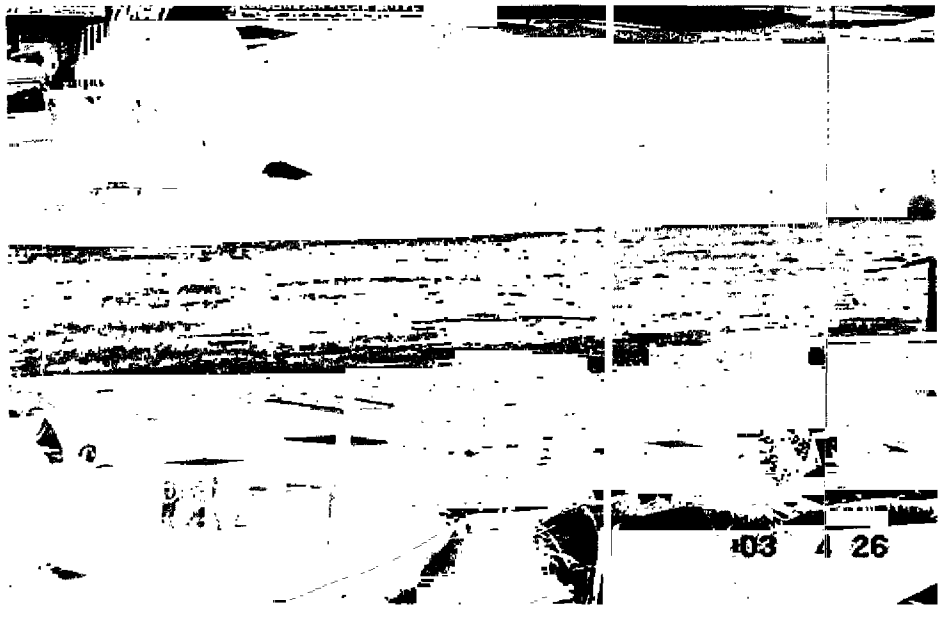
Sell of farm produce along Mau Summit Road



