



# L A M U

## DISTRICT ENVIRONMENTAL ASSESSMENT REPORT

National Environment Secretariat,  
Ministry of Environment and Natural Resources  
P.O. Box 67839  
Nairobi

July, 1985

L A M U     D I S T R I C T

ENVIRONMENTAL ASSESSMENT REPORT

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Environmental Training and Management in Africa  
(ETMA) Project.

July 1985

F O R E W O R D

This Environmental Assessment Report for Lamu District is the result of collaborative effort between the National Environment Secretariat (NES) of the Ministry of Environment and Natural Resources (Government of Kenya), and the Southeast Consortium for International Development's Environmental Training and Management in Africa (ETMA) Project. The Project on District Environmental Assessments was initiated in 1978 with the principal objective of findings ways of incorporating environmental considerations into the process of district planning and decision-making. Funding has come from the Kenya Government and the United States Agency for International Development. The Project itself derives its motivation from a number of considerations, chief among which are:

- (i) that it is a facet of Government policy to bring environmental factors into the mainstream of Government policy making in order to optimise use of scarce resources;
- (ii) that the Government has recognised the district as the primary unit of planning in order to effectively bridge the gap between the grassroots and the higher policy making levels. To this end, the Government has established district development committees in the bid to decentralise decision making and policy administration;
- (iii) that the inclusion of environmental considerations at the planning stages of any project or programme would help avoid the costly correction of environmental degradation that would otherwise occur. This amplifies the need to ensure the integration of development planning and environmental management objectives at the district level.

Thus this report, parallel with others in the series, is geared toward making a contribution to the implementation and future formulation of the District Development Plans for Lamu District.

The main objective of the report, therefore, is to ensure that development of the district takes place without the destruction of the resource base upon which it will depend for a sustained and improved quality of life for the people. To this end, the report is complementary not only to others in the series, but also to other parallel exercises being undertaken by the NES at Provincial and National levels.

The basic framework of the project is based on the "Guidelines for Environmental Management" (GEM), developed by UNEP and tailored to meet the specific requirements of the district exercise. It is hoped, therefore, that the

(ii)

recommendations contained in this report, and as they will be refined by a seminar to be organized soon, will form a truly useful basis for the management of the environment of Lamu District in the dynamic context of the development of the district.

I would like sincerely to thank all those persons who made contributions to the success of this exercise including the following:

The Government Ministries based in Nairobi for basic information and data; the Kenya Marine and Fisheries Research Institute (KM & FRI) (Mombasa) for their support and for covering the section on Marine Resources, the District Commissioner for Lamu for his keen interest and support during fieldwork; the Departmental Heads for information and data, the District Officers, their divisional staff and Chiefs for valuable information, data and organizing site visits; Mr. B. Machiri and Mr. G. Irangi for their immense assistance to the team during fieldwork; the people of Lamu who provided insights on the realities of life in the district; the Forest Department for the preparation of base maps; Miss E. Kariuki and Mrs. E. Wachira for typing the manuscript; and finally the multi-disciplinary NES and KM & FRI team whose contribution helped make this Report possible.

The report is based on the work and research of the following people:

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(iii)

It is my sincere hope that the work and team spirit shown by the above group will be sustained during the more important phase of the project-the implementation of the recommendations and findings contained in this report.

D.R. KAMAU  
DIRECTOR  
NATIONAL ENVIRONMENT SECRETARIAT

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## P A R T 1

### THE ENVIRONMENT

#### 1.0 LOCATION AND HISTORY OF SETTLEMENTS IN LAMU DISTRICT

##### 1.1 LOCATION

Lamu District occupies the northern-most part of the Kenya coast. It is bordered by Garissa District to the north, Tana River District to the west and south-west, the Indian Ocean to the south and east, and the Republic of Somalia to the north-east. This geographical location is depicted in Figure 1. The Lamu coastline runs north-eastwards for approximately 130 kilometres. The district is characterised by a number of islands among which Lamu, Pate and Manda are the largest. Other prominent physical features are the many inlets of which Milhoi, Dodori, Mto Wange and Mongoni Creeks are the main ones.

##### 1.2 HISTORY OF SETTLEMENTS

Coastal settlements may have started as seasonal anchorages which gradually grew larger and became market centres. Most of these settlements are now uninhabited but the relics of habitation in the form of ancient monuments are still seen. Some of the monuments are protected under the Antiquities and Monuments Act for historical purposes.

Lamu Town together with Siyu, Pate, and Faza are among the oldest towns along the Coast of Kenya, and have a history dating back for centuries. They traded mainly with the outside world in mangrove poles. Trade with their hinterlands was limited.

The importance of Lamu Town increased when it was selected to be an administrative centre because of easy accessibility relative to the other settlements.

#### 2.0 OVERVIEW OF NATURAL RESOURCES

##### 2.1 TOPOGRAPHY, GEOLOGY AND SOILS

###### 2.1.1 TOPOGRAPHY

The district is characterised by low, almost level plain with the exception of the coastal sand dunes and the Mundane Sand Hills. The sand dunes and the sand hills hardly exceed 50 m above sea-level. Few of their slopes exceed 5°. Due to the low level of the land, a large part of the district is susceptible to flooding. Although most of the land is a low plain, it can be divided into six terrain types as follows:

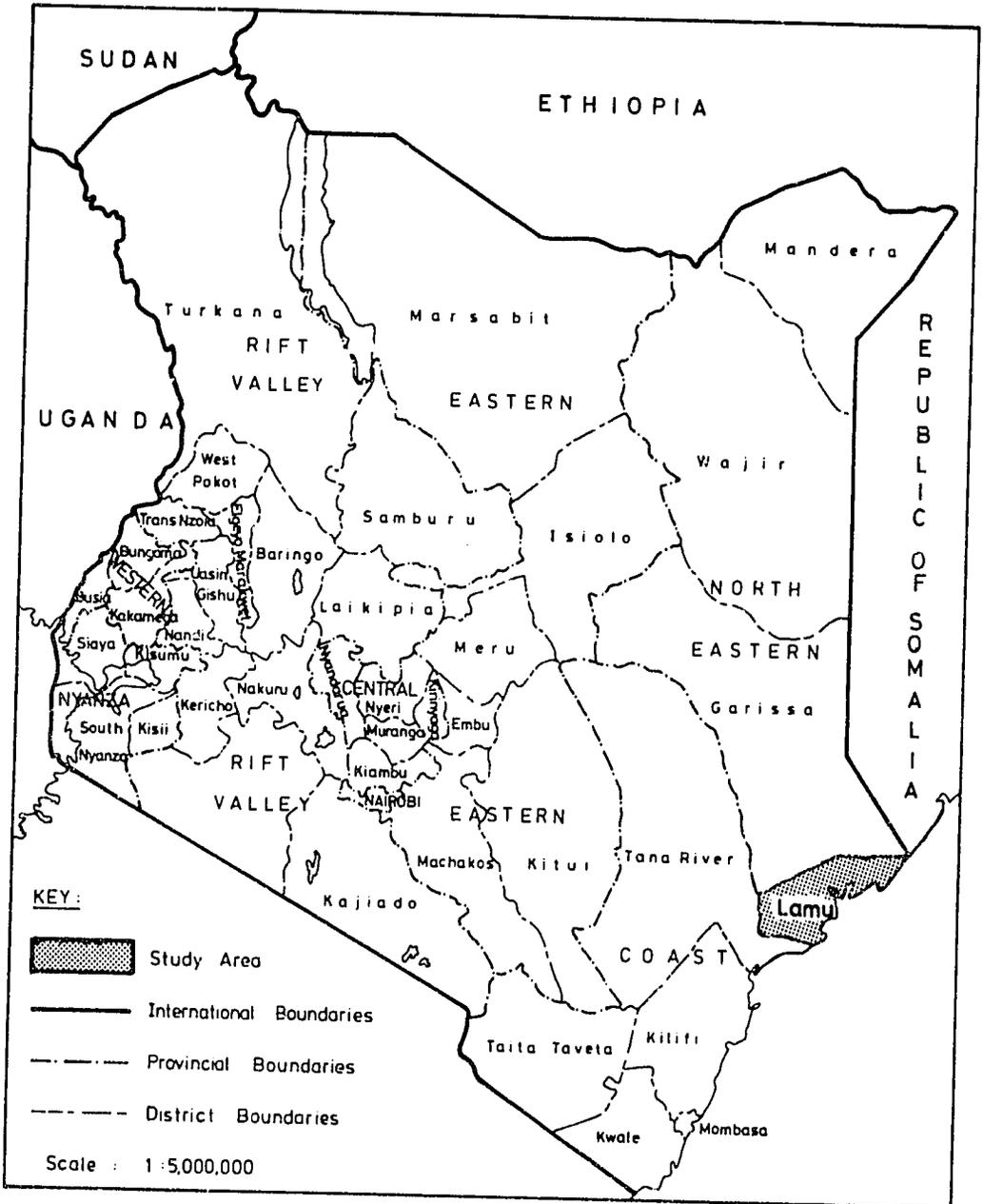


FIGURE 1 : LOCATION MAP

### The Tana Delta

The Tana Delta is found in the south-western part of the district and is characterised by the presence of several seasonal channels. Only one of these channels is permanent.

### The Coastal Plain

Contrary to its name, the coastal plain does not extend to the coastline proper. It is interrupted by coastal sand dunes and occupies most of the best agricultural land to the south and east of the inland plain.

### The Inland Plain

The inland plain occupies the northern and western-most part of the district.

### The Dodori River Plain

This is found mainly within the Dodori National Reserve.

### The Sand Dune System

The sand dune system is found mainly in the north-eastern part of the district and in the southern-most coastal areas. The Mundane Sand Hills-known as Samburu Hills-are the highest in the district, reaching a height of nearly 100 m above sea level. This system is very important because it is a source of fresh water.

### Offshore Islands and Waters

This includes all offshore islands and waters.

## 2.1.2 GEOLOGY

The whole of Lamu District is covered by quaternary deposits which range from estuarine deposits to sands, clays and coral limestone. Nine different types of these quaternary deposits have been identified. These are:

- (a) Sand Dunes
- (b) Undifferentiated Quaternary Sands
- (c) Near Surface Coral Limestone
- (d) Beach Deposits
- (e) Fluvial Deposits
- (f) Temporary Estuarine Deposits
- (g) Deltaic Deposits
- (h) Offshore Coral
- (i) Barrier Island Complex

Brief descriptions of each of these deposits are given below:

### (a) Sand Dunes

Two different age groups of sand dunes occur in the district. Firstly, there is the Mundane Range type composed of Pleistocene sands. These are often reddish in colour due to staining by ferrous oxides. Secondly, there is the coastal

Sand dunes which occur predominantly south of Lamu Island. These are composed mainly of yellow and off-white sands and are probably no older than Holocene.

(b) Undifferentiated Quarternary Sands

Quarternary sands cover a large portion of the district. These are mostly Pleistocene overlying Pliocene sands. The Pleistocene sands are grey or yellow in colour and have been referred to as the Kilindini Sands. They are variable in thickness and have inclusions of clay material and coral limestone in places. The Pliocene sands are much similar to the Pleistocene type except that the former have large areas of clay within them.

(c) Near Surface Coral Limestone

This occurs over a large portion of the district. Surface outcrops of this coral reef are uncommon, being overlain by quarternary sands, sand dunes or beach deposits throughout much of the area. They have a maximum thickness of about 100 metres, but are generally between 30 and 50 metres thick. The reef is not coral in the real sense, instead, it contains large proportions of coral breccia, calcite and quartz grains.

(d) Beach Deposits

These are essentially paleo-features overlying either quarternary sands or corals. They have variable composition ranging from clays and sands to coral breccia. Both consolidated and unconsolidated forms of these deposits occur. They vary in depth up to 10 metres, and areas where they occur are characterised by low ridges.

(e) Alluvial Deposits

These deposits consist of fine grained materials, generally clay. Sand deposits also occur. Alluvial deposits are found in the non-estuarine areas of the Duldul and Dodori Rivers.

(f) Contemporary Estuarine Deposits

These are sand deposits with clay lenses and are very similar in composition to the quarternary sands. Areas where these deposits occur are characterised by mangrove swamps.

(g) Deltaic Deposits

These are also contemporary deposits occurring along the Tana flood plain. They are predominantly clay in texture and occupy a very small section of the district.

(h) Offshore Coral

These are again contemporary coral reefs. Investigations show that these coral reefs are growing laterally without any vertical growth. This is due most probably to no changes in sea level.

(i) Barrier Island Complex

This has been formed as a result of deposition of erosional material from the coral reef. They consist mostly of modern time beach deposits.

2.1.3 SOILS

The parent material of the soils in the district originates from marine sediments. The distribution of the major soils is shown in Figure 2. These soils are shallow and generally poor for agricultural purposes. They are also prone to waterlogging.

Soils in the bottomlands and in the plains to the west of the district have high fertility while those in coastal plains have low to moderate fertility. The soils formed on former coastal beach ridges and on sand dunes also have low to very low fertility (see Figure 2b). Detailed descriptions of these soils are given in Appendix 1.

2.2 CLIMATE AND WATER RESOURCES

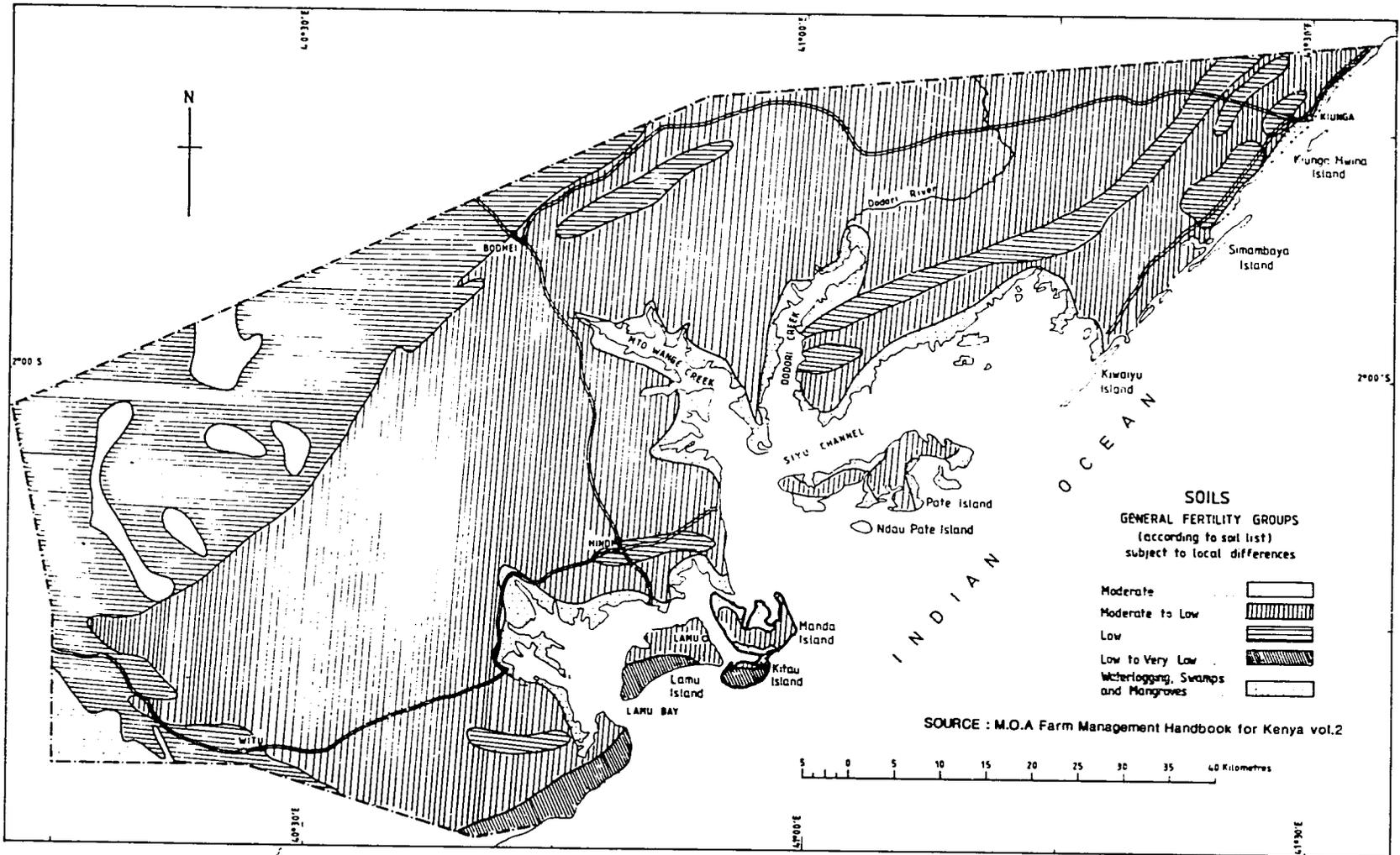
2.2.1 CLIMATE

The climate of Lamu district is difficult to describe accurately because there are very few recording stations. However, the climate is related to the regional climatic patterns, the bi-annual movement of the Inter-tropical Convergence Zone and the two Monsoons, namely the North-Eastern ('Kazkazi') and the South-Eastern ('Kuzi'). These are diagrammatically presented in Figure 3.

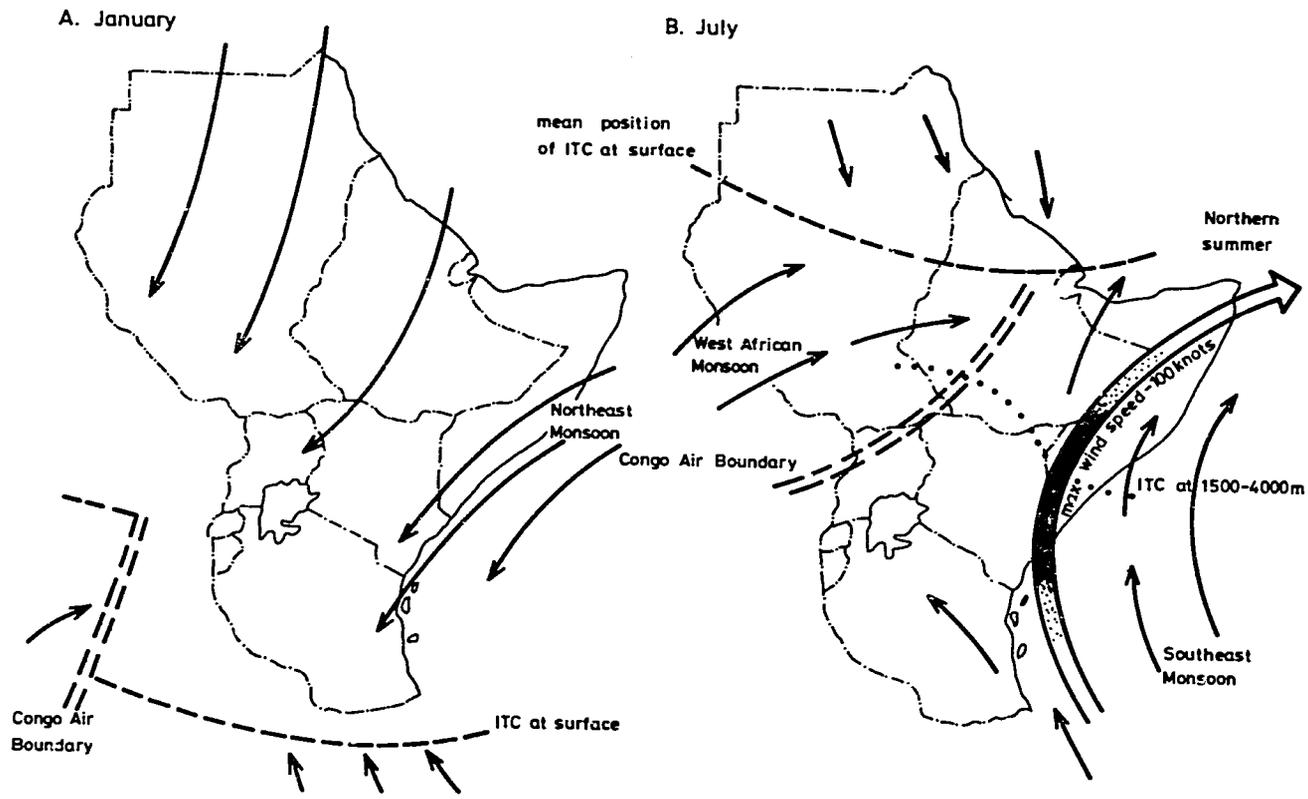
Rainfall

The rainfall pattern in Lamu is bimodal with the long rains falling throughout the district from mid-April to the end of June with light showers in July. May is the wettest month. The short rains fall in November and December. January to March are usually dry months. The degree of reliability of the short rains decreases from south to





FIGURE(2b) : SUITABILITY OF SOILS IN LAMU DISTRICT



SOURCE: Downing, 1982

FIGURE 3: REGIONAL AIR CIRCULATION PATTERNS IN JANUARY AND JULY

TABLE 2.1: MONTHLY AND ANNUAL RAINFALL (MM) FOR SELECTED STATIONS IN LAMU DISTRICT

STATION	LAMU			KIUNGA			MKUNUMBI			MPEKETONI		
Years of Record	1906-80			1937-80			1941-76			1972-80		
Month	Mean	Max.	Min	Mean	Max.	Min	Mean	Max.	Min	Mean	Max.	Min.
January	5	53	0	0	5	0	13	85	0	26	107	0
February	3	40	0	0	0	0	4	37	0	4	23	0
March	24	241	0	6	53	0	27	155	0	43	228	0
April	138	476	5	79	367	0	144	496	17	117	198	31
May	336	751	11	204	586	24	287	648	47	327	661	0
June	155	510	7	121	570	23	153	369	18	171	396	49
July	70	225	8	61	233	0	97	453	11	158	577	15
August	40	164	0	21	137	0	40	205	0	67	395	15
September	41	487	0	24	503	0	51	452	0	31	75	0
October	40	340	0	37	205	0	43	375	0	47	167	0
November	37	215	0	17	147	0	58	288	0	75	251	0
December	28	197	0	7	74	0	71	146	0	68	134	0
Annual	917	1,855	322	577	1,172	269	988	2,336	448	1,134	2,355	679

STATION	WITU			MOROWE WORKS CAMP			MANDA ISLAND CAMP		
Years of Record	1931-80			1955-60			1968-76		
Month	Mean	Max.	Min	Mean	Max.	Min.	Mean	Max	Min
January	29	193	0	7	34	0	0	0	0
February	10	66	0	8	29	0	2	13	0
March	37	117	0	17	67	1	43	260	0
April	131	510	12	118	225	89	140	380	41
May	290	563	61	245	382	142	256	406	120
June	146	310	1	125	174	82	226	635	0
July	86	277	14	61	126	23	97	315	0
August	54	223	0	22	40	1	17	52	0
September	60	764	0	20	79	1	22	57	0
October	63	300	0	11	33	1	11	44	0
November	97	487	12	50	119	0	31	156	0
December	98	283	0	28	90	7	13	55	0
Annual	1,101	2,137	472	712	923	425	858	1,177	221

SOURCE: Ministry of Economic Planning and Development  
Lamu District Planning Study Vol.2