Sugar cane truck transporting cane and the bus



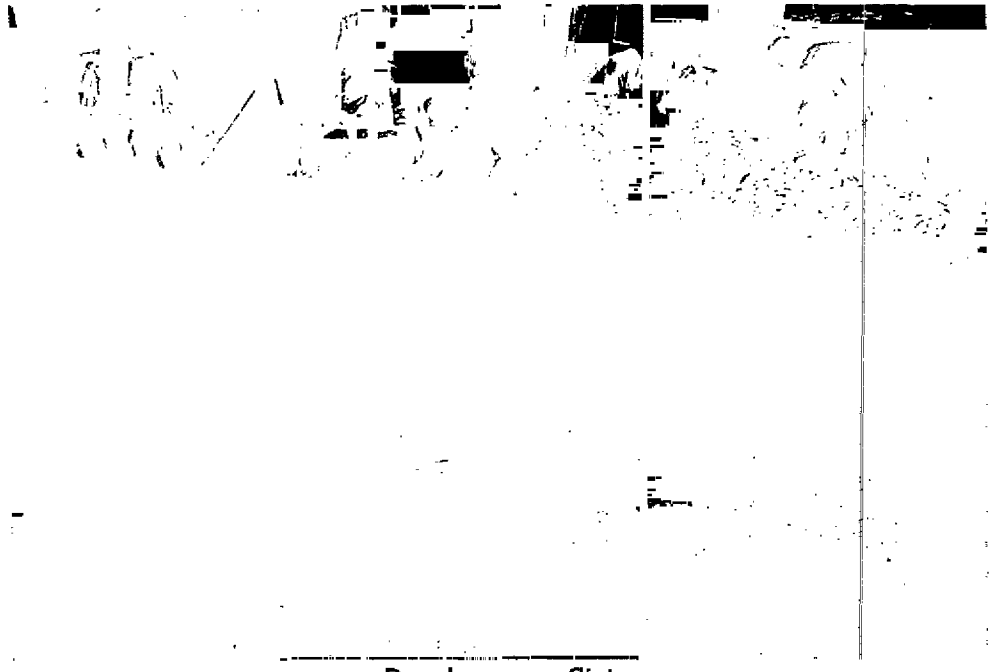
Roads works, Matatu and transit vehicle



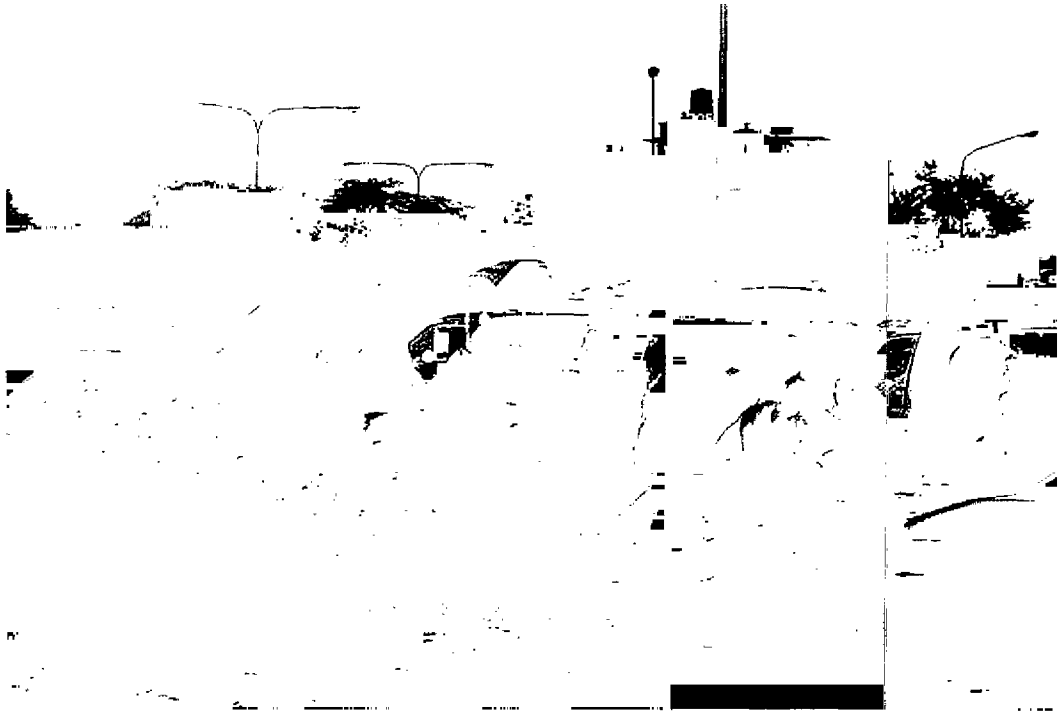
Trailer packing at Mau Summit

Some Trucks on transit to other regions

ROAD CONFLICT

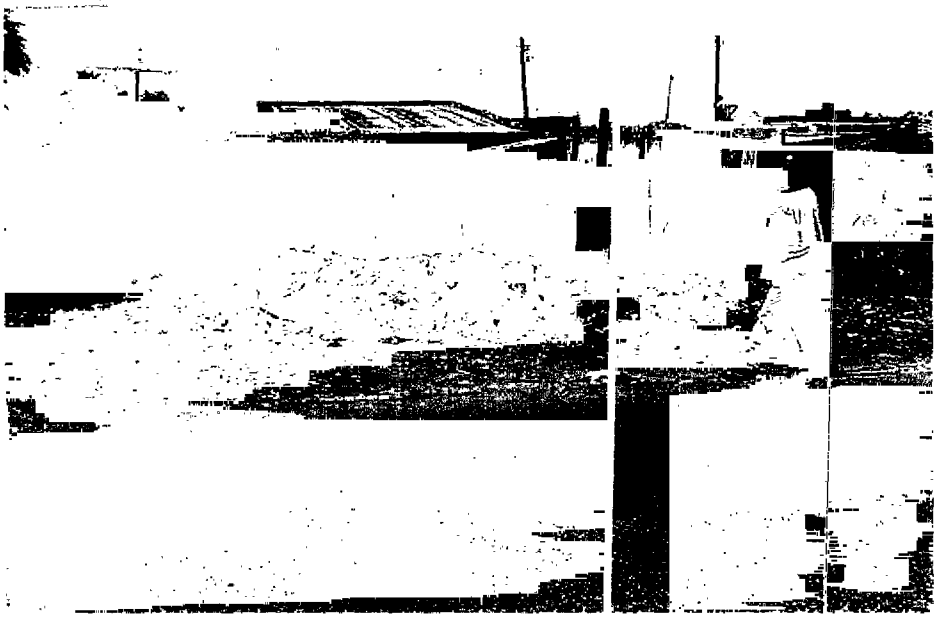


Road use conflict

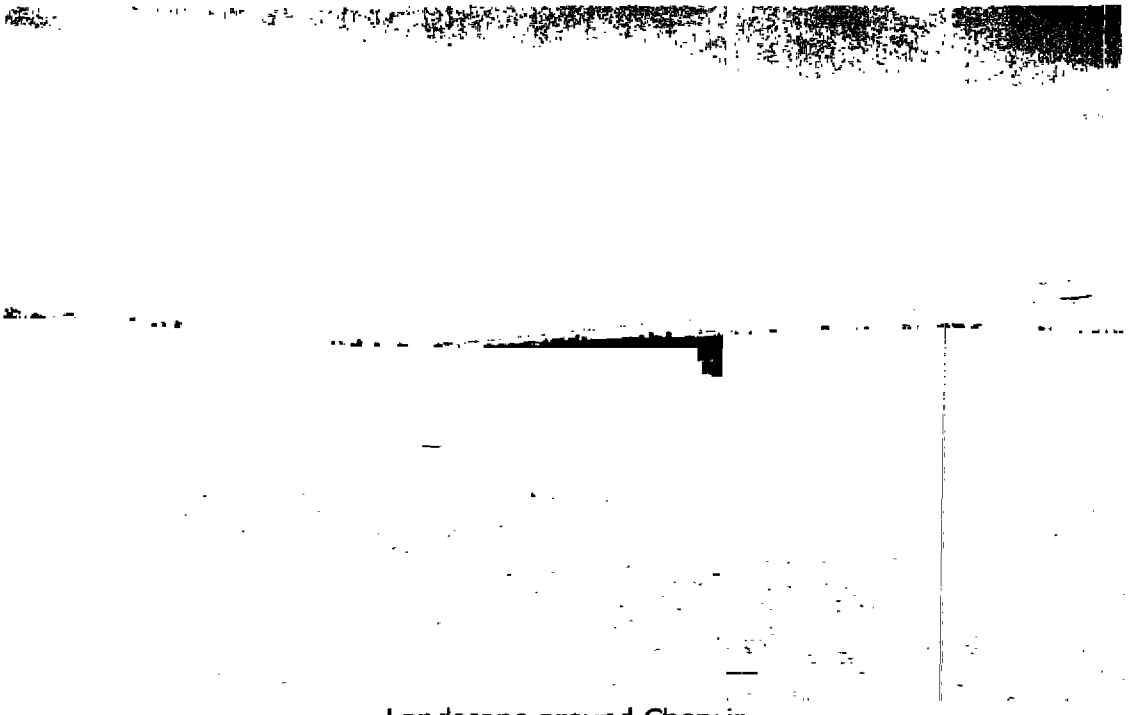


ENVIRONMENTAL ISSUES

A quarry turned into a water pan for domestic/livestock use



Dumping of waste on the road reserve



Landscape around Chepsir

Biodiversity along the project area, B1

APPENDIX 3: REFERENCES

1. Beentje, H. J. (1994) — Kenya Trees, shrubs and Lians; National Museums of Kenya.

2. National Environmental Action Plan Secretariat (MENR 1996) Nairobi, Republic of Kenya. — Environmental Impact Assessment (EIA) Guidelines and Administrative Procedures.

3. Grabowsky and Poort Consulting Engineers (1997) — Roads 2000 Environmenta Guidelines Study Volume 1, Final Report; Roads Dept. Ministry of Public Works-Kenya/ the Government of the Netherlands.