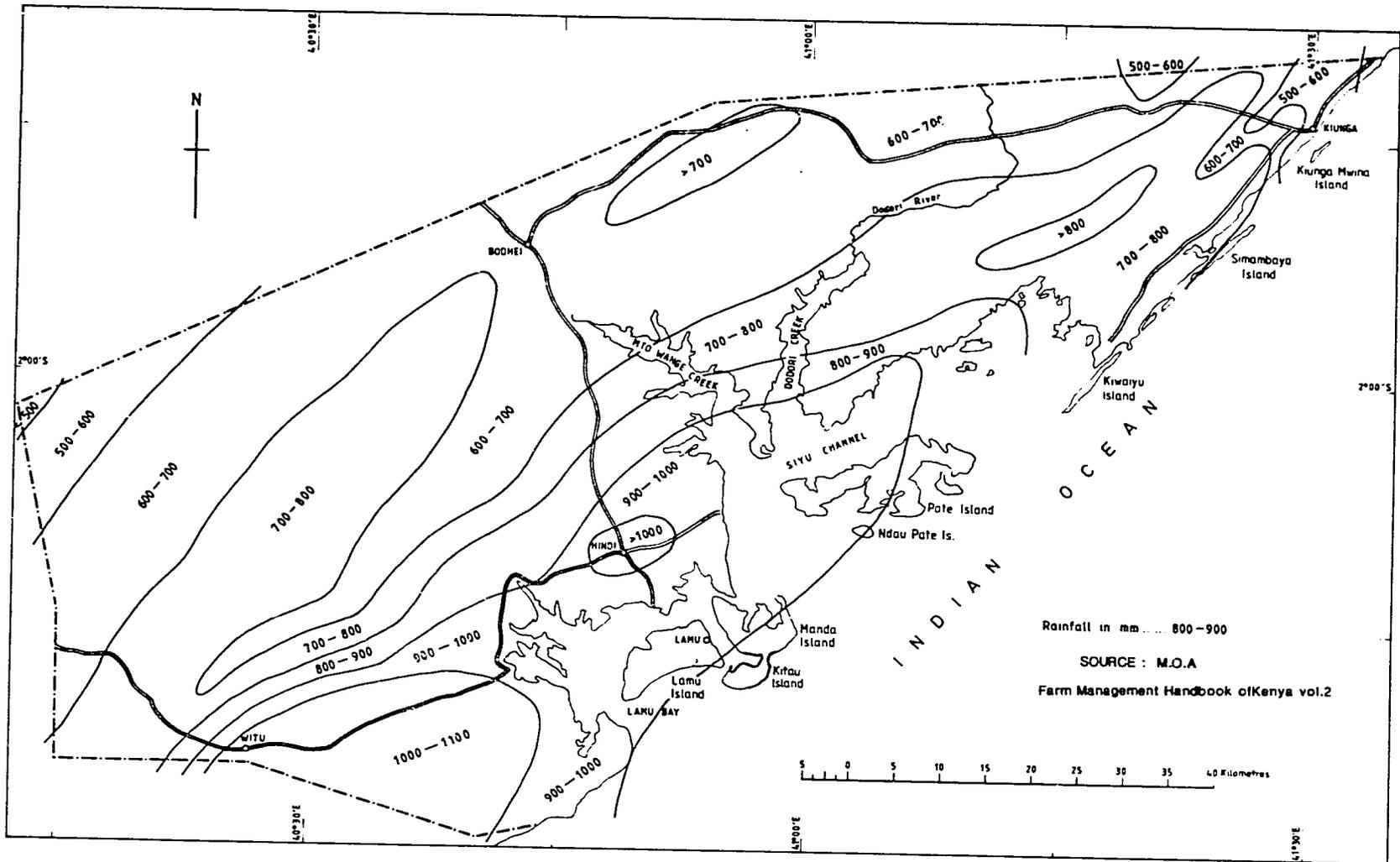


FIGURE 4 : AVERAGE ANNUAL RAINFALL - LAMU DISTRICT

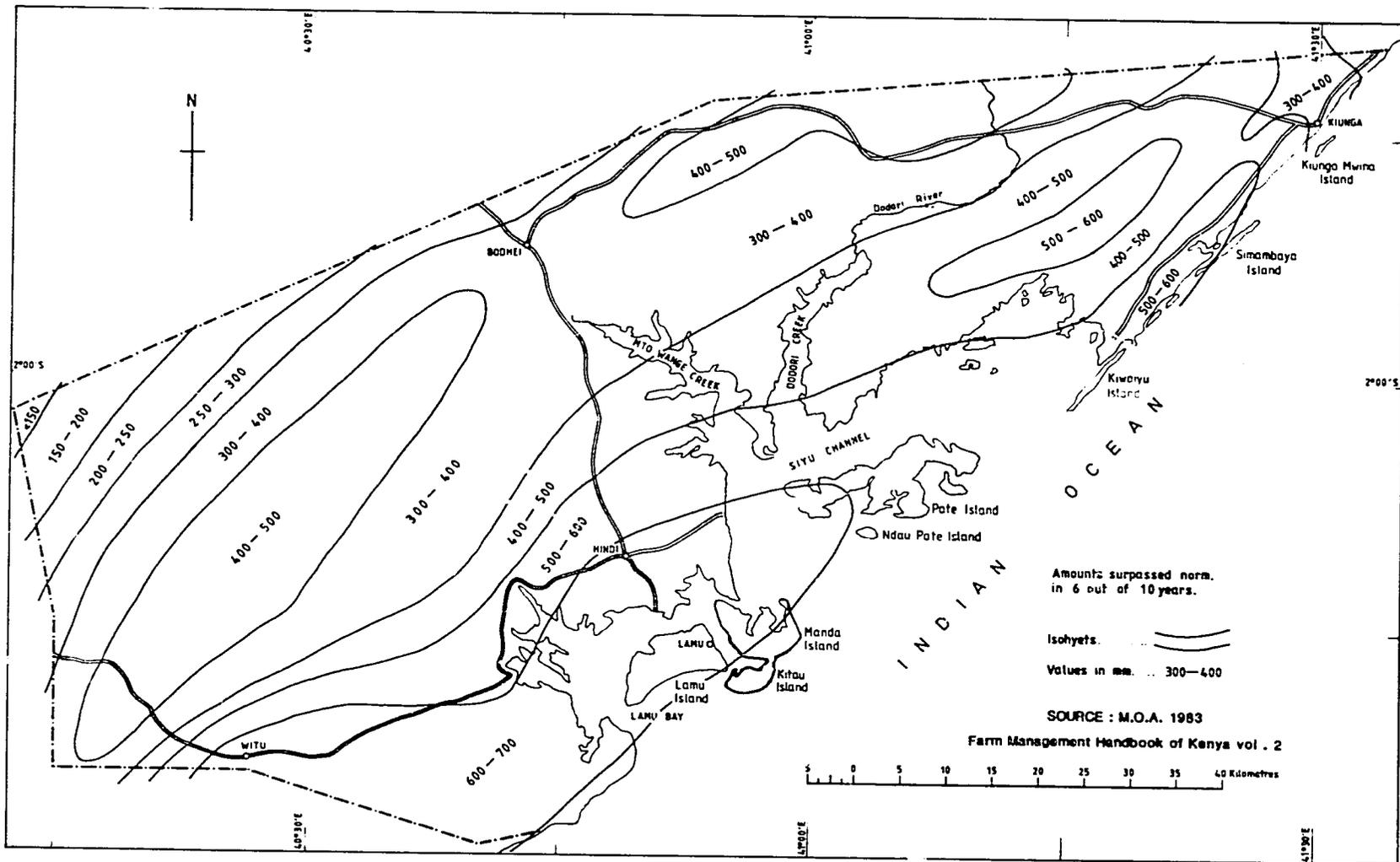


FIGURE 5: 60% RELIABILITY OF RAINFALL IN AGROHUNID PERIOD OF FIRST RAINS - LAMU DISTRICT  
(March - September or less)

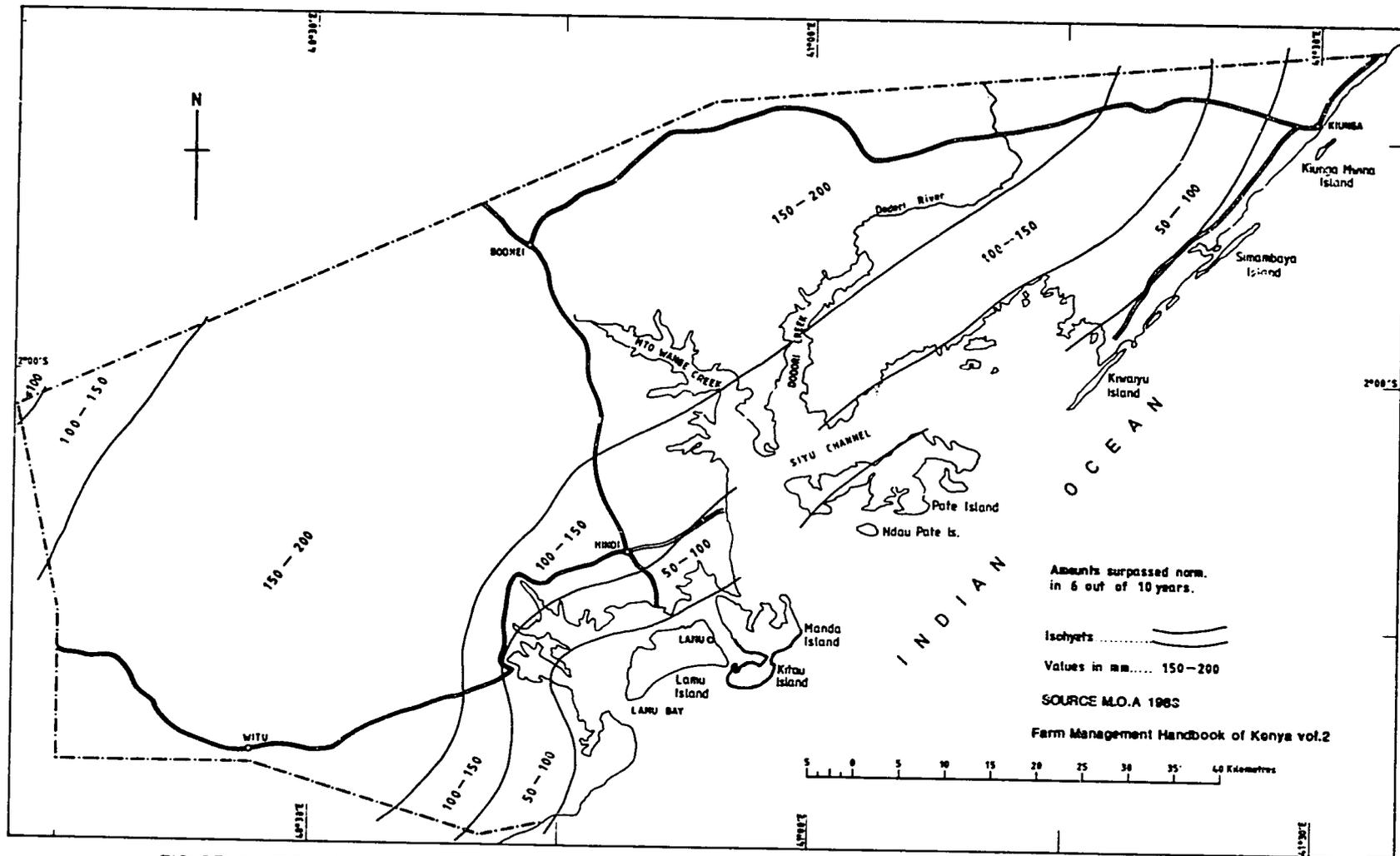


FIGURE 6: 60% RELIABILITY OF RAINFALL IN AGROHUMID PERIOD OF SECOND RAINS —LAMU DISTRICT  
(end of October — end of January or less)

north. Table 2.1 gives the monthly and annual rainfall for selected stations in the district while the annual isohyet map is presented in Figure 4.

The amount of rainfall in the long rains decreases from a strip of about 10 km wide from the coastline into the hinterland at a rate of about 100 mm per 5 km. The short rains increase from the coastline for the first 10 km and then decrease again (Figures 5 & 6). The highest average annual rainfall above 1000 mm occurs about 5-20 km inland. It is however, interrupted by Mkumumbi Bay. Generally, rains in the district are likely to be heavy every 3 or 4 years and relatively light in the intervening periods.

The district lies within the 600 to 1,000 mm isohyets and has three rainfall zones. The northern part of the district is semi-arid with an average annual rainfall of just over 500 mm. In the middle section, an annual rainfall of 750 mm is common. In the Southern coastal parts, rainfall in excess of 1,000 mm per year is common. The average annual rainfall thus decreases from south to north. Throughout most of the district, there is more than 30% chance of receiving less than 500 mm of rain in any one year, and in the more semi-arid north, there is more than 30% chance of receiving less than 380 mm in a year.

#### Temperature

Temperatures throughout the district are usually high ranging from 23°C to 30°C. The hottest months are December and April while the coolest months are May and July. Mean relative humidity in the district is 75%. The total amount of evapotranspiration is 2,230 mm per annum (Table 2.2) with the highest values occurring in March and September and the lowest in May. Comparison of evaporation and rainfall show that rainfall deficits occur in all months except for May. The largest deficit occurs from January to March.

#### 2.2.2 WATER RESOURCES

Surface water resources are very scarce in Lamu District. There are no permanent rivers; instead there are a number of drainage ways forming seasonal rivers. The most important of these are: Dodori, Arosen, Duldul, Mkondo wa Bargoni, Mkondo wa Kareni, Kitoko and Mkondo wa Mkuyuni near Witu. Every year, large quantities of water from outside the district come down these drainage ways to the sea.

Between the mainland and the islands' archipelago, and between the islands themselves, are stretches of inland waters. Other important inland waters are Dodori Creek, Mto Wange Creek, Ndaui Bay, Mto wa Hidio, Mto wa Kipungani and Mto wa Mkunumbi. Much of the water for human and livestock consumption is obtained from sub-surface sources, especially on the islands. Lamu islands, which has the most modern water supply in the district, extracts its water from sand dunes running approximately 15 km along the southern shore of the island. This source is recharged by rain water and its reliability depends on the reliability of rainfall. Due

to the low altitude of the district, the water table is very near the surface. Much of the water for household needs is from shallow wells. Djabias (underground water tanks) are also a major source of water for livestock. Most of the ground water sources are saline and some probably are polluted with organic materials.

TABLE 2.2 LAMU METEOROLOGICAL STATION MONTHLY CLIMATOLOGICAL DATA (1962-81)

Month	MONTHLY EVAPORATION			TEMPERATURE		RELATIVE HUMIDITY (%)		
	Mean (mm)	Highest (mm)	Lowest (mm)	Max (°C)	Min °C	0300 GMT	0600 GMT	1200 GMT
Jan.	195.1	220.0	130.0	30.6	24.3	89.0	79.0	67.0
Feb.	190.1	211.3	156.5	31.2	24.7	89.0	79.0	66.9
March	214.1	333.0	163.9	32.1	25.6	87.0	77.0	66.0
April	187.1	216.7	140.2	30.7	25.2	87.0	81.0	73.0
May	171.0	223.6	114.2	28.8	24.3	85.0	82.0	79.0
June	165.2	184.2	128.5	28.0	23.4	82.0	79.0	76.0
July	177.3	198.5	152.9	27.3	22.9	81.0	79.0	74.0
Aug.	188.0	216.2	158.4	27.5	23.0	81.0	77.0	73.0
Sept.	185.5	237.0	118.8	28.0	23.0	82.0	77.0	72.0
Oct.	188.0	223.8	148.1	29.1	24.1	85.0	78.0	72.0
Nov.	182.6	206.8	124.3	30.4	24.4	88.0	78.0	71.0
Dec.	183.0	213.6	123.0	30.8	24.5	89.0	78.0	69.0
Annual	185.6	223.7	138.2	29.5	24.1	85.0	79.0	71.0

SOURCE: Ministry of Economic Planning and Development.  
Lamu District Planning Study Vol. 2.

### 2.2.3 IMPLICATIONS FOR ENVIRONMENT AND DEVELOPMENT

The heavy rains which cause prolonged wetness in the district render loose surface access roads impassable. This state affects transportation of people and goods.

Rainfall amounts are quite high and rain water could be harnessed from roof catchments using appropriate technology for roofing and storage.

### 2.3 VEGETATION

The natural vegetation in Lamu District can be divided into six broad groups (Figure 7). These groups characterised by the dominant physiognomic vegetation types are described below.

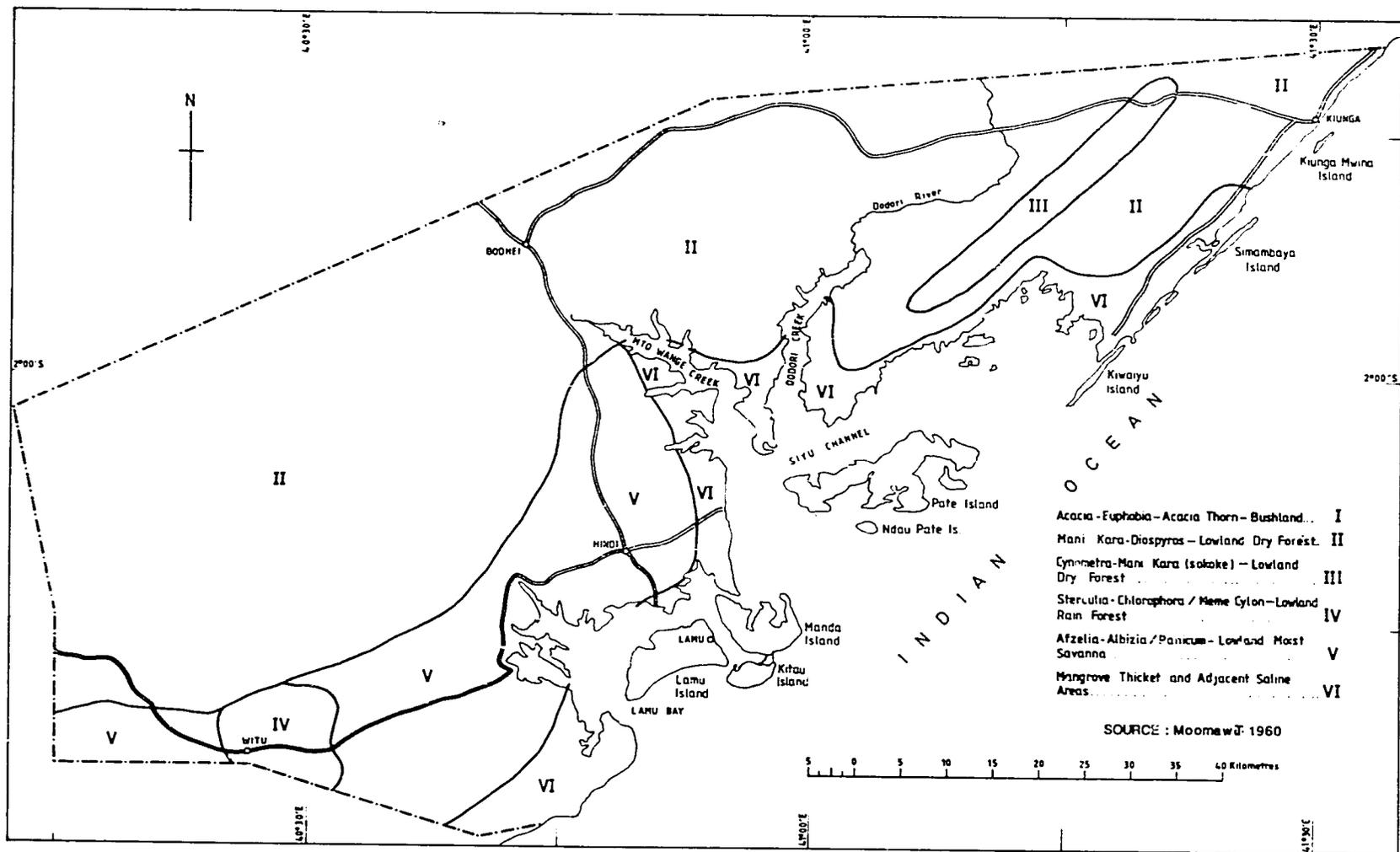


FIGURE 7 : VEGETATION IN LAMU DISTRICT

- I Acacia-Euphorbia Type (Acacia Thorn-Bushland)  
This is found north of the Mundane Range on the Somalia border. The different Acacias occurring in this group include Acacia senegal, Acacia seyal and Acacia lahai, while the Euphorbias include Euphorbia nyikae and Euphorbia tirucalli. Among the common grasses are Chloris myriostachya, Chloris gayana and Cenchrus ciliaris.
- II Lowland Dry Forest (Manilkara-Diospyros Type)  
The lowland dry forest of the Manilkara-Diospyros type in Lamu District occurs in Boni Forest. The tree species here are medium to small in size. Manilkara densiflora, Manilkara eichii, and Diospyros valdchani do well in this region. The dominant grasses are Digitaria mombasana and Chloris spp.
- III Lowland Dry Forest (Cynometra-Manilkara Type)  
Another type of lowland dry forest in the district is the Cynometra-Manilkara type. This occurs mainly at Lungi on the Mundane Range. This type of vegetation is similar to the type found in Arabuko Sokoke in Kilifi District. The main tree species are Cynometra webberi and Manilkara hutchinsii. Grasses that occur are sparse and include Panicum maximum, brevifolium and Brachiaria spp.
- IV Lowland Rain Forest  
The lowland rain forest of the Sterculia-Chlorophora/Mecycalon type requires a minimum of 1000 mm of rainfall annually or a high ground water table such as exists at Witu where this type of forest is found. The dominant tree species are Chlorophora excelsa, Terminalia kilimanscharica, Tecleopasis glandulosa, Brachylaena hutchinsii and Manilkara sansibarensis.
- V Lowland Moist Savana  
This was part of the lowland rain forest which has now been destroyed by human activities. Many of the tree species in this region are those found in the Rain Forest region. Others include Azelia Quanzensis and Albizia spp. However, tall trees are rare except for Doum Palms. This palm is more resistant to fire than most other trees in the area. This vegetation type covers a large area between Witu and Lamu. The common grasses are Panicum spp.
- VI Mangrove Forest  
Perhaps the most important type of natural vegetation in Lamu District is the mangrove forests and thickets. This type of vegetation is found in swamps and their adjacent saline areas. The mangrove forests extend from Hongwe in the south to a few kilometres south of Kiunga Divisional headquarters.

### 2.3.1 IMPLICATIONS FOR ENVIRONMENT AND DEVELOPMENT

The greatest threat to the natural vegetation in the district is from man made fires and other human activities. Cutting down of trees for fuel and other socio-cultural activities has been causing a great deal of deforestation in the district. The type of vegetation that is likely to do well when the natural one has been cleared is described in Section 3.3.

## 2.4 WILDLIFE AND FRESH WATER FISHERIES

### 2.4.1 VALUE OF WILDLIFE

Wildlife is an important resource in the district for both its aesthetic appeal and as a potential source of food, hides and trophies. There are many different species of wildlife on the Lamu mainland. The Dodori National Reserve, covering a total area of 87,700 ha, was gazetted in 1976 on account of these varied species found in the district. Most other areas outside the reserve also contain a rich collection of wildlife.