4. Grabowsky and Poort Consulting Engineers (1998) — Rehabilitation of Sultan Huamud-Mtito Andei Section of the Nairobi-Mombasa Road (A109); Roads Dept. Ministry of Public Works-Kenya.

5. Roads Dept. MoPW & H (1998) Nairobi, Republic of Kenya — The third Highway sector Project: Sectoral Environmental Assessment; Final Draft Report.

6. Roads Dept. MoPW & H (1998) Nairobi, Republic of Kenya — The third Highway Sector Project: Project specific Environmental Assessment; Final Draft Report.

7. Roads Dept. MoPW & H (1996) Nairobi, Republic of Kenya — Feasibility Study and Detailed Design of Mai Mahiu-Naivasha Road (C88) and Naivasha-Lanet Road (A104) Draft Environmental Impact Assessment

8. Geoprogetti/MECE Consulting Periodic — Inception Report, feasibility Study and Detailed Engineers (1999) Nairobi, Engineering Design for the Rehabilitation and Maintenance or strengthening Works of the Mau Siummit-Awasi & Kisati Bridge – Kisumu Airport roads (B1).

9. U.S.A. Federal Highway Administration –FHWA (1987) — Environmental Guidebook, Subchapter H, Part 771 Environmental Inpact Assessment and related procedures.

10. The World Bank (1991) Environment Department, — Environmental Assessment source book Volume 1 Policy, Procedures and Cross Sectoral Issues, World Bank Tecnical Paper No. 139.

11. The world Bank (1991) — Environmental Assessment Source Book Volume II.

Environment Department, Washington D.C

Sectoral Guidelines. World Bank Technical Paper 140.

12. the World Bank (1991) Environment Department Washington D. C.

Environmental Assessment Source Book Vol. III. Guidelines for Environmental Assessment of Energy a And Industry projects. Technical Paper No. 154.

13. The World Bank (1997) Environment Department, Washington D.C.

Roads and the Environment Handbook. Technical Paper No. 376.

APPENDIX 4: TERMS OF REFERENCE (TOR)

Environmental Impact Assessment Team

In order to effectively address the TOR the Chief Engineer Roads constituted a team of experts from various Government Agencies to carry this study.

	Institution	Name	Role
1.	MoRPW&H	Mrs. Elizabeth C. Mibey	Environmentalist (Team Leader)
2.	KWS	Mr. Bernard Kaaria	EIA Specialist
3.	MoRPW&H	Eng. J. Wanyama	Roads Engineer (Planning)
4.	MoLS	Mr. Patric Hayombe	Physical Planner

Terms of Reference (TOR)

- Briefly outline the existing land use within the proposed road improvement area.
- Identify both direct and indirect impacts on Agriculture, Vegetation and biodiversity.
- Identify prevention of erosion and sedimentation impacts.
- Analyze all potential impacts within the proposed road network.
- Provide workable Environmental Management Plan (EMP) and outline specific actions on significant negative impact due to the project.
- Ensure effective Public Participation and consultation in the Road Improvement project.
- Ensure that waste management issues are addressed during the consultation phase
- Ensure inclusion of HIV/AIDS awareness programme.
- Proposed a decommissioning programme if applicable
- Collect and collate relevant baseline information on the project area.
- Identify public health issues from ponding water and pollution of water courses
- Identify and suggest measures for the improvement of the quarries sites
- Analyze significant impacts on economic, social and cultural aspects in the project area in order to provide mitigation measures.
- Proposed ways of integrating gender issues into the project.

CURRICULUM VITAE

CURRICULUM VITAE

ELIZABETH CHEROTICH MIBEY

CURRENT ADDRESS	P.O. Box 28363
	Nairobi, Kenya.
MARITAL STATUS:	Married with two children
DATE OF BIRTH:	1st March, 1954
PLACE OF BIRTH:	Kamogo Village, Marakwet District
NATIONALITY:	Kenyan

EDUCATION:

1975-1979	Bachelor of Science in Microbiology,
1980-1982	MSEH-Masters of science in Environmental Health, East Tennessee State University, TN. USA.

EMPLOYMENT

1984-1998	Ministry of Environment and Natural Resources National Environmental Secretariat,(NES)
1998- 2002	Ministry of Roads and Public Works Roads Department, Planning Branch, Special Programmes, Environmental and Social Unit.
2003	National Environment Management Authority

ADMINISTRATIVE RESPONSIBILITIES

1988-1993	Head of Environmental Health Division-NES
1993-1995	Head of Human Settlement Division-NES

1995-1998	Head of Environmental Impact Assessment. -NES
1998- 2002	Head of Special Programmes Environmental Unit in Roads Department, Ministry of Roads and Public Works.
2003	NEMA: Compliance and Enforcement Department, Ag. Chief E.I.A Officer.

NATIONAL CONTRIBUTION

1993	Resource person on Policy Paper on Environment and Sustainable development.
	Member of Nairobi Liaisons Planning Committee, Ministry of Lands and Settlement.
1994-1997	Member of the National Environment Action Plan (NEAP) and Coordinating Committee and Urbanization in (NES), Ministry of Environment and Natural Resources.
	Member of National Steering Committee on Habitat, Ministry of Roads and Public Works
	Member of the National Urban Planning Committee on the Green Town Project, Ministry of Local Government

CONFERENCES

1993-	UNEP Governing Council, Nairobi – Delegate
1995-	Commission to UNCHS, Nairobi- Delegate.
1995	South East Asia /Africa, Environmental management for sustainable development conference, Cairo – Egypt.
1996-	Habitat II Conference, Istanbul, Turkey- Delegate

1997-	United Nations General Assembly Nineteenth Special Session UNGA, New York- Delegate

WORKSHOPS

1993	Workshop on Reproductive Health- Sponsored by World Bank, Safari Park Hotel, Nairobi.
1995	Environmental Impact Assessment (EAI) Sensitisation Workshop-GOK/UNEP Mbagathi-Nairobi.
1999	Road 2000 Coast Province Maintenance Project Implementation Plan Workshop –DANIDA FUNDED PROJECT.
2000	Sensitisation Workshops on Road and Environment for Provincials/Districts Engineers in Roads Department/Organizer and Implementer of the same.
2001	Preparation of +5 Habitat Conference Nairobi.
2002	Member of Technical Advisory Committee on Environmental Impact Assessment of NEMA.
2002	Reasource Person in the Seminar on Project Management by Snow mount Consultant at Silver Springs Hotel, Nairobi.
2004	GOK/ SIDA Roads 2000 Nyanza Province stakeholders awareness workshop-Kisumu.