### 2.4.2 CONSERVATION OF WILDLIFE

Although hunting has been banned, it is still probably the chief cause of decline in numbers of some large herbivores. The elephants, lions, leopards and rhinos have been poached for trophy and skin. Thus one of the major threats these animals face is from poachers particularly those using modern firearms. In 1972, the elephant population in the district was estimated at over 21,000 (the second highest in the country). By 1977 this number had decreased to slightly over 4,000, a reduction of over 80% in eight years. This kind of estimate in reduction of wildlife numbers due to poaching can be given for a number of large wildlife species in the area. The reliability of these estimates however, need to be checked through regular monitoring.

The Boni people are hunters by tradition and hunting has an important place in their socio-cultural set-up. These people are however, changing gradually to crop production. As a result of their relative inefficiency in farming, a vocation they have recently adopted, some researchers believe their activities are having serious adverse effects on the wildlife population in the district. It is argued that adoption of agriculture has the consequence of cutting down the forests that provide refuge for thousands of wild animals. It is estimated that about 80 hectares of forest are burnt down each year for farming. After harvest, the cleared area is colonised mainly by the sodom apple plant, which does not provide enough shelter for most of the wildlife species.

### 2.4.3 WILDLIFE MANAGMENT

Long distance wildlife movement have been noted among elephants, buffaloes, zebra, wildebeest and birds. The main causes for the movements are floods and seasonality in the distribution of food, water and cover. Animals move from the drier parts of Garissa and Tana River to riverine forests in the wetter south and towards Witu. The movement carries with it the ills of crop destruction, vegetation damage, wildlife diseases and in some cases loss of human life.

In several parts of Lamu District, land use conflicts between wildlife and agriculture have reached significant levels. Farmers in Lake Kenyatta Settlement Scheme are the worst affected. As mentioned earlier the district is endowed with many and varied species of wildlife. A large number of these, especially baboons and bush pigs, feed on cultivated crops. As such one of the major problems of farmers in the district is how to protect their crops from damage by wildlife. The people of Mpeketoni, for example, have been forced to organise themselves into anti-wildlife units with the assistance of wildlife guards. Damage of crops by wildlife is more acute in the vicinities of the national reserve and forest areas.

Compensation for crop damage by wildlife is available but requests always outnumber available funds. Petitions also take too long to process and farmers have actually lost faith in it. In some areas farmers are even not able to report damage due to a variety of reasons, such as illiteracy or living too far from wardens, which make reporting very difficult. Game cropping should also be undertaken but the major problems that will arise will include differentiating activities of licensed hunters from those of poachers and determining an optimum take off.

### 2.4.4 RECOMMENDATIONS

1. A limited experiment in game cropping should be initiated on several large ranches. Livestock and wildlife can coexist, but there must be some rewards to ranchers.
2. A mobile abattoir and sale of meat to the local population, especially to the Boni, should be established.
3. Education programmes, through the wildlife clubs etc. should be strengthened. The people must be encouraged to dip their cattle to combat wildlife-borne diseases. Practical benefits from wildlife should also be emphasised.
4. Anti-poaching activities must be increased and legal sanctions stiffened.

#### 2.4.5 FRESHWATER FISHERIES

Tilapia, Clarias and Protopterus are common in the district. Lake Adhi, River Mangai, and the Tana River are the most important fishing areas. Total catch from these sources has decreased drastically over the last two or three years (Table 2.3). The reduction in fish catch is mostly due to the use of nets with small mesh sizes by fishermen in the district. A small mesh size implies that small fishes are caught and this does not allow young fishes to grow into suitable sizes before they are caught. This has led to a reduction in both weight and stock landed. River Tana, being the main source of fish to the small lakes in the district, should be strictly regulated with respect to the size of mesh the fishermen use in order to avoid depletion of fish stocks.

On those lakes in the district where fishing is permitted, there is a general lack of landing and smoking facilities. The fishermen dry the fish before they sell in the bigger towns like Malindi and Mombasa. Increasing transportation cost is making it less attractive for dealers to arrange to sell their fish in Mombasa and Nairobi.

Very little of the freshwater fish caught is consumed locally. This is because apart from the Pokomos, the other tribes in the district prefer marine fish to freshwater fish. Most of the catch is sold outside the district by middlemen. As a result fishermen receive very low prices for their catch.

### 3.0 OVERVIEW OF THE HUMAN ENVIRONMENT

#### 3.1 ADMINISTRATION AND LAND TENURE

##### 3.1.1 ADMINISTRATION

Lamu District covers 6,814 sq. km and it is divided into five administrative divisions as shown in Figure 8. Apart from Faza Division which has two locations viz., Faza and Siyu, locational boundaries in the other four divisions coincide with divisional boundaries.

##### 3.1.2 LAND TENURE

All land in the district is Government land except for a relatively small area of about 233 sq. km which is either privately owned or trust land (Table 3.1). Land owners in the district have title deeds issued by the Sultan of Zanzibar who ruled this area. Some people in the settlement schemes and some of the ranches have also been issued with letters of allotment. Many others have neither title deeds nor letters of allotment.

It has been suggested that when the title deeds of land both for agriculture and ranching are to be issued they

TABLE 2.3.

FRESHWATER FISH CATCH FROM LAMU DISTRICT

Month	1983		1982		1981		1980		1979	
	KG.	KSH.	KG.	KSH.	KG.	KSH.	KG.	KSH.	KG.	KSH.
Jan.	3,678	9,929	3,250	9,750	43,396	122,239	2,080	5,230	590	1,190
Feb.	2,100	3,666	-	-	40,728	117,111	29,933	99,403	710	1,610
March	2,920	4,660	-	-	27,330	69,856	171,621	566,686	900	1,775
April	2,523	3,863	1,487	2,326	5,311	11,385	188,050	377,275	930	1,880
May	-	-	3,932	6,346	5,554	9,679	269,025	544,513	2,600	3,550
June	-	-	2,723	5,248	4,459	7,910	145,402	245,375	1,350	3,850
July	2,100	3,667	2,579	5,104	5,639	12,242	102,760	345,250	10,210	21,045
August	59,700	158,173	5,785	11,554	8,123	17,830	105,515	222,085	1,450	4,075
Sept.	1,400	3,300	8,904	19,037	10,356	19,621	50,706	108,559	1,990	4,475
Oct.	8,396	15,524	18,244	43,105	12,621	31,153	52,610	119,298	2,777	6,203
Nov.	-	-	6,418	13,810	33,802	94,792	38,116	96,051	3,700	10,200
Dec.	3,035	6,468	1,780	2,679	29,150	74,725	53,463	278,754	3,622	9,244
<b>TOTALS</b>	<b>65,852</b>	<b>209,250</b>	<b>54,302</b>	<b>119,019</b>	<b>226,369</b>	<b>590,377</b>	<b>1,210,291</b>	<b>3,016,957</b>	<b>30,229</b>	<b>71,667</b>

SOURCE: Fisheries Department, Nairobi, 1984.

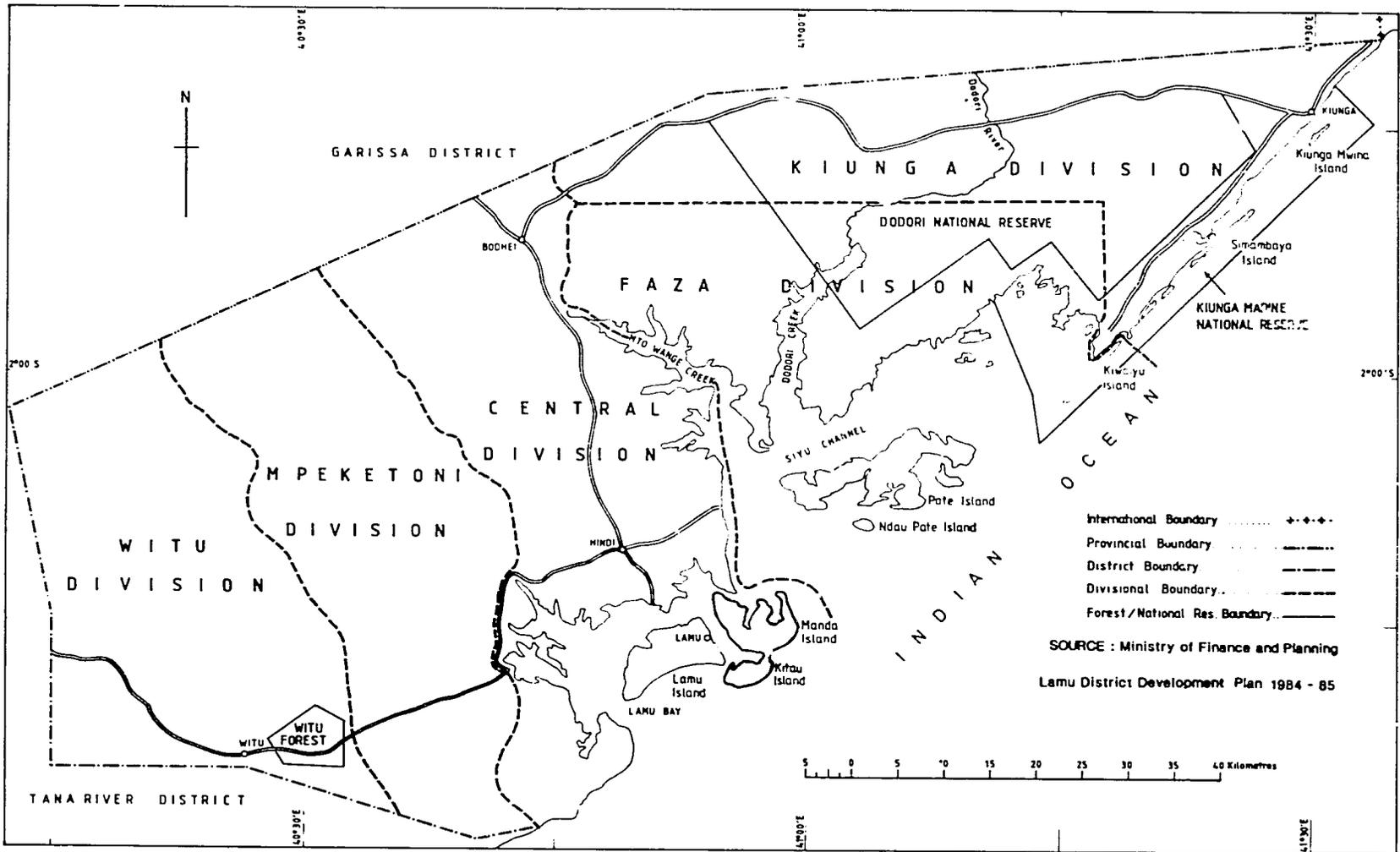


FIGURE 8: ADMINISTRATIVE BOUNDARIES-LAMU DISTRICT

should be leasehold and not freehold. This is because freehold land tenure would restrict the introduction of new settlement schemes.

TABLE 3.1. LAND TENURE IN LAMU DISTRICT 1980

<u>CATEGORY OF LAND</u>	<u>AREA (KM<sup>2</sup>)</u>
Government Land	6,273
Freehold Land	49
Trust Land	184
<u>Area of Water</u>	<u>308</u>
<u>Total</u>	<u>6,814</u>

SOURCE: Statistical Abstracts. 1983.

### 3.1.3 IMPLICATIONS FOR ENVIRONMENT AND DEVELOPMENT

Lack of title deeds or letters of allotment may impede loan requests by farmers who need such loans to develop their holdings. This is because the financial institutions require ownership deeds as collateral for loans.

## 3.2 POPULATION

### 3.2.1 ETHNIC COMPOSITION

The ethnic composition of the population in Lamu District has largely been influenced by the exposure of the district to maritime trade since the 14th Century, as well as the recent establishment of the Lake Kenyatta Settlement Scheme. This has resulted in an ethnic diversity comprising of the Bajuni, Kikuyu, Mijikenda, Arabs, Boni/Sanye, Pokomo/Riverine, Orma, Tharaka, Somali, Luo, Luhya, Swahili/Shirazi, Taita and many others (Table 3.2).

The main ethnic group is the Bajuni. They make up about 46% of the total population. The Bajuni live in villages in the archipelago, e.g. Faza, Pate and Kizingitini and along the coastal mainland. The Boni (5% of total population) on the other hand occupy the northern mainland while the Orma (2% of total population) are found in the southern part of the mainland. The Swahili/Shirazi and the Arabs who constitute 1% and 6% of total population respectively, are mainly in the trading centres. The Kikuyu, Luo and Luhya together comprise about 24% of total population and the majority of them are in the Lake Kenyatta Settlement Scheme.

TABLE 3.2 POPULATION BY TRIBE IN LAMU DISTRICT,  
(1969 AND 1979)

<u>NAME OF TRIBE</u>	<u>1969</u>	<u>POPULATION</u> <u>1979</u>	<u>% CHANGE</u>
Bajuni	14,709	19,374	31.7
Arab	1,284	2,495	54.3
Boni/Sanye	1,276	2,212	73.3
Pokomo/Riverine	890	2,542	210.8
Swahili/Shirazi	633	979	54.7
Orma	537	322	40.0
Somali	279	670	140.1
Kikuyu	146	9,059	6,204.8
Luhya	92	426	363.0
Luo	90	475	472.8
Taita	66	244	269.7
Tharaka	20	652	3,160.0
Others	2,389	2,886	20.8
<b>Total</b>	<b>22,401</b>	<b>42,299</b>	<b>88.8</b>

SOURCE: Compiled from the 1969 and 1979 population census.

### 3.2.2. POPULATION DENSITY

Lamu District as a whole is very sparsely populated. According to the 1979 population census the District had a total of 42,299 people living in an area of about 6,506 sq.km, thus giving a population density of about 6.5 persons per square kilometre. This is one of the lowest population densities in the country. In 1962 the population density was estimated at 3.4 persons per square kilometre.

There are large variations in population densities amongst the various divisions. Faza Division has the highest population density of about 20 persons per square kilometre, followed by Central (Amu) Division with 11 persons per square kilometre and Kiunga Division with the lowest density of 1 person per square kilometre (see Figure 9 and Table 3.3.).

### 3.2.3. AGE-SEX DISTRIBUTION

The age-sex distribution (Figure 10 and Table 3.4) indicates a high proportion of children (44.1%) and a high dependency ratio (47.8%) in the district.

According to the 1969 census, there were slightly more females (50.6%) than males in Lamu District. However, in the 1979 census (Table 3.5) females constituted 48.9% of the total population, slightly less than the 1969 figure.

This decline in female population was particularly noticeable in Witu, Mpeketoni, Central and Kiunga Division. The reasons for the decrease in female population is discussed under the section on migration.

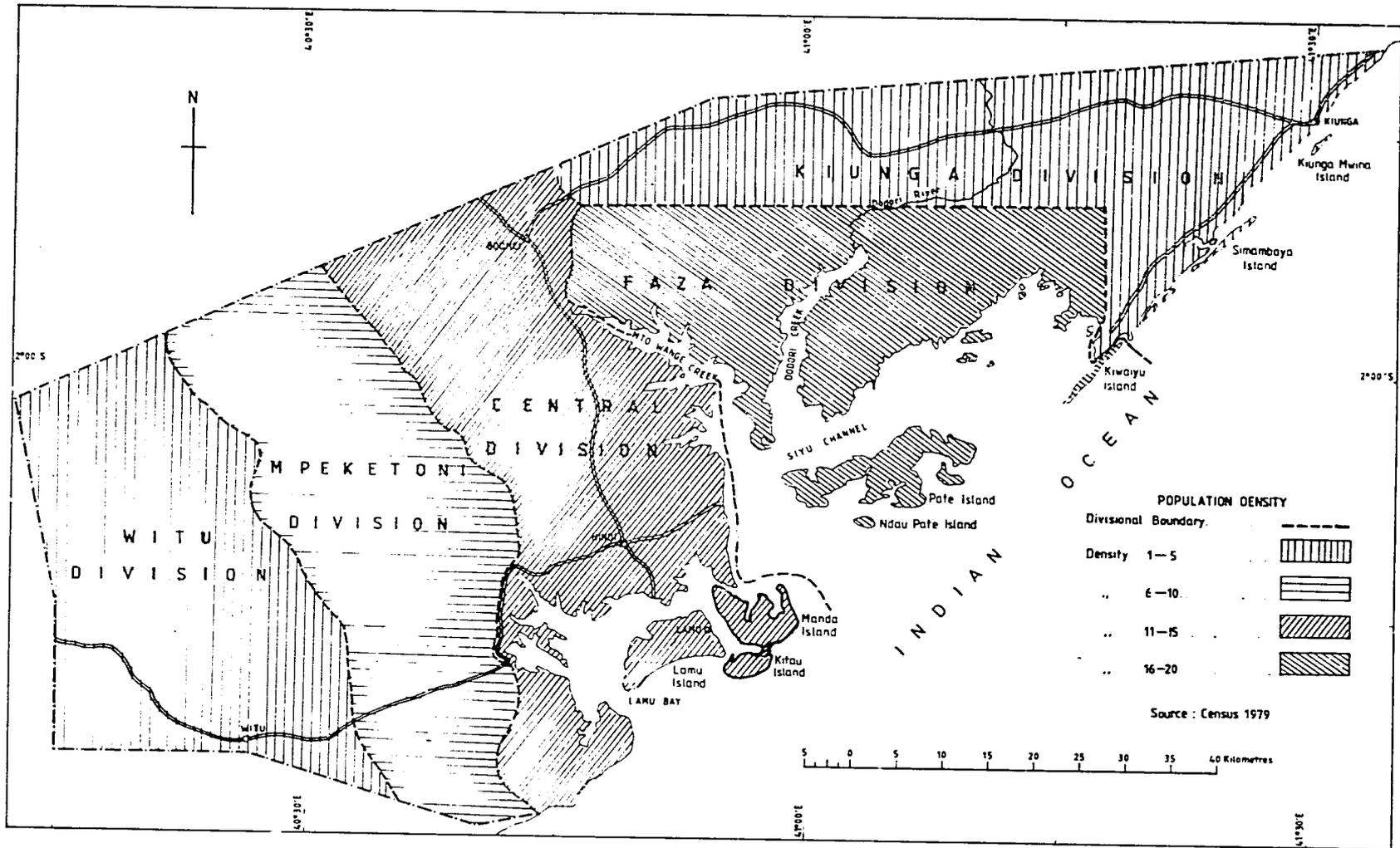


FIGURE 9 : POPULATION DENSITY - LAMU DISTRICT

**TABLE 3.3** POPULATION DISTRIBUTION AND DENSITY  
LAMU DISTRICT 1979

DIVISION	MALE	FEMALE	TOTAL	AREA KM <sup>2</sup>	DENSITY
Witu	1,751	1,598	3,349	1,232	2
Mpeketoni	6,223	5,547	11,770	1,429	8
Central	7,172	6,678	13,850	1,256	11
Kiunga	866	768	1,634	2,018	1
Faza	5,621	6,075	11,696	571	20
<b>LAMU DISTRICT</b>	<b>21,633</b>	<b>20,666</b>	<b>42,299</b>	<b>6,506</b>	<b>6</b>

SOURCE: Central Bureau of Statistics. 1979

**TABLE 3.5** SEX RATIOS BY DIVISIONS, 1979

DIVISION	MALE	FEMALE	TOTAL	SEX RATIO
Witu	1751	1598	3349	109.5
Mpeketoni	6223	5547	11770	112.1
Central	7172	6678	13850	107.3
Kiunga	866	768	1634	112.7
Faza	5621	6075	11696	92.5
<b>Total</b>	<b>21633</b>	<b>20666</b>	<b>42299</b>	<b>104.6</b>

SOURCE: Central Bureau of Statistics. 1979.

#### 3.2.4. MIGRATION

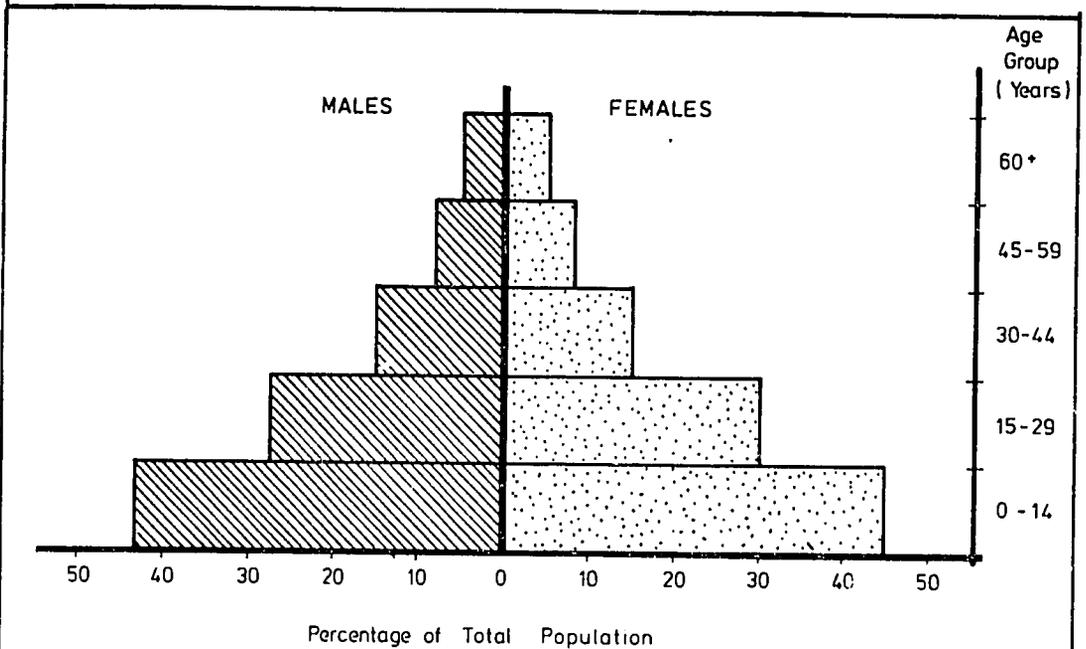
Population movement in Lamu District is mainly caused by the frequent occurrence of drought in neighbouring areas (especially in the North-Eastern Province), the opening of settlement schemes and also the search for gainful employment in trading centres.

Insecurity was, until a few years ago, a major population push factor. In 1969, of the 38,597 people born in Lamu, about 42% had emigrated. Large scale emigration is very much seen in Kiunga Division, where before 1965 there were about 5,000 people but where according to the 1978 population estimates there were just about 2,071 people. Many of the emigrants settled on the southern banks of the

**TABLE 3.4 DATA FOR AGE-SEX DISTRIBUTION:  
LAMU DISTRICT 1979**

(PERCENTAGES)

AGE GROUP	MALES	FEMALES	TOTAL
0 - 14	43.4	44.9	4.1
15 - 29	26.3	26.8	26.5
30 - 44	15.7	14.5	15.1
45 - 59	8.6	7.5	8.1
60+	6.0	6.3	6.1



**FIGURE 10 : AGE-SEX DISTRIBUTION IN LAMU DISTRICT**

SOURCE: Central Bureau of Statistics, 1979

Tana River or further south in Kilifi. It has been noted however, that some of these emigrants have started going back to their original home areas.