RESOURCE/SECRETARY TO THE;

1993-1996	Provincial Workshop on National Environmental Action Plan (NAEP) Nyeri.
1994	Provincial Workshop on National Environmental Action Plan HEAD, Mombasa.
1995	Secretary to the Task Force 5 (Human Settlement and Urbanization), NEAP Process / Ministry of Environment and Natural Resources.
1994	EIA Sensitisation Workshop, Ministry of Environment and Natural Resources/UNEP Mbagathi, Nairobi Workshop
1998	Workshop for working towards a corporate Environmental

Policy in Kenya (COREP), Nairobi Serena Hotel.

AWARDS

- 1991 Certificate in International Course on Environmental Pollution of Energy Exhaust Gases- Nagoya Japan.
- 1992 Certificate of participation in workshop Environment management for Sustainable Development- Green Hills Hotel.
- 1993 Certificate of participation in Inter-Personal Management Development Skills Seminar for Senior Women Managers in the Public Sector, Kenya Institute of Administration KIA
- 1994 Certificate in Training course on Methods and Techniques of Environmental Management for Specialists and Managerial Staff from Environmental Administration and Institutions in Africa,- Berlin, The Federal Republic of Germany.
- 1996 Certificate of International Training Course on Environmental Assessment for Planning and Management-Prince of Songkla University, Thailand.
- 2001 Certificate of sustainable Environment Management Course (KIA) Nairobi
- 2002 Certificate of sustainable Environment Management Course, Centre for Research and Education on Environmental Law (CREEL) at Hotel Sapphire, Mombasa.

CURRENT EXPERIENCE ON ROAD SECTOR

- May 1999 Environmental Examination report for Kilifi Bridge Construction Project for the Overseas Economic Cooperation Fund of Japan (OECF) for their follow up survey of 1998.
- July 1999 Participated as a counterpart in the study on Rural Roads Improvement in West Kenya with Pacific Consultants International Construction Project Consultants, Inc.

- ❖ Sept. 1999 Participated in the Pre-feasibility study for Isiolo-Moyale Road (A2) accompanied by Environmental Expert form GITEC Consult GMBH Gusseldorf, Germany on the site visit to the project region to cross-check the baseline environmental condition.

- ❖ Dec 2000 Participated as an expert in introducing environment measures to the Roads 2000 maintenance programme with DANIDA-GOK in Coast Province

- ❖ Feb 2001 organizer of Ministry of Roads & Public Works Roads Department sensitisation workshop on Roads Environment, Gender & HIV/AIDs for Western, Nyanza, Central & Eastern Province.

- ❖ Apr 2001 Team leader for EIA study for proposed ADB Roads 2000 programme in (8) eight districts of Rift valley province.

- ❖ July 2001 Team Leader for EIA study for the proposed project for Reconstruction of Athi and Ikutha Bridges in Eastern Province 2001.

- ❖ Sept 2001 Team leader for EIA study for World Bank Proposed Rehabilitation and Reconstruction of Maji ya Chumvi-Mi itini Seciton of Nairobi-Mombasa Road (A109) Coast Province.

- ❖ 2002 Represented The PS. Ministry of Roads and Public Works in the National Environment Council (NEC) of NEMA.

- ❖ 2003 Training of Engineers on Environmental Management and Coordination Act of 1999 and EIA regulation of 2003 as it relates to the road sub-sector activities, at Kenya Institute of Highway Building Technology (KIHBT) Nairobi.

PUBLICATIONS

- District Environment Assessment Report, Mombasa.
- District Environment Assessment Report, Kirinyaga
- District Environment assessment Report, Bungoma
- National Environmental Assessment Action Plan (NEAP), 1994
- African Newsletter on Occupational Health and Safety 1996.
- Proceeding of a workshop between the Roads Sector and National Environment Management Authority (NEMA) at Kenya College of Communication Technology, 2003.
- Sensitisation Workshops on Roads, Environment, Gender and HIV/Aid for six Provinces of Kenya.

EXTRA CURRICULAR ACTIVITIES

- Women Church Leader - **Chrisco Church**
- Chairperson National Youth Committee - **Chrisco Church**
- 1999 an Assessor in the murder of British Tourist Julie Ward in 1988 in the High Court of Kenya.
- A member of Impact Assessment Association of Kenya (IAAK).

Department of Physical Planning,
Ministry of Lands and Settlement,
P.O. Box 45025,
Nairobi -Kenya.
Phone: 718050 Ext. 4210.
Fax: 7[illegible]7523/16800
E-mail rapospat@yahoo.com
http://www.skynary.com/raposplan2000

NAME: HAYOMBE Patrick Odhiambo

Date of Birth: 24th July 1965
Marital Status: Married
Personal Number: 90024571

Education	Period	School and Institutions	Certificate Obtained
	2002-to date	Moi University	Registered D.Phil. Student in Environmental Planning and Management (Urban Planning) Thesis: City-Lake Interface: Towards Environmental Planning of Kisumu City (Proposal)
	1997	Moi University	M. Phil. Environmental Studies (Environmental Planning and Management Division) Specialized in Urban Environmental Planning and Management, and Geographical Information Systems. Thesis: *Some Environmental Problems Related To Urban Sprawl: A case of Southern Kasarani, Nairobi City. A planning Perspective.*
	1989	University of Nairobi	B.A (Geography), 2nd Class (upper)

Other Courses and Seminars Attended

2002	Mbagathi	Water Resources Conference
2002	KISM: Survey of Kenya	GIS Course
2002	UNEP-Gigiri	Africa-GIS Conference
2001	Sweden-SIDA Course	International Training on Forestry Policy and Strategy Development
2001	Columbus 2000.	Geoinformatics (Computer Database Management In Spatial Planning)