The recent opening up of settlement schemes in the district is also acting as a major population pull factor. The Lake Kenyatta Settlement Scheme, which started in 1971 as a cotton project but was later changed into a settlement scheme in 1973, has boosted the district's population considerably. This scheme has attracted people from all over the country (Table 3.6). The flow of people into the district will be enhanced further by the opening of other proposed schemes, such as the Hindi/Magogoni Scheme.

TABLE 3.6 MIGRATION IN LAMU DISTRICT BY PROVINCE AND SEX (1979)

<u>IMMIGRATION</u>	<u>MALES</u>	<u>FEMALES</u>	<u>TOTAL</u>
Nairobi	205	187	393
Central	3,066	2,585	5,651
Coast	1,731	1,226	2,957
Eastern	553	345	898
North-Eastern	225	143	368
Nyanza	292	153	445
Rift Valley	661	571	1,232
Western	269	123	392
<b>Total</b>	<b>7,002</b>	<b>5,333</b>	<b>12,335</b>

EMIGRATION

Nairobi	189	134	323
Central	136	114	250
Coast	3,876	3,596	7,472
Eastern	72	56	128
North-Eastern	102	105	207
Nyanza	30	23	53
Rift Valley	97	58	155
Western	28	19	47

<b>TOTAL</b>	<b>4,530</b>	<b>4,105</b>	<b>8,635</b>
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<b>NET MIGRATION</b>	<b>+ 2,472</b>	<b>+ 1,228</b>	<b>+ 3,700</b>
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Immigration as percentage of Total Population : 29.16%

Emigration as percentage of Total Population : 20.41%

Sex Ratio of Immigrants M:F : 1.31

Sex Ratio of Emigrants M:F : 1.10

SOURCE: Central Bureau of Statistics. 1979

The frequent occurrence of such natural hazards as drought and floods constitute another population push factor bringing about seasonal migration. During the dry season, pastoralists from as far as the North-Eastern Province bring their livestock down to the district in search of better pastures. The effect of this movement is seen particularly in Kiunga Division where usually only a few local families keep a small number of cattle, sheep and goats but where over 56,000 herd of cattle from North Eastern Province move to during every dry season. The local traditional cattle keepers, such as the Orma, also sometimes move during drought, but this has over the years been limited in degree.

Occupational migration also takes place within the district. Shifting cultivation is practised in Kiunga Division by farmers who reside in Pate. Most men migrate in search of employment outside the district leaving the females behind. A case in mind is Faza where there are more women than men as indicated in Table 3.5.

### 3.2.5 BIRTH AND DEATH RATES

Reliable figures on the fertility of the population are unavailable but the average fertility rate is estimated to be 5. This compares with the Coast Province in general which exhibits a below-average fertility (average fertility for Kenya in 1977 was estimated at 8.1). It is noteworthy here that Lamu has the lowest population among the coastal districts. However, the situation is bound to change with time since the district has a large young population.

Accurate figures on mortality are also unavailable but a general assessment indicates that death rates are high, especially infant mortality. The people are generally not very keen on reporting deaths. Factors contributing to the high mortality rate include bilharzia and the widespread incidence of malaria. Mortality is however, gradually being lowered through efforts in the provision of health services and facilities by both Government and non-governmental institutions.

### 3.2.6 POPULATION GROWTH

An analysis of trends in population growth in Lamu District has been illustrated by three scenario simulations covering up to year 2000 (Table 3.7). The first scenario (status quo) assumes constant rates of fertility and mortality. The second (low growth) assumes a fertility decline of 25% by the year 2000, at constant mortality. The third scenario (high growth) assumes a fertility increase of 20% and a mortality decrease of 15% by the year 2000. Migration rates have not been included in the scenarios and they are assumed to remain at roughly the current levels. As indicated earlier, Lamu District is sparsely populated. Historical evidence shows that this has been the case for the past three decades. The 1962 population census indicated that there were about 22,951 people in the district. Between 1962 and 1969 a negative population

TABLE 3.7.

POPULATION SCENARIOS FOR YEAR 2000 - LAMU DISTRICT  
(POPULATION IN THOUSAND)

AGE	1980 PROJECTED			I STATUS QUO			II LOW GROWTH			III HIGH GROWTH		
	MEN	WOMEN	TOTAL	MEN	WOMEN	TOTAL	MEN	WOMEN	TOTAL	MEN	WOMEN	TOTAL
0-4	4.4	4.5	8.9	12.4	12.6	25.0	9.7	9.8	19.4	14.9	15.0	29.9
5-9	4.0	3.8	7.8	9.3	9.4	18.7	7.7	7.8	15.6	10.6	10.8	21.4
10-14	2.6	2.4	5.0	7.1	7.2	14.4	6.3	6.4	12.7	7.8	7.9	15.7
15-19	2.2	2.0	4.2	6.8	6.4	13.2	6.4	6.0	12.4	7.2	6.8	14.0
20-24	1.9	1.9	3.8	8.3	6.5	14.8	8.1	6.4	14.4	8.5	6.7	15.2
25-29	1.8	1.6	3.4	7.0	5.6	12.7	6.9	5.6	12.5	7.1	5.7	12.9
30-34	1.5	1.4	2.9	5.5	4.3	9.6	5.4	4.2	9.6	5.5	4.2	9.8
35-39	1.3	1.0	2.3	3.9	3.1	7.0	3.9	3.1	6.9	3.9	3.1	7.0
40-44	1.0	0.9	1.9	2.7	2.3	5.0	2.7	2.3	5.0	2.8	2.3	5.1
45-49	0.8	0.6	1.4	2.0	1.7	3.7	2.0	1.7	3.7	2.0	1.7	3.7
50-54	0.7	0.7	1.4	1.5	1.3	2.7	1.5	1.3	2.7	1.5	1.3	2.8
55-59	0.4	0.4	0.8	1.1	1.0	2.1	1.1	1.0	2.1	1.1	1.0	2.1
60-64	0.5	0.6	1.1	0.8	0.7	1.5	0.8	0.7	1.5	0.8	0.8	1.6
62-69	0.2	0.2	0.4	0.6	0.6	1.1	0.6	0.6	1.1	0.6	0.6	1.2
70-74	0.1	0.2	0.3	0.4	0.4	0.8	0.4	0.4	0.8	0.4	0.4	0.8
75+	0.1	0.2	0.3	0.4	0.4	0.8	0.4	0.4	0.8	0.4	0.5	0.9
<b>TOTAL</b>	<b>23.5</b>	<b>22.4</b>	<b>45.9</b>	<b>69.7</b>	<b>63.4</b>	<b>133.0</b>	<b>63.8</b>	<b>57.5</b>	<b>121.3</b>	<b>75.3</b>	<b>68.8</b>	<b>144.1</b>
Average Annual Growth Rate %						5.44			4.94			5.86
Doubling Time - Years						13			14			12
No. of children under 15 for every person 15 and over						.77			.65			.87

SOURCE: Central Bureau of Statistics and NES Population Model

growth (-0.4%) was recorded. The 1979 census recorded about 42,299 people, giving a 4.7% growth rate per annum. Recent estimates put the current annual growth rate at 5.15%. As explained in Section 3.2.4, this increase in population has been brought about mainly by the establishment of settlement schemes.

### 3.2.7 IMPLICATIONS FOR ENVIRONMENT AND DEVELOPMENT

Population pressure in Lamu District is not a problem as yet. The district presents a rare situation in Kenya whereby, for the achievement of overall development, an increase in population will be an asset. Large sections of the district are virtually uninhabited except for wildlife.

The situation is aggravated by the fact that about half of the district's population live in trading centres. Thus, while there is ample space in the rural areas, there is pressure on the established facilities in the various nucleated settlements such as Lamu, Mokowe and Witu.

Lamu District offers an ideal situation whereby the dynamics and potentialities of human numbers can, if well manipulated, act as a resource or catalyst for development. This is even more appropriate at the present time when the district is the focus for rural development.

### 3.3 AGRICULTURE AND LIVESTOCK DEVELOPMENT

#### 3.3.1 AGRICULTURE

Lamu District can be divided into four agro-ecological zones as shown in Figure 11. These are the coconut-cassava zone, the cashewnut-cassava zone, the livestock-millet zone and the lowland ranching zone.

Although agricultural land in Lamu District covers about 650,000 hectares, not all this land is available for agricultural development. About 29% of the land suitable for agriculture is either gazetted forests, national reserves or planned forests and swamps. Approximately 26% has been allocated to some 9 ranches in the district and a further 12% is ear-marked for future ranches. This leaves only 33% or about 214,500 ha for crop production. It is estimated, however, that so far only 30,000 ha is under cultivation.

The agricultural potential of land in Lamu District based on annual rainfall totals is as follows:

high potential	97,500 ha	or	15%
medium potential	299,000 ha	or	46%
low potential	264,500 ha	or	39%

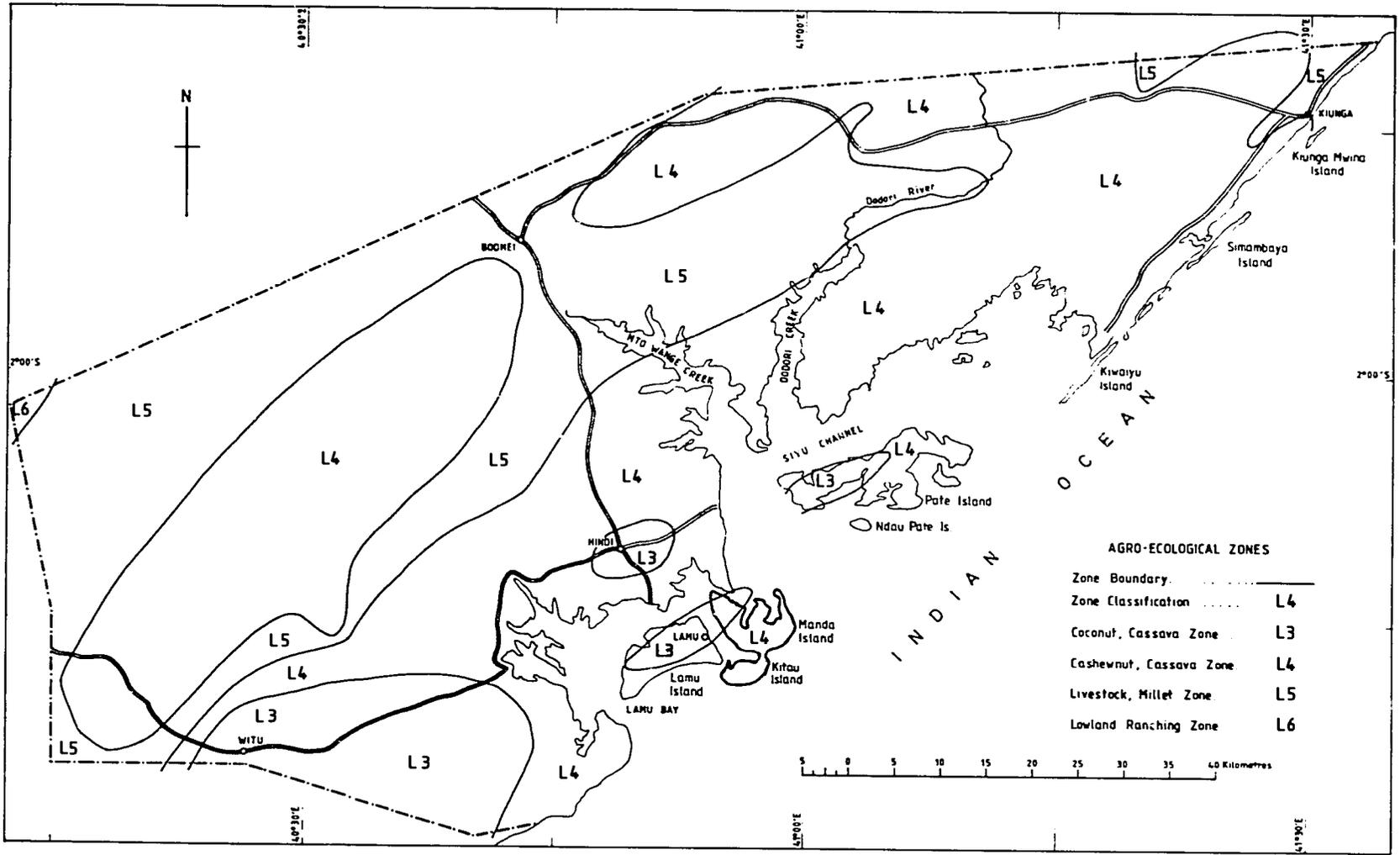


FIGURE 11: AGRO-ECOLOGICAL ZONES - LAMU DISTRICT

SOURCE : M.O.A 1983  
Farm Management Handbook of Kenya vol.2

### 3.3.2. CROP PRODUCTION

The major cash crops, which are listed in Table 3.8 include cashewnuts, bixa, cotton, coconuts, sesame (simsim) and mangoes. Maize, cassava, cowpeas, green grams, sorghum and pigeon peas are among the main food crops grown. The main areas of crop cultivation in the district are Witu, the Lake Kenyatta Settlement Scheme in Mpeketoni Division, Magogoni Settlement Scheme in Central Division, and parts of Faza Division. For land preparation purposes farmers mainly use the hoe. At the moment, there are only a few tractors in the district.

There are no large farms in the district and no irrigation is practised. Most farmers practise subsistence farming with an average plot size of one to two hectares and shifting cultivation is a noticeable feature.

Fertilizers are applied by only a few farmers and those who apply them have consequently realised high yields. Two pesticides, viz. sumicidin and thiodan are applied to cotton.

Credit facilities have been lacking in the district for a long time. Towards the end of 1983 however, the Co-operative Bank made arrangements to provide loans to farmers. For the same purpose, in April, 1984, the Agricultural Finance Corporation (AFC) opened an office at Garsen in Tana River District to serve farmers both in Lamu and Tana River districts.

Other credit facilities include the seasonal loan in settlement schemes and the assistance from the German Development Corporation. The Cotton Lint and Seed Marketing Board gives chemicals to farmers and recovers the equivalent value after the sale of cotton.

Co-operatives carry out the marketing of cashewnuts, simsims and bixa. Cotton is bought by Lamu ginners on behalf of the Cotton Lint and Seed Marketing Board, while coconuts are sold to an oil miller in Lamu. Other crops are sold in the local market.

Presently, there are forty-four demonstration plots in the district carrying out experiments on cotton, maize, sorghum, onions and tomatoes. There are twenty-seven demonstration plots for cotton, ten for maize, one for sorghum, eight for onions and eight for tomatoes.

### 3.3.3 LIVESTOCK DEVELOPMENT

#### 3.3.3.1 GENERAL

Keeping of livestock is done mostly by the Somali and Orma pastoralists who migrate frequently depending on the severity of drought in Lamu, Tana River and Garissa districts. The pastoralists keep large numbers of cattle,

TABLE 3.8 TRENDS IN AGRICULTURAL PRODUCTION - LAMU DISTRICT

CROP	1976	1977	1978	1979	1980	1981	1982	1983
<b>MAIZE</b>								
Hectares	2,150	2,514.4	1,798	2,053	1,592	1,799.1	1,593	1,411.8
Yield(tons)	-	-	-	-	-	-	-	-
Yield/ha	-	-	-	-	-	1,150kg	900kg	890kg
<b>CASSAVA</b>								
Hectares	45	123	203	193	255.97	109.6	175	15,000kg
Yield/ha	-	15tons	-	-	-	15,000kg	15,000kg	-
<b>COFFEES</b>								
Hectares	115	174	143	137	103	440	470	611
Yield/ha	-	540kg	-	-	-	2,000kg	-	500kg
<b>SORGHUM</b>								
Hectares	123	204	115	86	158	261	190	161
Yield/ha	-	-	-	-	-	700kg	500kg	460kg
<b>BANANAS</b>								
Hectares	33	65	134	166	113	229	318	339
<b>CASHEW NUTS</b>								
Hectares	1,106	1,248	1,433	1,458	1,492	1,526	1,577	1,783
<b>COCOONTS</b>								
Hectares	470	542	-	914	946	990	1,005	1,062
Yield/ha	-	-	-	-	-	-	1,200kg	-
<b>MANGOES</b>								
Hectares	114	438	513	704	761	847	898	1,026
<b>BIXA</b>								
Hectares	-	-	-	38	135	342	443	661
Yield/ha	-	-	-	-	-	-	800kg	-
<b>SINGSIM</b>								
Hectares	998	1,722	1,320	1,264	1,265	1,426	1,672	1,221
Yield/ha	300kg	-	-	-	-	-	-	-
<b>SUNFLOWER</b>								
Hectares	6.90	53	31	42	212	93	-	47
Yield/ha	-	300kg	-	-	-	-	-	500kg
<b>COTTON</b>								
Hectares	496	687	-	-	1,139	1,437	1,506	1,107
Yield(kg)	32,478	183,883	-	-	-	-	-	500tons
Yield/ha	65.5kg	268kg	-	-	-	400kg	400kg	0.45tons
<b>GREEN GRAMS</b>								
Hectares	56.2	96.34	99	101	57	180	189	224

SOURCE: Agriculture Annual Reports for Lamu District Various Issues, and office of the District Agriculture Office - Lamu

goats and sheep. Other types of livestock include poultry, donkeys and rabbits. With the rather harsh climatic conditions, it has become very difficult to keep pure breeds of cattle. The most common types of cattle found are the Boran, Semi-zebu and crosses between Sahiwal, Ayrshires, Friesians and Jerseys. Donkeys are kept mainly for use in transportation on the islands of Lamu and Faza.

The Kenya Meat Commission buys animals from farmers and ranchers and transports them either by ship or truck to their plant in Mombasa. There is no auction yard in the district. There was a proposal to start one at Mokowe but due to financial problems this was not realised. There are two holding grounds on which cattle bought from North Eastern Province are kept before they are sold to the Kenya Meat Commission.

### 3.3.3.2 RANCHING

About 248,000 ha of land have been classified as ranching land. Out of these, only 170,000 hectares have been demarcated for nine ranches. Of these nine ranches, shown on Table 3.9 and Figure 12, only four are operational viz Nairobi, Witu Nyongoro, Amu and Bujra's.

TABLE 3.9 SIZE AND STATUS OF RANCHES IN LAMU DISTRICT, 1982

<u>NAME</u>	<u>AREA (HA)</u>	<u>STATUS</u>
1. Nairobi (Pr. Company)	23,000	Operation
2. Witu Nyongoro	32,000	Operational
3. Tulu (Pr. Company)	20,000	Not Operational
4. Amu (Co-op Society)	25,000	Operational
5. Bujra's (Pr. Company)	8,000	Operational
6. Akiro (Pr. Company)	18,000	Not Operational
7. Bodhei (County Council)	22,000	Not Operational
8. Pwani (Pr. Company)	8,000	Not Operational
9. Proposed ranch for National Youth Service	14,400	Not Operational

Note: Pr. = Private

SOURCE: Ministry of Agriculture and Livestock Development, Range Management Division, and Consultant's investigations.

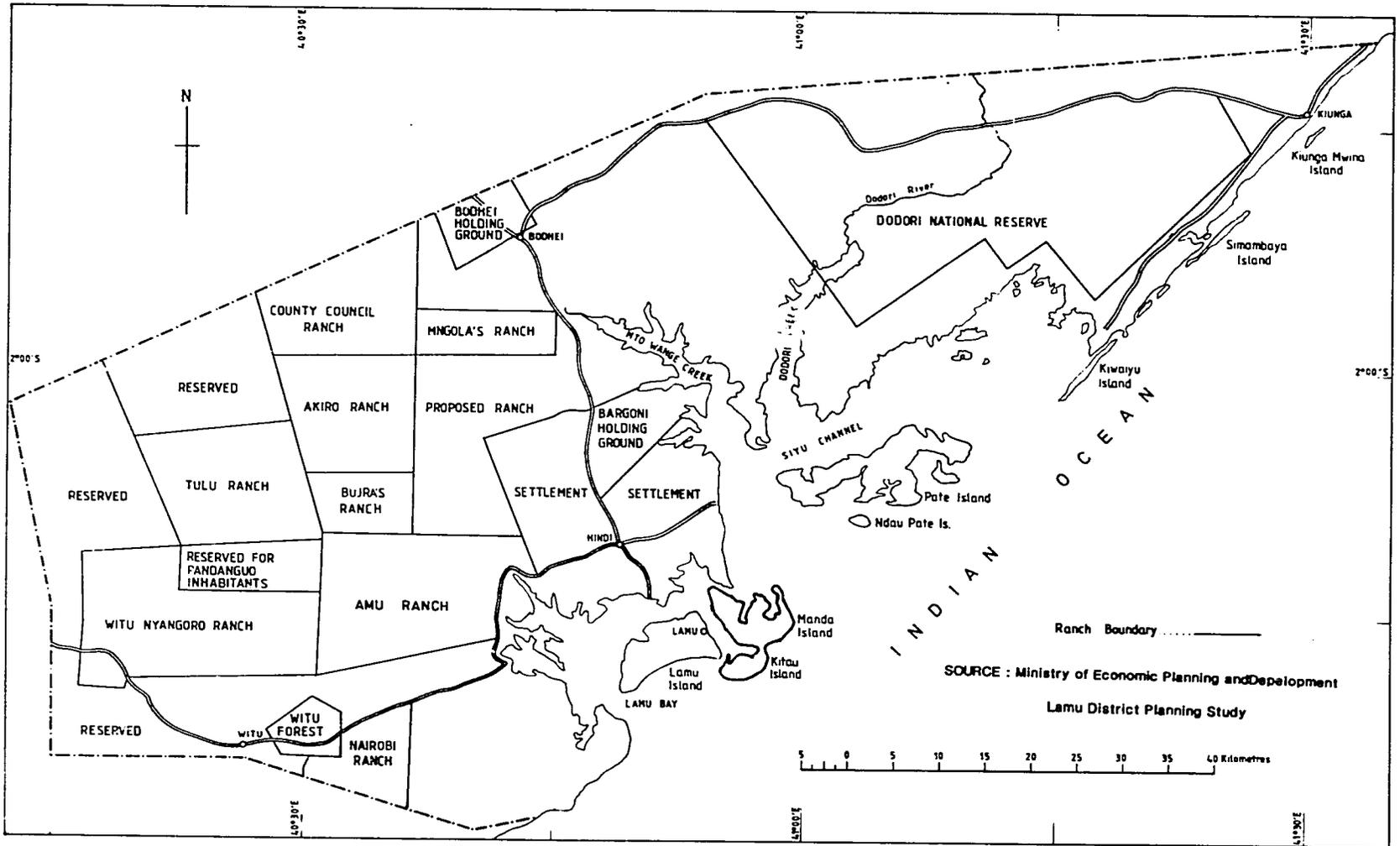


FIGURE 12 : RANCHES IN LAMU DISTRICT

### 3.3.3.3 DISEASE CONTROL AND STOCKING

There are eleven operating dips, one not operating and six under construction. These are funded by the European Economic Community.

Overstocking is a problem only on Lamu and Faza islands mainly because of the nature of the soil. Otherwise, overstocking is not a problem so far in the district as most areas are still understocked.

### 3.3.4 IMPLICATIONS FOR ENVIRONMENT AND DEVELOPMENT

Generally, agricultural land is under-utilised and since most of the farming is at subsistence level, it is important that priority is given to promoting improved agricultural productivity especially in the high potential areas. Unlike most other districts in Kenya experiencing heavy population pressure on agricultural land, Lamu District has no such problem.

In the settlement schemes bush and indigenous trees have been cleared in order to open the land for cultivation of crops. Care should be taken to avoid the loss of soil, destruction of wildlife habitats and wood resources in the long run.

Since the majority of livestock owners in the district are pastoralists, it will be very important when considering the development of the rangelands for livestock use to have suitable systems of grazing and to adhere to the carrying capacity of the land in order to avoid degradation of an already delicate environment. This issue will become even more important as population pressure on land increases.

## 3.4 TRANSPORT, COMMUNICATION AND SERVICE CENTRES

### 3.4.1 ROAD TRANSPORT

Lamu District has a total of 380.3 km of classified roads of which gravel/murram roads cover 116.0 km (30.5%) and earth roads 264.3 km (69.5%). The District has no tarmac roads and neither are there rural access roads. The most important road is the Mokowe-Garsen road which has a gravel/murram surface. It connects the district to Tana River District. It is, however, closed during some parts of the wet season. Under such circumstances, the only access to and from the district is by water or air. The other classified roads are D (secondary) and E (minor) roads which are mainly earth surface single lane roads (see Figure 13 and Table 3.10).

Within the Islands, especially Lamu where the majority of the district's inhabitants live, there are no motorable roads except along the sea-shore next to the Lamu

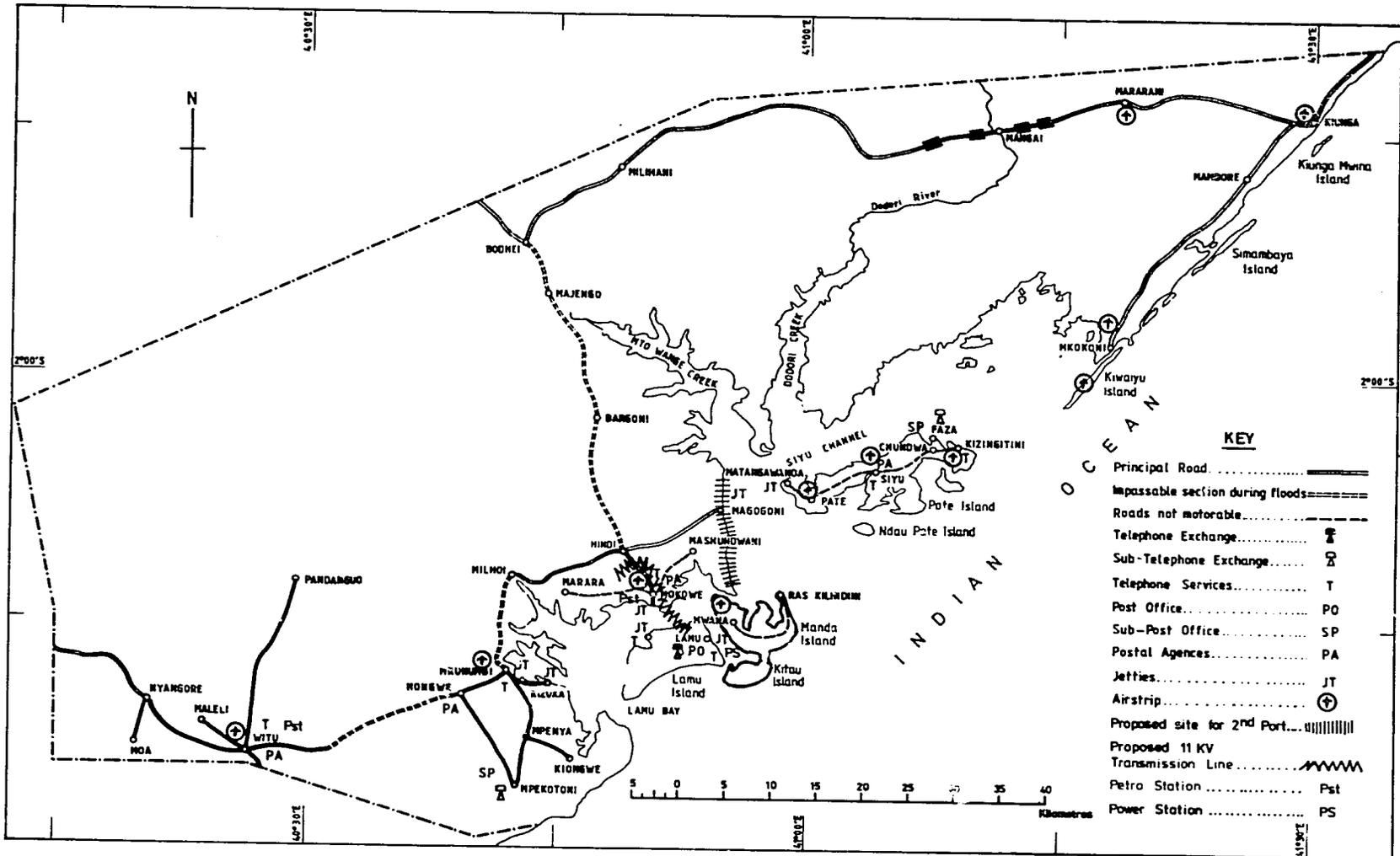


FIGURE 13 : TRANSPORT, COMMUNICATIONS AND SERVICE CENTRES - LAMU DISTRICT

SOURCE : MTC. and Lamu Development Plan 1984 - 1988

Sea Wall. As a result there are only about two motor vehicles on Lamu island. Hand carts, donkeys and donkey carts are the main forms of transport on the island. Even then some streets are so narrow that they cannot be used by carts. The "wider" ones are so narrow they do not allow a two-way traffic for carts and people.

TABLE 3.10 : CLASSIFIED ROAD NETWORK-LAMU DISTRICT

ROAD NO.	LOCATION	DISTANCE IN KM	TOTAL KM
C112	TANA RIVER BOUNDARY-WITU MOKOWE	93.4	93.4
D567	WITU-TANA RIVER BOUNDARY -KIPINI	2.0	
D565	HONGWE-MPEKETONI-MKUNUMBI	22.6	
D568	HINDI-GARISSA BOUNDARY	40.5	65.1
E881	NYANGORE-MOA	5.0	
E882	WITU-MALELI	8.4	
E883	WITU-PANDANGUO	20.0	
E888	MAPENYA-KONGWE	13.4	
E886	MOKOWE-HINDI MARARA	11.0	
E885	MOKOWE-MASHUNDWANI	5.8	
E865	BODHEI-KIUNGA-SOMALIA BORDER	121.6	
E866	KIUNGA-MKOKONI	33.9	219.9
<u>TOTAL DISTANCE</u>		<u>377.6</u>	<u>377.6</u>

SOURCE: Road Maintenance and Improvement Schedule - MoTC 1984/85, Lamu District.

(b) ROADS DECLASSIFIED SINCE 1981

ROAD NO.	LOCATION	DISTANCE (KM)
E883	WITU-DIDA WARIDI	7.7
E885	MWANA MARIYAMU-RAS KILINDINI	12.7
E884	PATE-BAJUMWAL/	20.8
E867	BADAA TRIANGLE (E865-E866)	2.6
<u>TOTAL DISTANCE</u>		<u>43.8</u>

SOURCE: Lamu District Planning Study Vol. 2. - Ministry of Economic Planning and Development. 1982

Most of the roads in the district are impassable during the wet season (Figure 13), inconveniencing movements of passengers and goods. Under such conditions places like Kiunga and Pandanguo cannot be reached by vehicles.

The Ministry of Transport and Communications maintains classified roads. Since 1981, four such roads have been classified (Table 3.10) and declassified because they carry minimal or no traffic at all.

The major causes of bad roads are the flat terrain which offers no natural drainage and lack of culverts causing the murram to be washed away by flood waters leaving very deep and wide holes. The clay and black cotton soils that occur in the district are very poorly drained and poor material for a road surface. There is lack of good and sufficient murram sites and existing sites at Hindi and Witu are far and nearly exhausted. The sites at Kiunga can only be reached during the dry season. This makes road gravelling in the district very expensive.

Machinery for road works is limited and those available are in poor condition. There is also a fuel shortage due to lack of storage facilities. There are very few road camp maintenance units which are very far apart. They are located at Witu and Mokowe. The Witu camp maintains roads up to Hongwe which is 50 km away while the Mokowe unit maintains roads at distances up to 175 km to the Somali border and 190 km to Mkokoni. The Kiunga camp was closed due to high administrative costs. Thus with the present distribution and number of road maintenance camps, road maintenance cannot be carried out as required. With a few kilometres of classified roads, the district's allocation of funds for road maintenance is also very small.

In spite of the efforts being made, the road network in the district is underdeveloped. There are plans, subject to availability of funds, to tarmac the C112 road from Garsen to Mokowe. There are also plans to improve the conditions of the D568 and E883 (see Table 3.10) roads.

The Mangai bridge over the Dodori river has to be completed since work has been temporarily stopped due to floods and breakdown of the only tipper truck. The proposed bridge at Majengo will replace the broken timber bridge. Efforts are also being made to locate murram sites closer to the roads.

The carriage units on the roads are buses, matatus and lorries. Two matatus operate between Mpeketoni and Mokowe. These two vehicles are insufficient, especially during market days. Four buses operate each way between Mokowe and Mombasa. The latest bus leaves Mokowe jetty before 9 o'clock in the morning after which no other transport is available to Mombasa until the next morning. The buses usually go via Mpeketoni but they are sometimes known to by-pass it.

Apart from the mentioned areas, the other parts of the district have no permanent means of transport. The available lorries are mainly for carrying goods and fish though they also carry people where no other means of transport is available.

### 3.4.2 SEA TRANSPORT

Sea transport in the district dates back a very long time and is very important because it connects Lamu with other ports in Kenya and outside. As indicated above there are no roads within the archipelago where majority of the people live. Movements between islands, therefore, is by sea. Sea transport is also used extensively during the wet season when most roads are impassable. Both passengers and goods are carried by small ships, motor-boats and dhows.

Navigation between Lamu harbour and the open sea is guided by several pillars, beacons and buoys. Small vessels usually anchor at the customs jetty but departure and arrival are sometimes affected by tides. However, large vessels anchor in the sea far from the town as the sea is shallow. Smaller vessels are then used to load or off-load them.

There are several jetties (Figure 13) but the most important ones are the Customs jetty on Lamu Island and the Mokowe jetty on the mainland. Between these jetties operate the highest number of boats carrying both passengers and goods. The Manda Island jetty connects Lamu Island with the only tarmac airstrip in the district (located on Manda Island). Boats operate during arrival and departure of aeroplanes mostly for tourists. Other jetties in Lamu Island are the Fisheries Department jetty and the landing steps at Shela near Peponi Hotel. The jetty at Matondoni has not been completed yet. Jetties are also located at Mkunumbi, Kizuka, Magogoni, Mtangawanda and Siyu. Most of these jetties were built by prospecting oil companies a long time ago and are now collapsing. With extensive mangrove forests, swamps and mud due to tidal changes, access to and from the sea is difficult without jetties. Surprisingly, the responsibility of servicing and maintaining the jetties is not clearly defined. The Kenya Ports Authority and Ministry of Transport and Communication (MoTC) are technically capable of maintaining jetties. The Ministry does not however, have the financial responsibility for maintenance although it carries out regular inspection on the Fisheries and Customs jetties on Lamu and Manda Islands and at Mokowe.

The Fisheries Department is responsible for its own jetties and MoTC for the Mokowe jetty (terminal for C-112 Mokowe-Garsen Road) and the Manda jetty which is an attached facility to the Manda airstrip.

Boat fares (Table 3.11) are fixed and controlled by the District Commissioner. There are several "matatu" boats licensed to carry passengers like any other Public Service

Vehicle, operating between Lamu Town and Mokowe. Other areas do not have regular services unless there are enough passengers or the boat is hired. The boats operate between Lamu and Mokowe until 6 p.m. except during the wet season when buses from Mombasa reach Mokowe late.

TABLE 3.11 BOAT FARES-LAMU DISTRICT

JOURNEY	APPROXIMATE DISTANCE (KM)	RATE PER PERSON (KSHS.)	SPECIAL HIRE RATE PER BOAT (KSHS.)
LAMU-MKUNUMBI	30	12	-
LAMU-MATONDONI	10	7	65 (DAY)
			85 (NIGHT)
LAMU-MANDA	1	3	30
LAMU-SHELA	3	-	50
LAMU-RAS KITAU	4	-	60
LAMU-MTANGAWANDA	24	7	-
LAMU-SIYU	36	8	-
LAMU-FAZA	43	12	1,000
LAMU-KIZINGITINI	47	15	1,150
LAMU-NDAU	54	-	1,200
LAMU-KIWAIYU	60	23	1,250
LAMU-MKOKONI	65	30	1,300

SOURCE: The District Commissioner, Lamu. 1982

### 3.4.3 AIR TRANSPORT

In a district like Lamu where road transport is very poor and sea transport is slow and unreliable, air transport is very important particularly during the wet season and for emergencies. There are several airstrips in the district (Figure 13) located on Manda Island, at Mokowe, Witu, Mkunumbi, Pate, Siyu, Kizingitini, Kiwaiyu, Mkokoni, Kiunga and Mararani (disused).

The airstrip on Manda Island with a length of 1,000 m is the most active and important in the district. It is the only one with a tarmac surface and easily accessible by boat from Lamu Town. The Mokowe airstrip (grass) with a length of over 1,000 m is also well maintained. The Witu, Mkunumbi, Siyu, Kizingitini and Kiunga airstrips are simple but of adequate length (up to 800 m) and are of strategic importance. At present none of these airstrips has any navigational aids, fire equipment or refuelling facilities. Only Manda and Mokowe airstrips are maintained by the Government.

Air services are regularly provided to the district through the Manda airstrip from Nairobi, Mombasa and Malindi. Three companies - Mombasa Air Services which is affiliated with the Cooper Skybird Group, Pioneer Airlines

and Caspair Sunbird Aviation - operate these routes. Light aircraft of up to ten seats are used on scheduled flights. During the peak tourists period however, additional aircraft and non-scheduled carrier services are operated.

Apart from Manda airstrip which is mostly used by tourists, all the other airstrips do not have regular flights. The local people are not able to afford the air-fares and depend on road or sea transport. Most of these airstrips are used either during emergencies, for important functions, by tourists or by government officers especially administration and security staff.

#### 3.4.4 COMMUNICATIONS

##### Postal Services

There is one departmental post office in Lamu Town with sub-offices in Mpeketoni and Faza. There are postal agencies in Witu, Mkunumbi, Kiunga, Siyu and Mokowe. The Mokowe postal agency is run by the chief, the Mkunumbi one by a private contractor and the others by the district officers of the respective areas. The postal agencies handle letters and all specialized postal services like money orders, etc. Telegrams can only be handled in Lamu Town. The Lamu Post Office has 100 private boxes and a waiting list of about 150. There are plans to install additional 400 boxes.

All mail is sorted out at Lamu Post Office before distribution to the final destinations. Mail is carried by boat to Mokowe and then by road to the various destinations on the mainland. During the rainy season when roads are impassable, more use is made of water and air transport. During this season mail takes several weeks to reach the destinations.

To improve postal services, there are plans for construction of departmental post offices in Mokowe and Faza during the 1984/88 plan period. A post office in Witu, and a sub-post office in Kizingitini are planned for 1985/86, while for the 1987/88 period a sub-post office is planned for Matondoni. Implementation of these plans are subject to availability of funds.

##### Telecommunications

Telephone services in the district are manual with the principal exchange located in the Lamu Post Office and sub-exchanges at Mpeketoni and Faza. The Lamu exchange has 200 lines while Mpeketoni and Faza sub-exchanges each have 70 lines. All telephone services are channelled through the Lamu exchange. Matondoni, Shela and Kizingitini also have telephone facilities. In addition to the above, there is a microwave station in Lamu Town. Other stations are under construction along the Mokowe-Garsen road to improve transmission.

Other places such as Kiunga have no telephone services and urgent communications are relayed by radio calls at the police posts and health centres.

There are plans to install subscribers trunk dialling (STD) in Lamu Town. Other planned projects include a public call office at Siyu and connecting Kiunga with the Faza exchange. Immediate plans are to install a telephone exchange with 70 lines at Mokowe during the 1984/85 period and another exchange also with 70 lines at Witu in 1985/86. The Lamu Exchange will have an additional 200 lines during 1987/88. The projected district demand for telephone services in the 1984/88 plan period is 410 lines.

### Service Centres

Lamu Town is the largest service centre in the district (it is both the commercial and administrative centre). Most other centres are villages with a few shops providing only the minimum basic requirements. Due to the scattered nature of the population, the people are inadequately served by the low number of service centres (Table 3.12). Most people have to walk long distances in order to reach any of the centres.

TABLE 3.12            DESIGNATED SERVICE CENTRES

<u>URBAN CENTRES</u>	<u>RURAL CENTRES</u>	<u>MARKET CENTRES</u>	<u>LOCAL CENTRES</u>
Lamu	Witu	Mokowe Hindi Mpeketoni Manda Bay Kizingitini	Kiunga Mkunumbi Majengo Faza Pate Matondoni Siyu Bargoni Mangai Mararani

SOURCE: Kenya's Fourth Development Plan - Part One 1979-83

Apart from these designated service centres there are several other smaller centres which serve the local people with most basic needs (Figure 13).

### 3.4.5 IMPLICATION FOR ENVIRONMENT AND DEVELOPMENT

Lamu district has areas of high agricultural potential as evidenced by the Lake Kenyatta Settlement Scheme. However, transport problems affect agricultural development especially during the rainy season when transportation costs are usually high. Supply of agricultural inputs such as seeds and fertilizers is delayed

by poor transport facilities. There are a number of ranches as well but extension services, proper disease control and marketing are not regular due to the poor roads. Air and sea transport are very important and efforts should be made to improve these services.

Postal and telephone services play an important role in development. However, most parts of the district do not have these services and there is need to provide and expand them to reach as many areas as possible.

With the exception of Lamu Town, the other centres offer very few services. Only Lamu Town has banking facilities provided by a branch of the Standard Bank. Social and economic amenities in the service centres are minimal. As a result people travel very long distances for basic needs and specialised services.

### 3.4.6 RECOMMENDATIONS

1. Use of roads is the most effective form of transportation in rural areas and there is need to upgrade the roads at least to all-weather standards. This will encourage more carriage units on the roads.
2. Roads declassification means less funds for road improvement and maintenance and this should be avoided.
3. More road camp maintenance units should be opened and the existing ones strengthened.
4. One Ministry or Government body should be charged with the service and maintenance of the jetties and funds should be made available for this purpose. Otherwise the jetties will deteriorate further. This should also include maintenance of the Lamu Sea wall.
5. The construction of unfinished or proposed jetties should be carried out as soon as possible as delays raise the costs of construction.
6. More navigation aids to guide ships and boats to the jetties should be provided to avoid risks.
7. Although the district has several airstrips many of them are neglected, e.g. many are bumpy and not fenced. Those not maintained directly by the government, should be the responsibility of the local authorities.

## 3.5 INFRASTRUCTURE

### 3.5.1 WATER SUPPLY SYSTEMS

Water resources on Lamu Island consist mainly of wells, djabias and dams. The island is generally low-lying, with a large portion of the terrain not more than 17 metres above sea level. Due to the topography and geology of the

island, rainwater does not collect in any developed drainage pattern. Some of the rainwater sinks into the coral formation and the rest collects into small pools and is lost through evaporation.

Much of Lamu Island is sandy. The large sand dunes on the seaward side of the island are the location of 20 wells from which water is pumped to supply Lamu Town. The capacity of this aquifer is unknown but is believed to be much greater than the withdrawal rate of approximately 120,000 litres per day. Table 3.13 shows the various water sources in the district.

TABLE 3.13 WATER SOURCES, LAMU DISTRICT

DIVISION	LAKES	RIVERS	DAMS	WELLS	DJABIAS	BORE-HOLES
Amu	-	-	7	170	25	-
Kiunga	-	-	-	5	8	-
Faza	-	-	-	60	20	-
Witu	-	-	-	9	9	1
Mpeketoni	1	-	2	65	30	-

SOURCE: District Water Development Officer, Lamu, 1984

Although Lamu Town has a steady source of groundwater, the rest of the district suffers from lack of water during the dry season. Distribution of the water is poor because most of the wells and djabias are owned by individuals. A few that are public owned are difficult to draw water from during the dry seasons due to their depths. Water is lifted in buckets tied on ropes, and the deeper the well the more difficult it becomes to reach the water. Dams fill seasonally and the water is quickly lost through evaporation and percolation.

There are a few seasonal rivers and streams in the district. During the wet season, water ponds on the almost flat terrain form numerous lakes commonly called "Ziwa" in Kiswahili. Lake Kenyatta is the only fresh water lake in the district.

Mpeketoni is the only division with an organised water supply system. It is managed jointly by the District Development Committee (D.D.C.) and the Department of Settlement. Witu has a small harambee water supply system.

Since water shortage is considered to be one of the main constraints to development in the district, the DDC should lay down priorities to develop reliable water supply systems. Projects to increase the number of public wells

should be encouraged and Lake Kenyatta should be used to supply piped water to the surrounding population.

The supply and demand issues for various areas in the district are described below (also see Table 3.14).

(a) Lamu Island

The island has the only well developed water supply system in the district. The main source of this supply was initially planned to be a 15-km stretch of sand dunes running along the southern shore of the island and relying on rainfall for their recharge. This system was constructed in the 1950s and consists of 20 wells of which 19 are currently being utilised.

The wells discharge about 650 m<sup>3</sup> daily giving an annual supply of 237,250 m<sup>3</sup> which is supplied to about 10,000 people. This gives a per capita annual demand of 23.7 m<sup>3</sup>. It has been found that this supply is not sufficient given that the system supplies Mokowe and Ras Vitan Hotel-Ras Kitau. The present daily demand is estimated at over 800 m<sup>3</sup>.

The rest of the island and parts of Shela, Matondoni, Kipungani and farms are supplied from individual wells.

(b) Pate Island

Pate island depends for its supply on djabias and shallow wells. During the dry seasons which often last up to 4 months, the wells are the only source of water. The djabias and wells are generally poorly constructed and frequent water shortages force Faza to import water from Lamu at high cost.

(c) Manda Island

There are 2 djabias close to the airstrip, a few wells at Takwa Milinga and at Ras Kilindini near the Blue Safaris Club. All these are not capable of supplying the needs of the island and it has been estimated that the present supply leaves a deficit of 500 m<sup>3</sup> on the daily demand.

(d) Ndau Island

Twenty five (25) djabias of which 5 are public and 1 belongs to the dispensary serve this island. On Table 3.14 it is shown that a daily shortage of 260m<sup>3</sup> occurs and causes substantial hardship in respect of domestic water requirements.

(e) Kiunga

Kiunga depends on djabias for its domestic water supply. The approximate yield of these djabias is 1000m<sup>3</sup> daily.

The health centre at Kiunga relies on its roof catchment for its domestic water supply.