2001	Kenya Institute of Administration (KIA)	**Communication Skills Development for Physical Planning Officers.**
2000	Frame Network/Internet in Natural Resource Management, Nairobi: Sponsor USAID.	**Frame Network/Internet** Membership
2000	Environmental Information Systems-Africa (EIS), UNEP, Gigiri	**Environmental Information Systems-Membership ACT Database**
2000	Participatory Environmental Planning Workshop, Machakos	**Participatory Environment Planning**
2000	Launching of Environmental Management and Coordination Act No. 8 of 1999, UNEP Gigiri	
1999	Geographical Information Systems (Map Info) KENFICO, Community Water Supply, Kakamega	**Participatory Rural Appraisal**
1999	Participatory Rural/Urban Appraisal (PRA), IUCN, Webuye and Mt. Elgon District	**Gender and Development**
1998	Participatory Environmental Planning Workshop, Kapsokwony	**Participatory Developmental Planning**
1997	National Policy Formulation for Development, Kapsokwony	
1996	Social Development Dimension (SDD) Workshop, Kakamega	
1995	Environmental Impact Assessment Training Workshop, SES, Wira Motel, Nairobi	**Environmental Impact Assessment**
1995	Participatory Rural Appraisal for Natural Resource Management Kakamega	

WORK EXPERIENCE AND ASSIGNMENT RELATED TO THE ADVERTISED JOB: PHYSICAL PLANNER 1 VACANCY V/No. 65/2001

A: PHYSICAL PLANNING DEPARTMENT: NAIROBI, HEADQUARTERS

- Review of Environmental Impact Assessment Cases (NEMA-TAC) 2002-to date
- Preparation of the Draft of **Integrated Water Resources Management Strategy Paper.** (Inter-ministerial Team. From February 2000 to Date).
- **Resource Person:** Preparation of **Molo Environmental Impact Assessment** on Excision of Mt. Londiani Forest.

- Preparation of Ministry of Land and Settlement **Performance Improvement Management Systems,** Schedule of Duties/Responsibility, First Draft (Departmental Team), From **October 2000-January 2001.**
- Preparatory paper of **Country Report on Habitat II in Istanbul**. Departmental Representative, **February 2000.**
- The Application of **Geographical Information System (GIS)** in Developing Database for Physical Planning Department:
  - Database for Taita Taveta District Regional Physical Plan, **May 2000.**
  - Database for Rongo Development Plan, **June 2000.**
  - Paper presentation: The Application of GIS in Developing a Database for Physical Planning; a paper presented to Environmental Information System Africa Workshop, UNEP, **July 2000.**
- Participated in the preparation of Ministerial Position Paper on **Environmental Consideration to Land Use Development Planning and Management.** A paper written in collaboration of Environment Management Unit, Ministry of Lands and Settlement and the Netherlands Government, March to June 2000.

B: MY CURRENT RESPONSIBILITIES:

Environment Management Unit: 7th February 2000 to August 2000

- Integrate the Environmental Issues in Urban Land Use Development Planning and Management.
- Developing Participation Methodology in Environmental Planning.
- Participate in coordination of Environmental Planning Workshops.
- Incorporate Environmental Impact Assessment in Physical Planning Process.

Enforcement Section: 31st August 2000 to Date.

- To operationalise the Physical Planning Act No. 6 of 1996.
- Participate in the coordination and organization of Liaison Committees and Physical Planning Stakeholder Meetings.
- Participate in Coordinating Departmental Litigation Matters.

Membership to Taskforces

- A member of Ministerial Environmental Management Unit Secretariat.
- A member of Departmental National Land Use Policy Secretariat.
- A member of Departmental Performance Improvement Systems.
- A member of National Environment Management Authority (NEMA):Technical Advisory Committee on Environmental Impact Assessment
- A member of Integrated Water Resource Management Strategy Taskforce
- A member of Taskforce on National Environmental Standards, Regulations and Standards (Land Use Guideline)
- A member of Taskforce on State of Environment Report (Population Dynamics, Poverty Alleviation and Human Settlement)

C: District Physical Planning Office, Mt. Elgon District

1997-1999: In-charge of Direction, Coordination and Control of Physical planning activities in the District.
Notable Contribution: The Preparation of **Kapsokwony Town**, District Headquarters, **Development Plan** (Draft).
1999: A member of District Management Committee for Mt. Elgon Environmental Conservation Project, IUCN.
1999: Proposals: Sustainable Mt. Elgon District Regional Physical Development Planning and Mt. Elgon Eco-Tourism Planning Proposals Presented to IUCN, Mt. Elgon Integrated Conservation Programme.
Resource Person: IUCN, Participatory Rural Appraisal (PRA) Exercise.

Resource Person: Kimilili Boys, Environment Development Plan.

D: Provincial Physical Planning Office, Western Province
1996-1997: Assisting the Provincial Physical Planning Officer in Directing, Coordinating and Controlling Physical Planning Activities in Kakamega District.
Notable Contribution: Preparation of **Bukura Development Plan.**
1999 Paper: The Application of Participatory Rural Appraisal Techniques in Physical Planning: A paper presented to Physical Planners Conference, CPA Center, Nairobi.

E: Membership to Professional Associations

- A Registered member with the Physical Planning Registration Board
- Cooperate Member of Architectural Association of Kenya (Town Planning Chapter).
- Cooperate Member of Kenya Institute of Planners.
- Environment Information System (EIS)-Africa.
- GIS-Kenya.
- Kenya Green Towns Association.

F: Awards

The Best Final Year Student, Geography Department, University of Nairobi, African Urban Quarterly, 1990.

G: Objective: To Provide Physical and Environmental Services to Realize Sustainable Development in Kenya.

H: REFEREES

FIRST REFEREE

Dr. G. P. Opata
Senior Lecturer,
Environmental Planning and Management Division,
P.O. Box 3900
Eldoret-Kenya.

Dr. V.A.O. Odenyo Senior Lecturer
Environmental Planning and Management Division,
P.O. Box 3900
Eldoret-Kenya.