TABLE 3.14 EXISTING AND PROJECTED POPULATION AND WATER DEMANDS  
IN LAMU DISTRICT, 1979-2000

Region	Population <sup>1</sup>			Water Demands <sup>2</sup> (1000m <sup>3</sup> )			Present Supply <sup>3</sup> (1000m <sup>3</sup> )
	1979	1990	2000	1979	1990	2000	
<u>Lamu Island</u>							
Lamu	8,552	16,230	29,070	202.9	385.2	689.8	Adequate
Matondoni & Shela	125	180	260	0.9	1.3	1.9	Adequate
Shela TC	979	1,430	2,020	23.2	33.9	47.8	Adequate
Matondoni TC	1,001	1,460	2,060	7.3	10.7	15.1	Adequate
<u>Pate Island</u>							
Pate	1,420	2,070	2,930	10.4	15.1	21.4	9.5
Faza (Rasini)	1,197	2,880	4,000	14.4	21.0	29.6	10.5
Siyu	1,571	2,290	3,240	11.5	16.8	23.6	Adequate
Tchundwa	3,880	5,670	7,990	28.3	41.4	58.4	Adequate
Tchundwa TC	1,319	1,930	2,720	9.6	14.1	19.8	Adequate
<u>Handa Island</u>	254	370	520	1.8	2.7	3.8	1.3
<u>Ndau Island</u>							
Ndau	342	500	700	2.5	3.6	5.1	2.0
Ndau TC	1,047	1,530	2,160	7.6	11.2	15.8	5.5
<u>Kiunga</u>							
Kiunga	550	800	1,130	4.0	5.9	8.3	2.5
Kiunga TC	761	1,110	1,570	5.5	8.1	11.5	3.5
Mkokoni TC	149	220	310	1.1	1.6	2.2	Adequate
Mambone TC	55	80	110	0.4	0.6	0.8	Adequate
<u>Mangai</u>							
Mangai TC	121	180	250	0.9	1.3	1.8	Adequate
<u>Bodhei</u>							
Bodhei TC	79	120	160	0.6	0.8	1.4	Adequate
<u>Bargoni</u>							
Bargoni	476	700	980	3.5	5.1	7.2	Adequate
<u>Mokowe</u>							
Makowe (incl. Hindi)	984	1,440	2,030	7.2	10.5	14.8	5.4
Mokowe TC	1,334	2,540	4,540	31.6	45.9	65.2	Adequate
<u>Mkunumbi</u>							
<u>Lake Kenyatta Settlement</u>	12,021	17,550	24,760	87.8	128.1	180.8	77.0
<u>Witu</u>							
Witu	1,756	2,560	3,620	12.8	18.7	26.4	9.7
Witu/Tana Delta Villages	1,585	2,310	3,260	11.5	16.9	23.8	Adequate
<u>Pandanauo</u>	278	410	570	2.0	3.0	4.2	1.8
<b>TOTAL</b>	<b>42,763</b>	<b>67,910</b>	<b>102,930</b>	<b>496.2</b>	<b>828.5</b>	<b>1,294.4</b>	

**Notes:**

1. Growth rate; 3.5% except Lamu; and Mokowe; 6%.
2. 20 litres per person per day rural areas, 65 litres per person per day Lamu, Shela TC and Mokowe.
3. In areas where existing supply is not considered adequate to satisfy demand, the estimated supply is given.

SOURCE: Ministry of Economic Planning and Development, Lamu District Planning Study, 1982

Shakani village has 4 djabias and 2 wells. The rest of the region taps water from fresh water wells in Mkokoni and Stesheni. Due to lack of suitable alternative, Mambore and Mararani villages use saline well water.

In an effort to solve the water supply problem in this area the Ministry of Water Development undertook investigations in sand dunes in Mkokoni. One fresh water well was struck and yielded 135m<sup>3</sup>/day under test conditions. This water could be pumped a distance of 40 km to Kiunga.

(f) Mangai  
Ponds in the Dodori River supply water to this area.

(g) Bodhei  
This region is served from the livestock holding ground where there are dams along the Duldul River. The 5 dams found here have a capacity yield of 900m<sup>3</sup>/day. Bodhei has not experienced any shortage of water so far.

(h) Bargoni  
There are 5 hafirs (sub-surface dams) with a total capacity of 45,000m<sup>3</sup>. One supplies domestic need to the nearby 500 inhabitants in the area.

(i) Mokowe  
Mokowe Trading Centre has a population of about 2,300 people who depend on Mokowe water supply. This water comes from the Lamu water supply and the prison wells.

(j) Mukunumbi  
Water holes and djabias supply this area. A small dam has been constructed to replace a well that went saline due to over-pumping.

For livestock needs in the ranches a dam has been constructed at the confluence of Mkondo wa Busho and Kitoka rivers.

There is an average shortage of 2,000m<sup>3</sup>/day in this area.

(k) Lake Kenyatta Settlement  
In 1979 the settlement had 12,021 people spread over an area of 200km<sup>2</sup>.

Fresh water from the lake is tapped to supply 2,000 people in the Administration and Mpeketoni Trading Centres and 4,000 people in the surroundings.

Lake Kenyatta is known to have dried up in 1956 and this makes it an unreliable source of permanent supply.

This area is also served by numerous shallow wells of varying water qualities. A further possible source of water would be the sand dunes at Kiongwe.

All in all Lake Kenyatta Settlement Scheme suffers a shortage of 10,000m<sup>3</sup> daily.

(1) Witu

Only one well yielding about 12m<sup>3</sup> per day supplies nearly 2,000 people. This supply is considered to be insufficient since some people who were previously being served are now obtaining their water from a borehole at the polic station.

Witu generally gets only about half of its domestic water needs.

(m) Pandanguo

There is a fresh water well about 4 km east of the village with a water rest level about 22m from the surface which supplies 280 people and is adequate.

### 3.5.2 HEALTH

#### 3.5.2.1 HEALTH FACILITIES

There are seventeen health facilities in Lamu District, including one hospital situated on Lamu Island. These are shown on Table 3.15 and Figure 14. Table 3.16 shows the number of health staff in the district. Access to the hospital is difficult because transport is partly by boat. A district hospital is under construction at Mokowe and a sub-district hospital at Kipini. Although the latter hospital is in Tana River District it is administered from Lamu.

In addition, three new dispensaries are planned to be built at Mangai, Mkokoni and Moa.

#### 3.5.2.2 PREVALENT DISEASES

There are four most prevalent diseases in Lamu district namely:

- malaria
- acute respiratory infection
- diseases of the skin
- diarrhoeal diseases.

It is also felt that cases of malnutrition, tuberculosis and bilharzia are underreported. The incidence of all these diseases could be reduced by use of better sanitary measures. Table 3.17 gives the outpatient morbidity statistics for the district.

#### 3.5.2.3 ENVIRONMENTAL AND ECONOMIC FACTORS

The following environmental and economic factors have led to the high incidence of the diseases reported above.

(a) Scarcity of Clean Potable Water

The shallow wells which are the main source of water are often brackish. Water from the existing rivers, lake and ponds is often polluted and leads to diarrhoeal diseases once drunk unboiled.

(b) Vector Habitats

The rivers, lakes, ponds and shallow wells are often continuous breeding grounds for malarial mosquitoes and for bilharzia vector snails.

(c) Poor Transport and Communications

Generally roads are flooded and impassable during the rainy season. Airstrips and jetties are inadequate and there are only limited telephone facilities in the district. This sometimes delays supplies and urgent deliveries for several weeks.

(d) Poverty and Low Incomes

Most of the population has only scanty sources of income. Agriculture, mangrove cutting and fishing are the main activities and they generate only meagre incomes for the people.

TABLE 3.15 HEALTH FACILITIES

	<u>FACILITIES</u>	<u>LOCATION</u>	<u>STATUS</u>	<u>CAPACITY (BEDS)</u>
1.	Lamu	Lamu Town	Hospital	36
2.	Kiunga	Kiunga	H. Centre	12
3.	Faza	Faza	H. Centre	12
4.	Mpeketoni	Mpeketoni	H. Centre	12
5.	Witu	Witu	H. Centre	12
6.	Shela	Shela	Dispensary	-
7.	Matondoni	Matondoni	"	-
8.	Mkunumbi	Mkunumbi	"	-
9.	Hindi Prison	Hindi Prison	"	-
10.	Pate	Pate	"	-
11.	Siyu	Siyu	"	-
12.	Kizingitini	Kizingitini	"	-
13.	Tchundwa	Tchundwa	"	-
14.	Ndau	Ndau	"	-
15.	Mokowe G.S.U.	Mokowe	"	-
16.	*Mpeketoni Mobile	Mpeketoni	"	-
17.	Kipini	Kipini	H. Centre	12

NOTES: \*Private health facility giving services to the public free of charge. Kipini Health Centre though run from Lamu is in Tana River District.

SOURCE: Medical Officer of Health, Lamu District, 1984

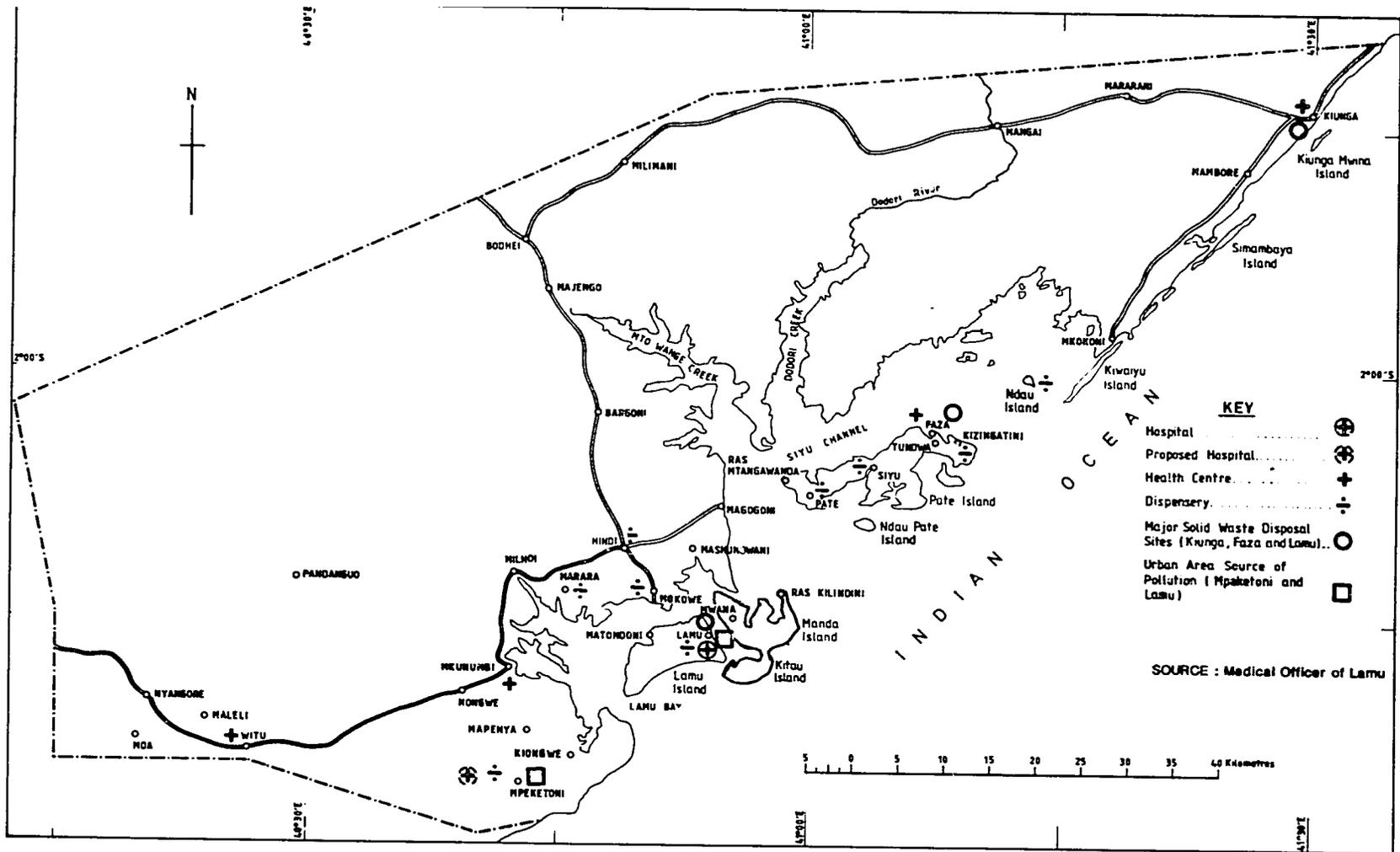


FIGURE 14: HEALTH FACILITIES, WASTE DISPOSAL AND WATER POLLUTION - LAMU DISTRICT

TABLE 3.16

MINISTRY OF HEALTH PERSONNEL IN LAMU DISTRICT, MAY 1982

<u>Hindi Dispensary</u>	<u>Lamu District Hospital</u>	<u>Faza Health Centre</u>
KCEN x 1	KRN x 6      2 Doctors	Clinical Officer x 1
Ungraded x 1	KCEN x 8	KCEN x 2
<u>Mpekotoni Health Centre</u>	KEN x 7	Nutritionist x 1
Clinical Officer x 1	Ungraded x 12	Ungraded nurse x 2
KCEN x 1	Nutritionist x 1	PH Tech x 1
PH Tech x 2	Enrolled Midwives x 2	Lab Tech x 1
Ungraded nurse x 2	PH Tech x 3	
<u>Division of V B Diseases</u>	Clinical Officer x 5	<u>Kizingitini Dispensary</u>
Lab Tech x 2	Lab Tech x 2	KEN x 1
	Lab Attendants x 2	Ungraded x 1
<u>Kiunga Sub-Health Centre</u>	<u>Shela Dispensary</u>	<u>Tchundwa Dispensary</u>
Clinical Officer x 1	Ungraded x 1	Ungraded x 1
KCEN x 1		<u>Siyu Dispensary</u>
Ungraded x 1	<u>Mkunumbi Dispensary</u>	KCEN x 1
PH Tech x 1	KCEN x 1	PH Tech x 1
<u>Witu Health Centre</u>	KEN x 1	Ungraded x 1
Clinical Officer x 1	Ungraded nurse x 1	<u>Ndau Dispensary</u>
KCEN x 2	PH Tech x 1	KEN x 1
KEN x 2		Ungraded x 1
PH Tech x 1	<u>Pate Dispensary</u>	PH Tech x 1
	KCEN x 1	<u>Matondoni Dispensary</u>
	Ungraded x 1	Ungraded nurse x 1
		<u>Mokowe Dispensary (GSU)</u>
		PH Tech x 1

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Total:    Doctors 2      Auxiliary Staff 99

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NOTE:    KCEN - Kenya Community Enrolled Nurse.  
           KEN - Kenya Enrolled Nurse.  
           KRN - Kenya Registered Nurse.

SOURCE: Ministry of Health, 1982

TABLE 3.17 OUTPATIENT MORBIDITY-LAMU DISTRICT, 1979

1.	Malaria	37,079
2.	Acute Respiratory Infection	31,699
3.	Diseases of the Skin (including Ulcers)	30,215
4.	Diarrhoeal Diseases	11,174
5.	Intestinal worms	8,610

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NOTE: Facility rather than population based figures.

SOURCE: Health Information Bulletin Vol. III No. 3,  
Vol.III No. 4, Vol. IX No. 1.

3.5.2.4 IMPLICATIONS FOR ENVIRONMENT AND DEVELOPMENT Health facilities are inadequate and scattered except within Lamu Town, making them inaccessible to the people. Some of these facilities cannot be reached during the wet season when roads are flooded.

### 3.5.3 ENERGY

#### 3.5.3.1 OVERVIEW

The majority of the people in Lamu District use firewood for their basic energy needs and it is anticipated that this will continue for a long time. Charcoal will likewise continue to be in high demand in towns and other centres. Proper management and utilisation of woodfuel is therefore essential. Growing of more trees is also essential to expand the tree resources in the district.

Charcoal is mostly used in towns though a small percentage is utilised in the rural areas. Other sources of energy include electricity, paraffin (kerosene), gas (LPG), diesel, petrol, wind and solar energy. Paraffin, gas and electricity are usually too expensive for the majority who resort to cheaper woodfuel viz., firewood and charcoal. Figure 15 and Table 3.18 provide comparative data for Coast Province which probably holds true for Lamu District also.

#### 3.5.3.2 WIND AND SOLAR ENERGY

Wind energy is commercially utilised by dhows for fishing and to a lesser extent for sea transport although the working speed is low. Solar energy in the form of direct sunshine is used to dry fish, copra, fuelwood and farm produce.

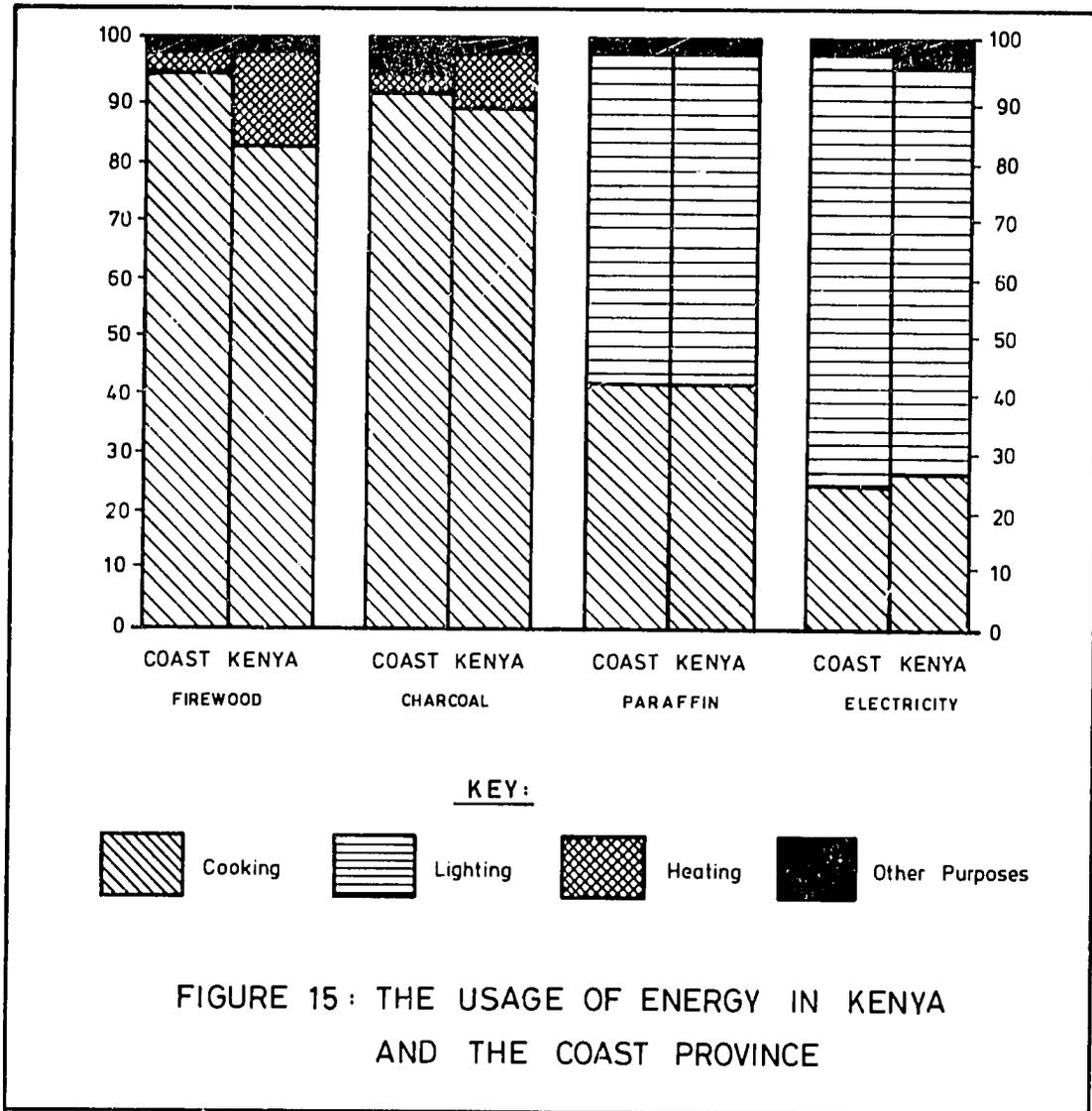


TABLE 3.18. DISTRIBUTION OF HOUSEHOLDS BY DISTANCE FROM SOURCES OF ENERGY IN THE COAST PROVINCE

Distance	Firewood	Charcoal	Paraffin	Gas
0-0.9 km	50.45	81.12	75.17	71.79
1.0-1.9 km	26.43	8.53	14.90	7.36
2.0-2.9 km	12.35	1.88	4.19	3.89
3.0-3.9 km	2.58	7.32	1.11	15.15
4.0-4.9 km	6.35	0.25	1.76	0.39
5.0-5.9 km	0.52	-	0.66	-
6.0-6.9 km	0.74	0.90	0.25	-
Over 7.0 km	0.58	-	1.96	1.44

SOURCE: Central Bureau of Statistics, 1980

### 3.5.3.3 HYDROCARBONS AND ELECTRICITY

Cooking gas (LPG) is not readily used due to its high cost. It is mainly used in hotels though a few people use it domestically. Supply is usually obtained from Mombasa and Malindi which raises costs considerably as a result of transportation. Paraffin is mostly used for lighting purposes although an appreciable amount is used in cooking. Paraffin costs are not uniform and supply comes from Mombasa by road usually in jerry cans. Diesel and petrol are used almost exclusively in motor boats and vehicles. There are only two petrol stations in the district. They are located at Witu and Mokowe as shown in Figure 13.

Petrol and diesel is transported and stored in drums. During the rainy season when roads are impassable shortages are common. Diesel is used to run small factories and to generate electricity in the Lamu Power Station which serves the town. In Witu, there are two small generators (one at the Police Station and the other at a garage in the shopping centre) that supply electricity to a limited number of people.

There are plans by the Kenya Power and Lighting Company to extend electricity from the Lamu Power Station to Mokowe and nearby areas by a 11KV line as indicated in Figure 13. This will require the installation of powerful generating machines. Transformers will also be required for effective electricity distribution.

Due to their low incomes the majority of the people cannot afford charges for electricity connection unless they are assisted.

### 3.5.3.4 WOODFUEL

Firewood is the main source of energy for cooking and lighting in the rural areas. A few people also use it in urban areas. The cost of woodfuel is not uniform and depends on demand and availability. Fuelwood costs about KShs. 15-20/- for a small pile of 20 pieces or 300/- per ton. Charcoal is used for cooking on a small scale in the rural areas but is the main fuel in use in the towns for cooking.

Owing to the low population density, widespread devegetation is not common in the district. The rural people live in villages and it is only around these settlements that devegetation is noticeable. In settlement schemes like Lake Kenyatta and Hindi, vegetation is cleared for farming. With increasing population in these areas fallow periods have become shorter and regeneration is no longer an effective way of controlling the establishment of trees. Planting needs to be done in some areas.

Charcoal is mainly used in towns for cooking. Charcoal prices are not uniform throughout the district. The producer gets about KShs. 15/- per bag in places like Lake Kenyatta Settlement Scheme and about KShs. 25/- in Mpeketoni town. Production averages about 20 bags per month per person. Charcoal burning is however, not done on full time basis.

Investigations showed that prices of charcoal vary from place to place as illustrated below:

<u>Place</u>	<u>Price per Bag</u>
Faza	KShs. 30
Manda	" 25
Kiunga	" 35
Lamu	" 35-40

Charcoal burning licences and transportation permits are normally controlled by the local administration.

Woodfuel is presently readily available in the district. But it is anticipated that future demand can only be satisfied if vigorous afforestation starts now. The Forest Department has tree nurseries at Mpeketoni with about 140,000 seedlings and at Amu where an unspecified number of seedlings have been raised. Most of the Chiefs also have tree nurseries but there are problems of water during the dry periods and funds to run the nurseries are generally in short supply. There are two Chief's nurseries at Mpeketoni with about 200,000 seedlings. Other nurseries are at Witu and Lamu. The demand for seedling by the public is higher than the supply. Survival rate of the seedlings planted by the general public has not been assessed. The survival rate of seedlings planted in the forests is 65-75%. Forest fires and wild animals destroy many of the planted seedlings.

#### 3.5.3.5 RECOMMENDATIONS

1. The use of solar driers for fish and copra should be promoted. Solar heaters should also be encouraged as they are cheaper to run and to maintain.
2. Efforts should be made to harness wind energy for the running of windmills to pump underground water from boreholes. Windmills are cheaper to maintain compared to diesel pumps.
3. Development of other alternative renewable sources of energy such as biogas should be promoted.
4. Although thermal (diesel) generated electricity is more expensive than hydro-electricity, efforts should be made to expand the supply of electricity to nearby centres and households. The public will need assistance to meet the high cost of electrification. One alternative would be to add any extra charges to the monthly bill to offset the cost of installation.

5. The new charcoal kilning method which reduces production wastage should be promoted. Charcoal and firewood saving Jikos (Stoves) should also be promoted. These save energy which in turn will save many trees. The possibility of starting fuelwood plantations should be considered.

6. All seed nurseries should be located near permanent water sources to reduce running costs as is done in Mpeketoni. More funds should also be assigned to running trees nurseries. Schools should be encouraged to have tree nurseries.

7. During clearing of land for cultivation in Settlement Schemes, the public should be advised to leave some trees. These will provide them with some firewood, building and fencing posts.

8. Shifting cultivation and seasonal bush burning can no longer be accommodated as this not only destroys mature trees but also young ones.

9. Agro-forestry should be encouraged. Planting of fruit trees which can be pruned for firewood should also be encouraged.

#### 3.5.4 EDUCATION

##### 3.5.4.1 PRIMARY EDUCATION

There are only a few primary schools in the district. Most of them are on the islands, in Mpeketoni Division and along the road to Kiunga (see Table 3.19 and Figure 16). Most of the schools do not have sufficient basic facilities, e.g. classrooms, desks, etc. Even so, it is difficult to organize 'harambee' meetings to raise funds for these facilities.

There is only one Teachers' Advisory Centre which is located at Lamu Primary School. Although it offers library book and teaching facilities, it is not easily accessible to the majority of the intended users.

##### 3.5.4.2 POST PRIMARY EDUCATION

Secondary schools are unevenly distributed in relation to the population they serve. Settlements are generally dispersed and nucleated. Only a few of them have schools. Students walk long distances to and from schools. It is hoped that as parents continue to appreciate the need for formal education, sites will be provided and more schools will be built. Table 3.20 summarizes the number of post primary educational institutions in the district, as well as enrolment per class among others.

TABLE 3.19 NUMBER OR PRIMARY SCHOOLS IN LAMU DISTRICT

	DIVISION					
	Amu	Kiunga	Faza	Witu	Mpeketoni	
Number of Government Schools	9	4	10	11	39	
Special schools (for handicapped)	1	-	-	-	1	
<u>Enrolment:</u>						
Boys	1407	185	1253	2288	5515	
Girls	1003	137	1013	2030	4449	
<b>Total</b>	<b>2410</b>	<b>322</b>	<b>2266</b>	<b>648</b>	<b>9964</b>	
<u>Teachers:</u>						
Trained	61	7	43	18	77	206
Untrained	33	6	29	13	44	125
<b>Total</b>	<b>94</b>	<b>13</b>	<b>72</b>	<b>31</b>	<b>121</b>	<b>331</b>

SOURCE: District Education Officer, Lamu District. 1984

There are two Village Polytechnics in the District. These are at Mpeketoni and Lamu Town. A third one is under construction at Faza. The enrolment in these institutions is given in Table 3.20 and the courses offered are listed in Table 3.21.

#### 3.5.4.3 ADULT EDUCATION

The organization and enrolment in adult education centres by Divisions is shown in Table 3.22. The low proportion of full-time teachers is a major constraint to the development of adult education in the district.

The adult education programme is particularly popular among young females, most of whom have organized themselves into women's groups for this and other purposes.

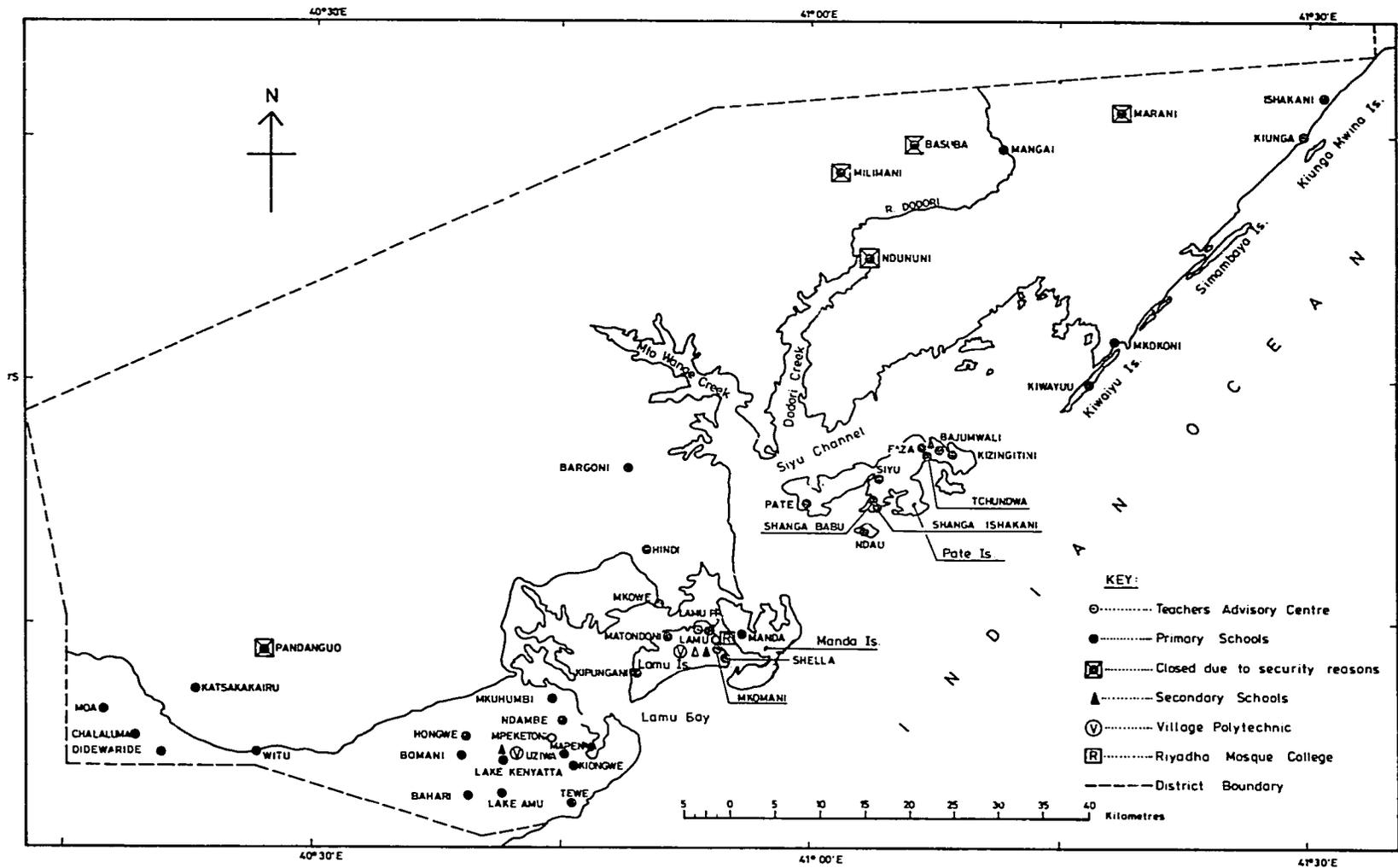


TABLE 3.20. POST PRIMARY EDUCATIONAL INSTITUTIONS, 1983

NAME	DIVISION	TEACHERS	AVERAGE PUPILS/ CLASS	SPONSORING AGENTS
a) <u>Secondary Schools</u>				
Lamu Boys	Amu	6	40	Government
Lamu Girls	Amu	6	40	Government
Mpeketoni Mixed	Mpeketoni	6	40	Government
Faza Mixed	Faza	3	40	Government
b) <u>Village Polytechnics</u>				
			<u>Enrolment</u>	
Mpeketoni	Mpeketoni		126	
Lamu	Amu		86	

SOURCE: District Education Officer, Lamu District.

TABLE 3.21: ENROLMENT IN MAJOR TRADES IN LAMU DISTRICT VILLAGE POLYTECHNICS BY SEX, 1983

TRADE	<u>E N R O L M E N T</u>		
	Boys	Girls	Total
Carpentry	55	-	55
Dress-making/Tailoring	4	82	86
Home Economics	4	35	39
Masonry	32	-	32
TOTAL	95	117	212

SOURCE: Lamu District Development Plan, 1984-1988

TABLE 3.22

ADULT EDUCATION ORGANIZATION AND ENROLMENT-  
LAMU DISTRICT, 1984

DIVISION	FULL TIME			PART TIME			SELF-HELP			TEACHERS		
	NO. OF CLASSES	MALE	FEMALE	NO. OF CLASSES	MALE	FEMALE	NO. OF CLASSES	MALE	FEMALE	FULL TIME	PART TIME	SELF HELP
KIUNGA	4	36	25	5	54	62	1	-	18	2	5	1
FAZA	5	30	296	11	150	89	-	-	-	5	11	-
WITU	3	3	55	4	19	49	-	-	-	3	4	-
MPEKETONI	7	14	102	19	66	199	-	-	-	7	19	-
AMU	11	38	156	13	124	148	3	18	-	5	13	3
TOTAL	30	121	634	52	413	547	4	18	18	22	52	4

SOURCE: District Adult Education Officer, Lamu, 1984

#### 3.5.4.4 INFORMAL EDUCATION

There are over 30 "Madrassas" or Koranic Schools in the district. These are organized on part-time basis for pupils attending other schools. Children join "Madrassas" at 6 to 7 years of age and complete at the age of 12 to 13 years. The Lamu Riyadhha Mosque College, set up in 1900, enrolls 30-50 students annually from Kenya and some neighbouring countries.

There is also an informal training in crafts. This is attended on a family membership basis and is mainly in traditional carpentry. There is a general lack of training in modern skills like repair of boat engines and electrical appliances, plumbing, mechanical work, among others.

#### 3.5.4.4 IMPLICATIONS FOR ENVIRONMENT AND DEVELOPMENT

There appears to be a conflict between formal education and Koranic teaching, especially on the islands. Most Muslim parents prefer to send their children to Koranic schools but attempts have been made to reach a compromise. Most parents now allow their children to attend formal schools in the morning and Koranic schools in the afternoon.

Owing to the flat nature of the terrain, large tracts of land are poorly drained. Schools like Milimani, Basuba, Mangai, Mararani and Ishakani become inaccessible by road during the wet season. This affects pupils work and progress.

Insecurity is one of the major problems facing education institutions in the hinterland. Currently, Pandanguo, Milimani, Basuba, Mararani and Ndununi schools are closed due to security reasons.

In Mpeketoni, children have to assist their parents in guarding crops against wildlife damage between June and August in order to realise any harvest. Although the administration is assisting, the question of absenteeism from school as a result wildlife menace to crops is crucial in the district.

## PART II

### ENVIRONMENTAL PROBLEMS AND DEVELOPMENT

#### 4.0 THE TERRESTRIAL ENVIRONMENT

##### 4.1 LAND TENURE

###### 4.1.1 AN OVERVIEW

As mentioned in Section 3.1.2, the present land tenure systems and lack of title deeds make it very difficult for the people to develop their farm lands. This is because many of them are unable to obtain loans for this purpose. A plot is recognised as belonging to an individual only when the individual is actively farming on it. This clearly shows that there is no motivation to develop that piece of land by investing into it by way of soil conservation measures or fencing. The situation is made worse by the lack of credit. The prospects for increased agricultural productivity in settlement schemes are high because many of the farmers in these schemes are able to obtain credit for agricultural purposes.

###### 4.1.2 RECOMMENDATIONS

To exploit the agricultural potential for the district to the maximum, it is recommended that funds should be solicited for the establishment of more settlement schemes. It is only through such schemes that people can be effectively settled and be given some assistance to increase their productivity. Lake Kenyatta Settlement Scheme is a good example of the anticipated development.

The people who are allocated plots should be given title deeds to enable them obtain credit from financial institutions.

#### 4.2 AGRICULTURAL DEVELOPMENT

##### 4.2.1 NATIONAL GOALS FOR AGRICULTURE

The country's highest development priority is the rapid growth of agricultural production. It is therefore the government's policy to ensure that:

- the agricultural sector supplies the food required by a growing population,
- produces more for export,
- provides productive work for the expanding labour force,

- maintains rural livelihoods, and
- sustains environmental health.

Agricultural productivity can be increased through the expansion of land under crops and increases in yields per unit area. In Lamu district, some expansion of the cultivated areas especially in the settlement schemes is possible.

Agricultural development can also be achieved through the application of investments in the establishment of settlement schemes, so making full utilization of idle land, use of improved varieties of seeds, extended use of fertilizers and pesticides, better farm management, improved infrastructure and protection of crops from destruction by wild animals.

#### 4.2.2 CONSTRAINTS TO INCREASING AGRICULTURAL PRODUCTIVITY

Most of the farmers in Lamu district are small holders whose major constraint is limited resources or a total lack of some of the resources. For example there is no stockist in Lamu District to supply agricultural inputs.

Another constraint mentioned earlier, is the land tenure problem. Many people do not have title deeds that can enable them obtain loans to develop their farms.

There is a low standard of technology in the farming practises. Labour productivity per unit of land is also very low because the traditional methods combined with relatively low fertility soils necessitate the use of large areas of land to produce sufficient food even for family subsistence needs.

Another major constraint to increasing agricultural productivity in Lamu district is the destruction of crops by wild animals, especially baboons. Wild pigs, elephants and antelopes also cause damage to crops.

Agricultural development in Lamu District is also constrained by inadequate services such as regular extension visits, farmers' training courses, supply of improved varieties of seeds and seedlings, inputs such as fertilizers and pesticides, market outlets and credit facilities.

Insect pests and plant diseases cause losses as in the case of cotton. However, the constraint to agricultural development posed by insect pests and plant disease is minimal compared with crop losses caused by wildlife damage.

Another problem restricting the agricultural productivity is the condition of most of the roads which become impassable during wet seasons.

Lack of markets for horticultural crops such as mangoes is also another constraint.

On Lamu Island, floods are a major problem. These come after every 3 years. Other areas affected by this problem are Mpeketoni and Witu. The floods cause a lot of crop destruction when they occur.

Over the last twenty or so years, there has been a problem of insecurity in many parts of the district. This has retarded the development of agriculture because many people had abandoned their farms, particularly in Kiunga and Faza, and settled on the islands.

#### 4.2.3 PROGRAMMES UNDER WAY

Many programmes have been proposed and their implementation is yet to be carried out. The following are some of the few programmes which are being implemented in various divisions of the district.

1. A coconut rehabilitation and expansion programme involving the raising of good quality seedlings which are given to farmers to plant in place of the old and unproductive palms which are cut down. This programme is on-going mainly in Witu and Faza divisions.
2. In Faza division, there is a programme, through demonstration and extension visits, aimed at encouraging the people to eat more vegetables.
3. In Witu division, a programme in soil conservation measures is on-going. Farmers are advised to plant special trees and where there is waterlogging, the farmers are assisted and shown how to drain the land.
4. There is the National Seasonal Credit Scheme which is aimed at providing small loans to farmers, but which is not thriving due to lack of proper management in the co-operative society and also failure on the part of most members to repay the loans.
5. There are also a number of extension programmes in the Lake Kenyatta Settlement Scheme. These however, are not very effective due to lack of adequate transport facilities and staff to implement the programmes.

#### 4.2.4 RECOMMENDATIONS

1. As discussed in Section 4.2.2. above, the indigenous people of Lamu District use very low technology of farming. This low technology will make it very difficult to improve their agricultural output beyond a subsistence level.

2. As is evidenced by the Lake Kenyatta Settlement Scheme, the development of agriculture in the district will very much depend on the establishment of new settlement schemes and the expansion of the present ones.

3. Crop destruction by wildlife is one of the major hinderances to agricultural development in the district. The Department of Wildlife Conservation and Management should work out a system of reducing the numbers of wildlife that are a menace to crops. This system may include game cropping and fencing of farm lands. The latter though will be very expensive.

4. The conditions of most of the roads, especially in the Lake Kenyatta Settlement Scheme, should be improved to enable farmers who are usually cut off during the rainy season to transport their agricultural produce to the buying centres.

#### 4.3. LIVESTOCK AND RANGELANDS DEVELOPMENT

##### 4.3.1 SPECIAL PROBLEMS AND OPPORTUNITIES OF RANGELANDS

Range and desert land in Lamu District covers an area of about 255,000 ha of which 170,000 ha, have been set aside for the development of ranches (see Section 3.3.3).

The development of ranches in the district has been seriously retarded by poor availability of permanent water. Again, even in areas with permanent water, there is serious competition between livestock and wildlife for the available water.

Development finance is another major constraint that has restricted the development of ranching in the district. Only three ranches - Nairobi, Amu and Witu Nyongoro (see Figure 12) have been able to receive loans through the Agricultural Finance Corporation (AFC). As discussed earlier, most ranchers in the district do not have the leasehold certificates which are required by the AFC so it becomes very difficult for them to obtain loans.

Another problem that has been hindering livestock development in the district is cattle rustling and banditry. Faza, Kiunga and Witu divisions have been more vulnerable to this menace than any of the others.

Diseases also affect the development of livestock in the district. Trypanosomiasis is the major disease. This disease is prevalent due to shortage of appropriate drugs and also to the presence of some species of wildlife which act as hosts for trypanosomes. Tick control programmes in the district have not been successful, mainly due to the widespread movements of pastoralist stock.

The potential for livestock development in the district is high. However, the aforementioned problems have hindered the successful development of the rangelands and improvement of livestock industry in general.

#### 4.3.2 PROGRAMMES UNDER WAY

1. There is a poultry project under the National Poultry programmes where cockerels of improved breeds are raised and exchanged with the local types.

2. A sheep and goats programme aimed at improving the local breed through crossing and selection is also in progress.

3. There is a government demonstration project for bee-keeping at Mpektoni. It is used by extension officials to reach interested local people and teach them practical aspects of bee-keeping.

#### 4.3.3. RECOMMENDATIONS

With the recent improvement in security, increased efforts to alleviate the other impediments to livestock development mentioned above should be made. The most important considerations to be included in any development programme should be the development of water supplies, provision of credit facilities and extension services to ranchers. The Agricultural Finance Corporation should also accept letters of allotment as collateral to provide loans to interested ranches.

#### 4.4 INDIGENOUS FORESTS AND WILDLIFE

##### 4.4.1 INDIGENOUS FORESTS

Although the mangroves constitute the dominant forest resource in the district, there are other indigenous forests in the mainland with valuable resources. These are the Witu Forest Reserve, Lungi Forest and Boni Forest (Figure 18). The last two are not gazetted.

Witu Forest Reserve has an area of 3,839.5 ha of natural forest and 98.1 ha of plantation<sub>3</sub> forest. The natural forest has a gross volume of 315,425m<sup>3</sup> of which 30% of the trees are over 30 cm in diameter. Manilkara sansibarensis is the most exploited species in this forest. Brachylaena hutchingsii is exploited for its hardwood for carving whereas the famous Lamu carved doors are made from Azelia guanzensis.

As stated in Section 2.3, the natural vegetation, and thus the indigenous forest, is threatened by fires and through agricultural development. The Boni Forest was, until the ban on hunting, relatively safe from these activities. Now it is threatened by the Boni people who burn large portions of the forest every year for subsistence agriculture.

The Doum Palm which is rather unique in the whole of East Africa is tolerant to both fires and water-logged soils. It has however, not escaped the attention of the people. All the Doum Palm trees in the settled areas have been uprooted especially in Mpeketoni division. There are claims that the palm attracts baboons because of its fruits. The Doum Palm has many uses and there is need to protect it.

Another threatened management tree is Tecleopsis glandulosa locally known as "wangati". This slow-growing tree has hard wood and is resistant to termites. It is therefore much in demand both for fencing and building poles. As such one hardly sees "wangati" near the settlements because they all have been cut down for domestic use.

Afforestation programmes are underway in the district but they have been hindered by:

- shortage of vehicles to transport the necessary materials and personnel to supervise the rural activities and the poor state of roads,
- inadequate and unreliable water supplies,
- lack of labour,
- lack of staff due to a housing shortage, and
- damage of young trees by wild animals.

Efforts are however, being made to get the programme going.

#### 4.5

#### TERRESTRIAL WILDLIFE

The entire district constitutes a wildlife region. Although detailed census for Lamu District has not been carried out, the available data (Table 4.1) shows an abundance of wildlife. Most of the plain herbivores, e.g. wildebeest have increased in number especially around the settlement areas of Lake Kenyatta. Areas where a high concentration of wildlife is found are in Witu, Dodori National Reserve and on Manda Island, among others.

In addition to the large animals the diverse habitats of the district contain many species of birds, snakes, butterflies and insects, along with many other small animal species.

As discussed in several of the earlier sections, even though wildlife has both ecological and economic values, they are a menace to crop production in the district and effort needs to be made to stop them from damaging the livelihood of majority of the people.

Table 4.1 LARGE ANIMALS FOUND IN LAMU DISTRICT

	<u>1976 (March)</u>	<u>1978 (Jan)</u>
Elephant	1,400	12,000
Wildebeest	11,000	15,000
Zebra	10,000	10,000
Giraffe	5,000	7,000
Waterbuck (Ringed)	2,500	1,800
Buffalo	5,000	3,500
Rhino	820	-
Topis	68,000	72,000

SOURCE: Wildlife Department Lamu. 1984

## 5.0 COASTAL AND MARINE RESOURCES

### 5.1 INTRODUCTION

Exploitation of marine resources by the people in Lamu District is quite high. Large quantities of mangroves, molluscs, fish, lobsters, prawns and crabs, are exploited on commercial basis. The non-living resources like fossil corals, lime, and sand are also exploited but mainly for domestic purposes, e.g. brick making and building construction. It is only the algae and zooplankton which are not of any commercial or social value to the people that are not touched. Some of these organisms occur on artificial habitats along the coastline while others are found in the sea.