SECOND REFEREE

George Adika Onyiro,
Senior Assistant Director,
Physical Planning Department,
P.O. Box 45025
Nairobi Kenya

1. Bernard Kaaria Irigia

CURRICULUM VITAE. JULY. 2003.

Personal Details

Name:	Bernard Kaaria **IRIGIA**
Address:	PO BOX 40241, NAIROBI.
Tel	**254-2**-602345/501081(Office), 0722-773951(Mobile)
Email	bkaaria@kws.org
Nationality	Kenyan.
Profession	Biologist/Environmental Impact Assessment (EIA) Specialist
Experience:	18 years experience in environmental planning, conservation and management.
Date of Birth	30/11/1954.
Marital Status:	Married.

Key Specialization Areas

Key areas of experience include: Environmental Impact Assessment. Natural Resource Planning and Management, environmental conflicts and resolutions, project planning/management, policy formulation, proposal development, policy analysis, advocacy and extension in addition to team work co-ordination in executing both desk and field assignments.

Experience

I have gained enormous insight of the Environmental Management and Co-ordination Act while co-opted as a member of the National Committee on the Implementation of the Environmental Management and Co-ordination Act. (1999-2000) and as a member of the Technical Advisory Committee on EIA to NEMA, (2001-Date). In addition, have

10 years **hands-on** experience in conducting EIA and guiding environmentally sound conservation and management decisions by Kenya Wildlife Service (KWS) and other development partners.

In total, I have 18 years experience in resource management planning, environmental conservation, community development and sustainable decision making while working for Kenya Wildlife service. Most of experience has been gained through implementation of KWS donor funded development projects

Currently, I am the Head of Environmental Impact Assessment (EIA) Unit of Kenya Wildlife Service (KWS) responsible for articulating decisions relating to biodiversity planning and implementation of environmental assessment programmes by KWS, collaborators and partners. I also supervise and guide university students on Internship with KWS from both national and international universities. I also facilitate EIA courses by the KWS Training Institute Naivasha in addition to facilitating several environmental management seminars, workshops and courses organised by NGOs and other development partners. I am also a founder member and Chairman of the Impact Assessment Association of Kenya (IAAK), an affiliate of the International Association for Impact Assessment (IAIA).

Scholarships and Awards

1987:Netherlands Government Grant to pursue a PostGraduate Diploma in Rural and Land Ecology Survey at ITC, Netherlands

1988: Certificate of recognition as Foreign Students Class Representative by the ITC Foreign Students Association

1993: World Bank Grant to pursue Msc in EIA at the University of Wales, UK

1999: Netherlands Ministry of Foreign Affairs Capacity Building Grant to attend International Association for Impact Assessment (IAIA) Conference held in Glasgow, UK.

June 1999: International Co-operation Committee of IAIA Certificate of Recognition for Outstanding Contributions to IAIA Conference, held in Glasgow.

June, 1999: Awarded Certificate for successful completion of Environmental Management Systems (EMS) Course held at the University of Strachlyde, UK.

June 2000: USAID/REDSO Grant to attend the IAIA Conference held in Hong Kong.

June 2000: Awarded Certificate for successful completion of Strategic Environmental Impact Assessment (SEIA) Course held at the Hong Kong.

November 2000: Netherlands Ministry of Development Co-operation Grant to attend a workshop on Spatial Information Management for Environmental Impact Assessment held in Arusha, Tanzania.

April 2002: World Bank Grant to attend EIA Project Management Course held in Zambia.

Key Responsibilities and Assignments Undertaken

July – August – EIA team leader of the French Aid for International Development funded Meru Conservation Area fence Project.

September – October EIA Team leader of the filming activity (Tomb Raider II) in Hells Gate and Amboseli National Parks.

November –December participated in finalizing EIA and environmental Audit (Environmental Audit) regulation for NEMA

February- May Team leader for the Ngong Road Forest sanctuary trust funded Electric fence Project

May 2002 to Date: A Member of the Technical Advisory Committee on EIA appointed by the Director General of National Environment Management Authority NEMA).

January 2002: Reviewed the proposed Environmental Impact Assessment report of the proposed Nairobi National Park Constructed Wetland project on behalf of KWS.

December, 2001: Reviewed the Environmental Impact Assessment Report of the Proposed Hurlingham Service Station on behalf of the National Implementation Committee on Environmental Management and Co-ordination Act.

November, 2001-January, 2002: KWS Acted on behalf of the Deputy Director, Research and Planning and was responsible for all administrative and scientific decisions of the Department.

February, 2002: Represented KWS in the Inter-Ministerial Task Force to review the Environmental Management and Co-ordination Act implementation Strategy and Action plan

February, 2002: Advisor to the Interministerial subcommittee tasked to review the Environmental Impact Assessment (EIA) Guidelines and Regulations.

September 2000: Appointed to be a member of the National Committee on the Implementation of Environmental Management and Coordination Act (NIC-EMCA). My key role was to articulate implementation of Section 58 that specifically deals with EIA.

The Committee was tasked to ensure formation of the National Environment Management Authority (NEMA), a Co-oporate body that will co-ordinate smooth implementation of the newly enacted Kenyan environmental law.

Coordinated implementation of the EIA for the World Bank/ GEF funded Witu II Resettlement Programme, August -Nov, 2000. This EIA report served as a model for the NIC-EMCA to test the practical implementation of Section 58.

Represented KWS in the Interministerial Committee reviewing EIA for the proposed Kwale Titanium Mining Project, August 2000.

Coordinated development of KWS Draft mining policy guidelines within protected areas, September 2000

Team leader of the environmental reconnaissance survey of the proposed Mzima Springs Underwater Tank Viewing Project. October, 2000

Leader of the Government of Kenya specialists in developing terms of reference for the Roads 2000 ADB funded environmental mitigation programme, November-December, 1999

Team leader in developing EIA terms of reference for the KWS Tana River GEF World Bank funded resettlement Programme, December 1999

Team leader for the KWS environmental/ Management planning Specialist Group carrying out environmental audit of the Geothermal Power generating activities within the Hell's Gate National Park, Kenya, March 2000.

Lead consultant for the Environmental Impact Assessment of the proposed Lower Shire Valley (LSV) irrigation project contracted to CODA Africa by the Malawi Government and funded by African Development Bank (ADB), September, 1996-March, 1997.

Participated in the formulation and review of the draft National Environment Action Plan (NEAP) EIA Guidelines and the draft Environmental Management Bill, January, 1995-December, 1996.

EIA team leader of the USAID funded Kimana Community Wildlife Sanctuary located at Loitokitok, Kenya, June-August 1995.

EIA team leader of the EEC funded Kimana/Namelog Community fencing project, November, 1995-January, 1996.

EIA team leader of the proposed Naari Community Fence Project being jointly funded by USAID, KWS and the local community, September-October 1995.

EIA team member of the Proposed EEC funded Mount Kenya Fence Project, December 1995-February 1996.

Team member of the USAID/Netherlands Wetland Programme funded EIA Policy and Administrative Guidelines for KWS, November 1997-June 1998.

Team member of the USAID funded feasibility study to assess the role of the Leroghi/Kirisia Community of Samburu District in biodiversity conservation, January-March 1995.

EEC funded Elephant and Community Wildlife Programme review team member, March-April 1995.

EIA team member of the ODA funded Kora Bridge project across Tana River to link Meru and Kora National Parks, May-July 1997.

EIA team member ODA funded Galana Bridge Bridge Project to link Tsavo East and Chyullu Hills, August-November 1997.

Team member of the KWS Wildlife Utilization Policy Study commissioned by the USAID, September, 1994-December, 1996.

Participated in the EIA review of the EC funded Shimba Hills Fence Project, 1994

Education

Institution	Field of Study	Date	Qualifications
University of Wales, UK	Environmental Impact Assessment (EIA):	1994	Master of Science Degree
ITC-Netherlands	Rural and Land Ecology Survey	1988	Diploma in Ecology
Punjab University, India	Biology	1982	Bachelor of Science Degree

Relevant Professional Skills

- PRA techniques,
- E ecological, socio-economic, biological diversity and land-use surveys,
- Socio-economic and cultural considerations in designing projects.

- Rural Planning and management of biodiversity and development,
- community sensitisation and mobilization through participation,
- project planning/management, monitoring and evaluation.
- Multi-disciplinary/integrated approaches to policy formulation,
- Report writing and analytical skills,
- Advocacy and extension to influence policy decisions on both micro and macro projects,
- Co-ordination of researchers in data collection, collation and analysis,
- Effective communication skills,
- Interpretation of remote sensing data and use of aerial photo mapping,,
- Leadership capabilities and analysis of gender issues for consideration during project planning,
- Use of computing packages (Word perfect, Lotus, D-base, windows) Rational decision making,

Other Training

- Strategic Environmental Impact Assessment Course held in Hongkong and organized by the International Association for Impact Assessment (IAIA), June 2000.

- Environment in EC Development and Economic Cooperation workshop at Holiday Inn, Nairobi between June 13 and 16, 2000. The workshop focused on Environmental Analysis, Country Dialogue and Strategic Environmental Assessment
- Environmental Decision Making workshop held in Glasgow, University of Stratechlyde, UK and organized by the International Association for Impact Assessment in June, 1999

- Environmental Management Systems (EMS) Course, held in Glasgow, University of Stratechlyde, UK and organized by the International Association for Impact Assessment in June, 1999

- Mutonga Grand Falls EIA Review workshop at Kenya College of Communications Mbagathi, Nairobi, 1998.
- The Role of Community in Coastal Forest management Workshop at Lotus Hote Mombasa, 1998.

- KWS/UNESCO Workshop at Namanga River Hotel on Community Participation in Planning and Management of Amboseli Biosphere Reserve, 1998.

- Integrated Planning workshop for Mwea National Reserve and the environs held at Masinga Lodge, 1996.

- Gender Awareness and Planning workshop held at Naivasha and facilitated by the Center for Women Studies and gender analysis, Egerton University, Njoro-Kenya, 1996.

- Participatory Rural Appraisal (PRA) workshop at Naivasha conducted by Egerton University, 1995.

- Integrating Research findings into Planning, Lake Nakuru National Park case study, 1995.

- Communication Skills Course at the Agricultural Information Center-Kabete, 1992.

- Senior Personnel Management Course by Personnel Management Consultants, 1992.

- Protected Area Management Course by IUCN at Mweka College of Wildlife Tanzania, 1990.

- District Officer's Course at the Administration Police Training College (APTC), 1988.

- Wildlife Management Course at the Wildlife Management Institute Naivasha, 1988.

- Fuelwood Conservation Workshop at HomaBay by Kenya Energy Non Governmental Organisation (KENGO), 1984.

- Renewable resources as alternative source of energy in the developing countries workshop held at Jacaranda hotel, Nairobi by the USAID, 1984.

Professional Membership

- Member of the International Association for Impact Assessment (**IAIA**).

- Chairman and founder member of the *Impact Assessment Association of Kenya (IAAK)*
- Member of the Interministerial Committee on the Environment **(IMCE).**

- Member of the National steering Committee on the GEF Cross Border Biodiversity Project, which aims at formulating biodiversity management policies across the three East African countries.

Publications and KWS Internal Reports since 1986

Irigia, B., K.,Katunga,F.,K. 1986:The Ecology of the Nguruman-Kenya.

Irigia, B., K.1987: The Debarking effects of Giraffes on the Lake Nakuru National Park Vegetation

Irigia etal 1987: The Role of Aerial Photographs in the management of protected areas.(Case Study of Namnao National Park-Thailand).

Irigia B.K.1989: The human-wildlife resources of the Ngurumman.

Irigia, B.K. 1990: Effects of elephants on Combretum molle and Acacia geradii in Ol-Arinyiro Ranch-Laikipia.

Irigia, B.K.1990: Elephant crop raiding assessment in Ngarua-Division of Laikipia District.

Irigia, B.K.1990: An evaluation of the Southern Laikipia Ranches/Farms and their importance to elephants conservation.

Irigia B.K., Hoare R.E.1990: Observations on crop raiding fence design and elephant behaviour in Laikipia District.

Irigia B.K.1991: Ndare electric fencing (Community partic pation and public relations).

Irigia B.K. 1992: Elephant crop raiding assessment in Laikipia District.

Irigia B.K.1992: The role of Laikipia Elephant Research in Community Wildlife Service.

Irigia B.K.1992: Laikipia elephant project progress reports.

Irigia, B.K. Kagiri, J.W.1992: Kiamariga-Raya fence project, Mutara Location-Laikipia District.

Irigia, B.K.1992: Aberdare-Laikipia elephant movements in relation to salt licks and their effects on human/agriculture. Will electric fencing be a solution?

Irigia, B.K. 1992: Rumuruti Forest elephants.

Irigia, B.K. 1994: The Role of EIA in Resolving Human-Elephant Conflicts in Kenya.(The case study of Laikipia District-MSc Thesis).

Irigia, B.K. 1995: The EIA of the proposed Kimana Wildlife Sanctuary-Kajiado, Kenya.

Irigia etal 1995:Problem Animal Management policy guidelines.

Irigia etal 1995: Wildlife utilisation policy guidelines.

Irigia etal 1995: Environmental Impact Statement of the Proposed Imenti Forest Community Fence project

Irigia etal 1995: Environmental Impact assessment of the Proposed Mount Kenya Fence Project

Irigia etal, 1995: Community Involvement in biodiversity conservation in Leroghi/Kirisia Conservancy (A Feasibility Study in Samburu District- Kenya)

Hamisi, Irigia, 1996: The EIA of the Proposed Kimana/Nanielog Community Fencing Project

Irigia, Kariuki, 1996: KWS Strategy for Conduct and Use of Environmental Assessments

Irigia, Kodera, 1996: The EIA of the proposed Hell's Gate 3!!0KV Power Line.

Irigia, Kodera, 1996: The EIA of the proposed Tsavo East National Park Bore Hole Drilling Project.

Irigia, Mukungi, Muriithi, 1996: The EIA of the proposec Kibwezi Forest Ecotourism Development

Irigia, BK., 1999: The Role of EIA in resolving conflicts relating to sustainable resource management

Irigia, B.K., 2000: Towards Environmental Governance and Sustainable management in Kenya(A paper presented at the IAIA Conference in HongKong)

Irigia, B.K., Kuloba, B. , 2001: EIA of the Proposed UNDP supported Mt Kenya East Beera Community Fencing Project.

Irigia B.K., Wekesa, C., 2002: EIA of the Proposed Staff Quarters at Elsa Gate- Hell's Gate national Park.

Irigia B.K., etal., 2002: EIA of the Proposed Meru Conservation Area Fence Project.

Certificates/Testimonials -Several and can be availed on request

CURRICULUM VITAE

Name: **Joseph Wanaswa Wanyama**

Profession: Civil Engineer

Nationality: Kenyan
Date of Birth: 14th June 1960

Employer: Permanent Secretary, Ministry of Roads and Public Works

Year Employed: November 1987

Membership in Professional Societies: Registered Graduate Engineer, (ERB)

Key Qualifications:

Mr. Wanyama has 15 years of experience as a civil engineer (Roads) with the Ministry of Roads Public Works and Housing, Kenya. He has worked in various branches of Roads Department including Planning, Design, Contracts, and Maintenance .He is fluent in English and Swahili

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Employment Record:

2001, March to date	Planning Branch, Environment Unit(March-July) and now Traffic Engineering Unit In Environment Unit works undertaken include Environmental Impact Assessment (E.I.A) for the proposed ADB Roads 2000 Maintenance Programme in 8 Districts of the Rift Valley Province. The E.I.A study for JICA on Athi and Ikutha Bridges in Eastern Province . Currently coordinating World Bank funded Classified Road network inventory /condition survey study by consultancy. This study is utilising GPS/GIS Technology.
2000, Jan.-2001 Mar.	Design Branch

Township and Roadside Develo ɔment matters

1995 – 2000 Maintenance Section
District Works Officer Nyamira

District Roads Engineer Nyambene

District Roads Engineer Lugari

1992 – 1995 Minor Roads Programme
Minor Roads and RuralAccess Roads Programme(MRP/RAR)
DMIE Siaya District

1989 – 1992 Contracts Section
Prepared Contract Document For Kisumu – Kakamega
Supervised Repair and Resealing o Thika and Nairobi Phase III Roads

1988 –1989 Design Section
Basic Training in Computer Aided Road Design(B.T.C)
As an Assistant Engineer Designed 3Km of Chavakali – Yala (C63) Road

1987-1988 Planning Section (Road Safe y Unit)
Employed as an Assistant Engineer in M.O.R&P.W and Deployed in Planning -Road Safet / Unit

THE MINISTRY OF ROADS, PUBLIC WORKS & HOUSING CONSTITUTED A TEAM OF EIA EXPERTS FROM VARIOUS GOVERNMENT MINISTRIES TO CARRY OUT THIS STUDY.

ENVIRONMENTAL IMPACT ASSESSMENT EXPERTS

Name	Contact address	Area of specialization	Experience	Signature
Mrs.Elizabeth Cherotich Mibey	MoR&PW P.O.Box 30260 NAIROBI 0722-761434	Team Leader Resource person in several EIA's studies for WB, ADB JICA	Over 10 years	
Mr. Bernard Kaaria Irigia	Office 602345 Mobile 0722-773951	EIA, Resource Management & Planning	Several EIA Studies for World Bank, USAID, ADB, KWS, GOK.	
Eng. Joseph Wanaswa Wanyama	MORYPW TRANSLOM HOUSE ROOM 434. BOX 30260 NBI Tel. 0733-700223	CIVIL ENG. (HIGHWAYS)	CARRIED OUT EIA ON: 1. ROADS IN THE EIGHT DISTRICTS OF RIFT VALLEY FOR RDS 2000 FOR AFD FUNDING - 2001 2. ALL THE BRIDGES FOR JICA FUNDING - 2001	
Mr. Patrick Odhiambo Hayombe	Office 716800 Mobile 0721-516325	Environmental Planning & Management: Physical Planning	Several EIA Studies for GOK, Physical Development Plans: Strategic Environmental Assessment (SEA)	