### 5.2 FLORA AND FAUNA OF ARTIFICIAL HABITATS

The artificial habitats under consideration here are man-made barriers constructed along the shoreline to prevent encroachment by the sea. In Lamu this consists of a concrete wall or a pile-up of solid waste barriers above the shoreline. The following living organisms are among many others found on these artificial habitats.

At Faza the concrete sea-wall supports small numbers of Nerita undata, Littorina scabra, Chathamalus spp. and Crassostrea cucullata.

On Lamu Island the following organisms are found on the sea-wall; Littorina kraussi, Crassostrea cucullata, Morula fenestra, M. granulata, Isogonomon dentifer, Chathamalus spp., Planaxis sulcatus, Onchidium veruculatum and the crab Geograpsus stormi, among others.

In some areas in the district, wall barriers are submerged at high tide because the walls are not high enough. In such areas, the wall surfaces have completely been covered with dense growths of Crassostrea cucullata, giving the impression of an outcrop of a buried reef. The

rough surfaces created by the Crassostrea cucullata give shelter to other organisms like Morula granulata, Mytilus spp, Isogoonomon dentifer, Nerita undata, N. albicilla and Planaxis sulcatus.

#### 5.2.1 ROLES OF ARTIFICIAL HABITATS

The water medium carries various types of larvae of rocky shore invertebrates. These may settle on both natural and artificial 'rock' habitats. Marine invertebrates release planktonic juveniles or spawn abundant numbers of eggs from which several larvae are hatched. In some cases massive death of larvae or juveniles may occur due to unavailability of substrates to settle on. Since natural rocky shores are scanty in this district it is likely that the habitat is a limiting factor to successful settlement of rocky shore invertebrate larvae. The man-made barriers therefore offer an alternative stratum to many of these organisms. As more stretches of walls are built to safeguard the seashore from wave action a build-up of rocky shore community of various other species may be evident. Such a build-up will help to maintain a continuity of genetic material of these rocky shore species.

#### 5.2.2 SEA BARRIERS USING WASTES AND THEIR ENVIRONMENTAL IMPLICATIONS

Another form of artificial barriers along the Lamu coastline is created from a pile-up of domestic waste. As these continuously pile on as a result of rubbish dumping, the shore is elevated and slowly transformed to a terrestrial environment. Although the rubbish is set on fire regularly, it cannot burn completely because of the damp conditions at the site. Hence there is a chance of build-up of these waste materials above the shore line.

Dumping of domestic solid wastes into the sea to act as barriers or for reclaiming land from the sea is also practised at Faza. To protect the houses which are near the banks of the creeks, the inhabitants build mangrove-pole enclosures along the lower grounds (Figure 17). In these enclosures domestic rubbish is dumped in order to create a barrier and also elevate the shore-line considerably above sea level. In some parts of the shore, this activity has appreciably reclaimed land from the sea. This system of protecting the sea-shore from denudation is a unique invention by the local people.

Although the types of wastes deposited are carefully sorted out and those which could produce unpleasant odours are disposed elsewhere, there is need to monitor the shore for any toxicity and pollution of the water medium due to the waste materials.

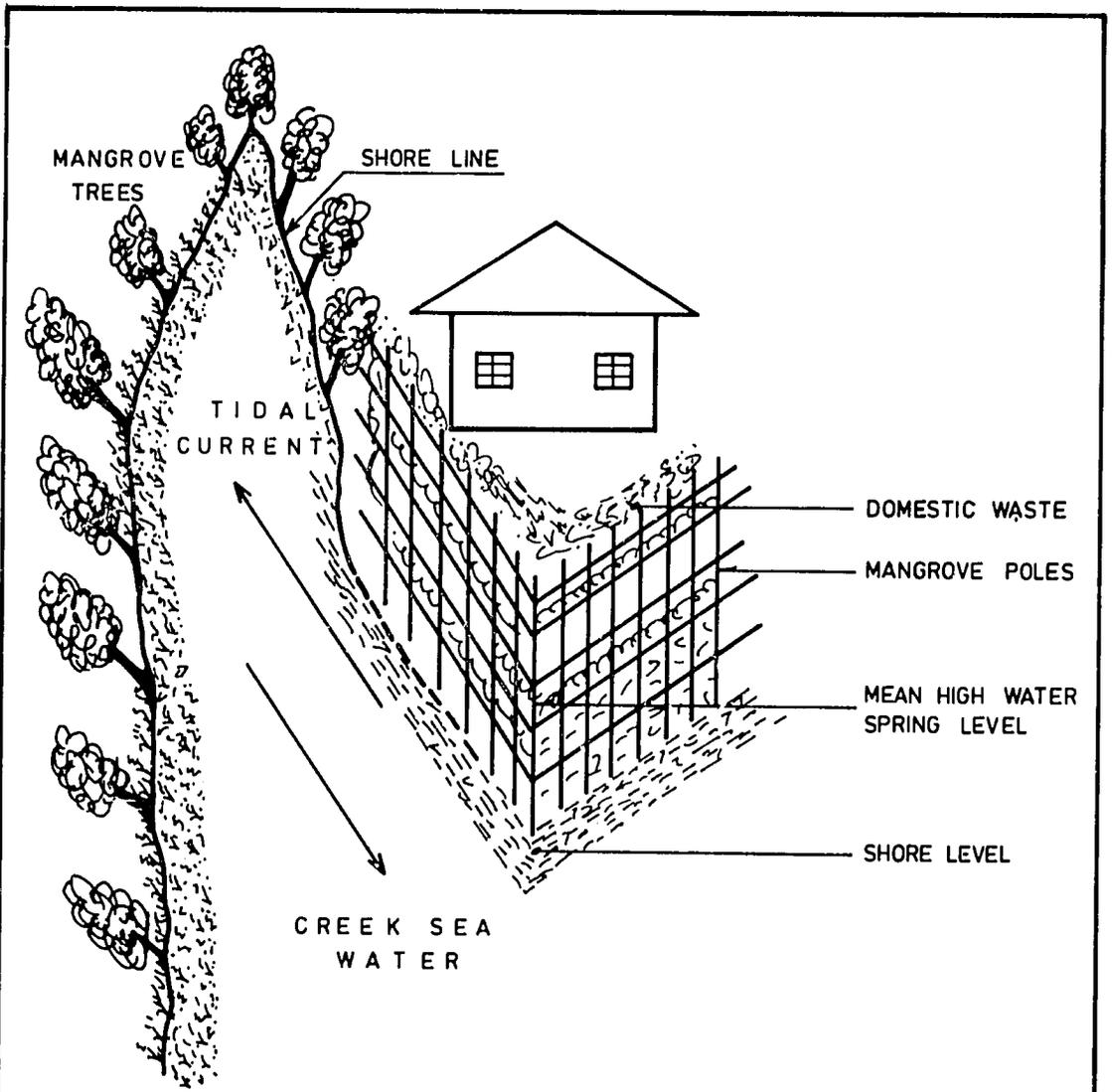


FIGURE 17: SEA BARRIERS USING DOMESTIC WASTES  
IN MANGROVE ENCLOSURES AT FAZA

SOURCE : NES/KMFRI Team.

### 5.2.3 POLLUTION

A huge accumulation of garbage dumped in the vicinity of a mangrove swamp at one end of Lamu Island has raised a lot of concern among various authorities. The garbage site is known to be a breeding ground of flies. The smell from putrefying matter which includes waste from butcheries and markets annoys residents. Broken glasses, bottles, tins, plastics, torch cells etc. are all found at this particular dumping site.

The organic matter and chemicals leached from the dump to the sea when it rains or during spring high tide are thought to be polluting the sea. Other sources of organic matter are scavenger birds. The rubbish dump supports a big community of scavenger birds which feed on the garbage. A large amount of the droppings of these birds are scattered on the shore and get washed into the sea at flood tide.

The area around this rubbish dump still supports numerous Uca and Sesarma spp which are characteristic fauna of mangrove ecosystem, which is an indication that the environment is not yet adversely affected. There is however, an immediate need to study the effects of chemicals leached from the garbage on the environment, particularly on the mangrove organisms.

Visible floating oil has not yet been reported in Lamu District and there have been no complaints about oil pollution. However, due to the fact that diesel propelled boats are commonly used for transportation. The concentration of dissolved hydrocarbons needs to be investigated.

## 5.3

### MARINE FISHERIES

#### 5.3.1. TYPES OF FISHERY RESOURCES

The main types of fishery organisms caught in this district include kingfish, barracuda, snappers, cavalla jacks, sharks, rays, groupers, scavengers, goatfishes, grunts, siganids, sardines, emperors, mackerels, sicklefish, crabs, lobsters, prawns and squids.

#### 5.3.2 ORGANISATION OF THE FISHING INDUSTRY

Fishermen are licensed and their fishing craft registered. There is no restrictions however on the number of fishermen (Table 5.1) that can operate in the area. The fishermen have been organised into a fishing co-operative society with the aim of not only eliminating exploitation by middle men but also to help the fishermen acquire loans (so that they can improve their craft, gear, etc), to acquire storage facilities, and improve and control the marketing system. The Fisheries Department and Co-operative officials are continually helping this society achieve its goals. The

Department operates through the society to pass on relevant information on several aspects of fishing to members.

Due to lack of cold storage facilities, fishing activity is not carried out daily or as frequently as the fishermen would like. Active fishing is done when dealers put forward their order and send vehicles to collect the catch. Dealers supply ice blocks to preserve the catch which is mostly transported to Malindi, Mombasa, and Nairobi. Some of the catch, especially of prawns, is processed in Mombasa for export. A large portion of the catch is however, gutted, salted and sun-dried before sale. Data on fish from Lamu to other districts are not available. The collection of such data is difficult because some of the catches are not landed in the district.

TABLE 5.1. NUMBER OF REGISTERED FISHERMEN  
LAMU DISTRICT

<u>FISHING CENTRES</u>	<u>NO. OF FISHERMEN</u>	<u>AVERAGE DAILY CATCH</u> (kg)
Kiunga	200	4*
Faza	500	3*
<u>Amu</u>	<u>150</u>	<u>8*</u>
<u>Total</u>	<u>850</u>	<u>15*</u>

NOTE. \*Not all fishermen go out fishing every day.

SOURCE: Fisheries Department, Lamu Office. 1984.

The prices per kg (wet weight) of various catches paid to fishermen at the land depots in Lamu District are as shown in Table 5.2.

### 5.3.3. LIMITATIONS OF THE FISHING INDUSTRY

The state of the fishing industry strongly depends on how efficiently the available resources are exploited. In that context the following can be said to be the main limitations affecting fishermen and hence fishing activities in the district.

(a) Craft: Although the Bajuni and Swahili fishermen of Lamu District have the necessary experience to build larger boats (10-50 tons) than any other local Kenyan fishing community, their craft are not strong enough for deep sea fishing.

TABLE 5.2. FISH PRICE AT LANDING DEPOTS IN LAMU DISTRICT  
(WET WEIGHT)

<u>ITEM</u>	<u>PRICE PER KG</u>
Fish GI	KShs. 5/50
Fish GII	4/10
Fish GIII	2/50
Kingfish GI	13/80
Kingfish GII	8/90
Lobsters	40/50
Prawns GI	13/50
Prawns GII	10/80
Crabs	10/00
Squid	5/00
<u>Parrot fish</u>	<u>1/20</u>

SOURCE: Fisheries Department, Lamu Officer, 1984.

(b) Hydrographic factors: The heavy wave action during the South-East Monsoon restricts fishing to the inshore waters. On the other hand during the calm North-East Monsoon, fishing can be done further in the offshore waters.

(c) Untrawlable bottoms: Most of the offshore areas have tough, spiky and stony bottoms which tear nets when trawling.

(d) Cold storage facilities These are lacking in Lamu District. This lack is stifling the efforts of the local fishermen to improve their catches because they fear a bigger catch may get rotten. An alternative would be to buy a fleet of vehicles to transport the catches in cold boxes immediately they are landed. The roads however, are bad during rainy seasons as noted earlier. In some cases lobsters have to be airlifted due to the poor road conditions.

Catch records at the various landing depots in the district, from 1977 to 1983, are as shown in Table 5.3.

#### 5.4. OTHER MARINE RESOURCES

In addition to the coastal and marine organisms discussed in Sections 5.2 and 5.3, large quantities of other

TABLE 5.3

CATCHES AT VARIOUS LANDINGS IN  
LAMU DISTRICT - (KG)

<u>YEAR</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>
AMU	189,737	282,994	220,947	341,641	378,894	453,755	420,314
KIUNGA	131,333	181,831	135,671	307,141	307,642	268,323	282,240
FAZA	455,312	669,242	649,808	666,979	713,893	694,883	548,711
<u>TOTAL WEIGHT.</u>	<u>776,382</u>	<u>1,134,067</u>	<u>1,006,426</u>	<u>1,315,761</u>	<u>1,400,429</u>	<u>1,416,961</u>	<u>1,251,265</u>
<u>TOTAL VALUE</u> <u>(RSH)</u>	<u>2,102,280</u>	<u>3,196,527</u>	<u>3,351,908</u>	<u>4,651,830</u>	<u>5,320,917</u>	<u>6,551,589</u>	<u>5,965,803</u>

SOURCE: Fisheries Department, Lamu Office 1984

marine organisms, are found at Lamu. On account of these organisms Kiunga was gazetted as a reserve to protect the unique genetic resources, some of which are of scientific interest.

Some important species found in the Kiunga Marine Reserve are:

- (1) Marine Mammals: the dugong (Dugong dugong)
- (2) Marine Reptiles Hawksbill Turtle (Eretmochelys imbricata)  
Olive Ridley Turtle (Hepidochelys divacea)  
Loggerhead Turtle (Caretta caretta)
- (3) Marine Birds Roseate Tern (Sterna dongalli)  
White-checked Tern (Sterna repressa)  
Soaty Tern (Sterna fuscata)  
Bridled Tern (Sterna anaethetus)  
Cannon Noddy (Chous stolidus)  
Hemprich's Gull (Larus hemprichii)

The above mentioned marine organisms are not confined to the Lamu region, but are known to occur along the entire Kenyan coast and the Indian Ocean in general.

Mangrove crabs are plentiful in Lamu. They are caught by the local people who poke them out of their holes in the mud with a curved stick. However, as mangrove forests are being intensively cut down in some areas the mangrove crab is becoming less plentiful.

Lobsters are found in the coral reef areas. They are also caught by the fishermen and sold to hotels on Lamu and other islands. Some are flown to Malindi and Mombasa.

Large quantities of prawns also occur. They are caught either on a small scale using prawn nets, or on large scale by trawlers. Large quantities are sold at the local markets, either dried or fresh. Some are also flown by small aeroplanes from Lamu to Mombasa and Nairobi, where they are sold to hotels, etc. or are frozen for export.

Various types of shells also occur in large quantities, but massive collection is taking place especially at Kiunga. This has led many conservationists to express fear that certain species in the Kiunga Reserve (and the coastal areas in general) are seriously threatened. These include species like clams (Tridacna spp.), the bullmouths (Cypraeacassis rufa) and the triton (Charonia

tritonis), which are the most preferred by tourist and shell collectors and buyers who are responsible for the export market.

#### 5.4.1 THE LOCAL SHELL TRADE

The number of licensed shell collectors in the whole district is 35 whereas the number of shell dealers and retailers are 4 and 3, respectively. Shells sold in the district come from within and due to low volume of tourism in the district, most of the shells are sold in Malindi and Mombasa.

During this survey, only one retail shell premises was open and the prices pertaining at the time are given in Table 5.4. The prices quoted are those that a Kenya resident would likely be charged. A tourist may be charged about twice as much. At the major tourist areas, eg. Mombasa, the prices of shells are comparatively higher.

Locally, shells are used for making ornaments, ash trays, flower vases and souvenirs. Besides these uses, Lamu inhabitants make chalk from shells of the mangroves swamp mollusc Terebralia palustris. Cleaned shells of Terebralia palustris are dried for a few days and then burnt using coconut husks. This is then ground into a white powder which is used for white washing among others.

#### 5.5 CONSERVATION

The rate of cutting of mangroves has decreased considerably. This is not only because of the ban on export of mangroves, but also the ban on burning of mangroves for charcoal. Mangrove cutters are now licenced and the marketing of poles is only through the Mangrove cutters' Co-operative Society.

The major reserves in the district are the Kiunga Marine National Reserve and Dodori national Reserve. (Figure 18). Kiunga has islands where birds breed, and both Kiunga and Dodori reserves have mangrove thickets. Detailed inventories of marine fauna and flora in these reserves are lacking. It is necessary that all species in these reserves be identified and scientifically studied in order to offer comprehensive information to help in their conservation.

The Kiunga Reserve should be upgraded to National Park status. This is justifiable for the preservation of the rare and important species found there. It should be considered a living museum, a natural laboratory, for use by Kenyan and international scientists, and part of the heritage of the people of Kenya.

TABLE 5.4 PRICE LIST OF VARIOUS TYPES OF MARINE SHELLS  
AT A LAMU SHELL KIOSK, JULY 1984

<u>Family</u>	<u>Species</u>	<u>Price (KShs)</u>
Turbinidae	<u>Turbo marmoratus</u>	15/= (20-30/=)
Strombidae	<u>Lambis lambis</u>	3/= (10-15/=)
	<u>Lambis crocata</u>	3/= (10-15/=)
	<u>Lambis truncata</u>	50/= (40-80/=)
Cypreidae	<u>Cypraea annulus</u>	1/= (1-5/=)
	<u>Cypraea moneta</u>	1/= (1-5/=)
	<u>Cypraea caurica</u>	1/= (1-5/=)
	<u>Cypraea lynx</u>	1/= (1-5/=)
	<u>Cypraea vitellus</u>	2/= (5-10/=)
	<u>Cypraea carneola</u>	2/= (5-10/=)
	<u>Cypraea felina</u>	2/= (1-5/=)
	<u>Cypraea histrio</u>	3/= (10-20)
	<u>Cypraea tigris</u>	3/= (5-10/=)
	<u>Cypraea staphylaea</u>	5/= -
	<u>Cypraea ziczac</u>	5/= (20-30/=)
	<u>Cypraea asellus</u>	5/= -
	<u>Cypraea mauritania</u>	7/= (30-40)
Cassidae	<u>Cypraecassis rufa</u>	10/= (15-20/=)
Tonnidae	<u>Tonna galea</u>	25/= (20-30/=)
Muricidae	<u>Chicoreus ramosus</u>	5/= (20-30/=)
Fasciolaridae	<u>Fasciolaria trapezium</u>	4/= (1-5/=)
Olividae	<u>Oliva spp</u>	1/= (1-5/=)
Mitridae	<u>Mitra mitra</u>	5/= (10-15/=)
Vasidae	<u>Vasum turbinellus</u>	2/= (1-5/=)
Conidae	<u>Conus ebraeus</u>	1/= (1-5/=)
	<u>Conus leopardus</u>	5/= (5-10/=)
Bullidae	<u>Bulla ampulla</u>	1/= (1-5/=)
Pteriidae	<u>Pinctada margaritifera</u>	2/= (5-10/=)
Pennidae	<u>Pinna bicolor</u>	5/= -
Tridacnidae	<u>Tridacna squamosa</u>	15/= (5-20/=)
Nautilidae	<u>Nautilus pompilius</u>	5/= (20-30/=)

Note: Mombasa Shell Prices are shown in Parentheses.

SOURCE: Compiled by the Research Team, NES and KM & FRI.

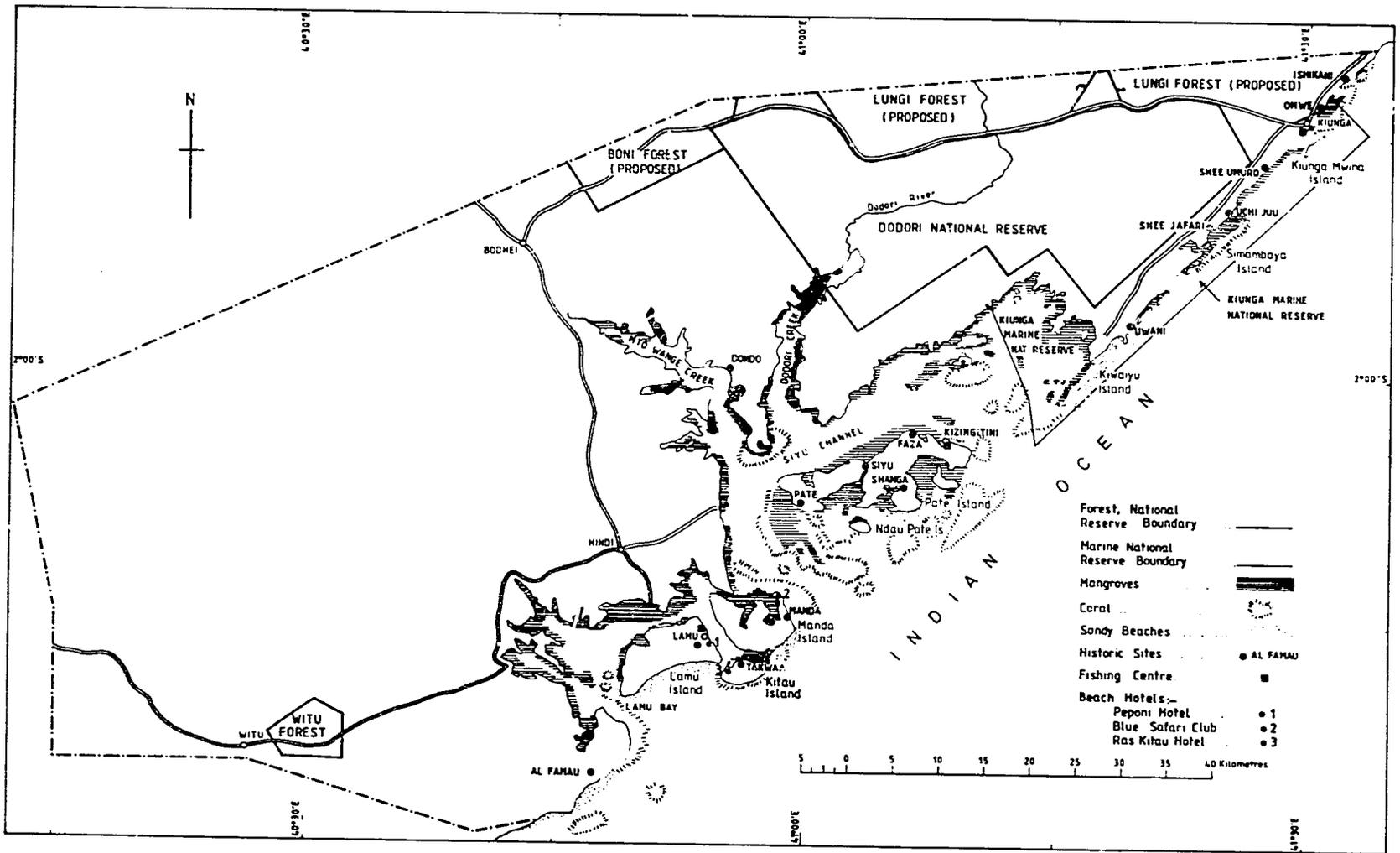


FIGURE 18: COASTAL RESOURCES, FORESTS AND NATIONAL RESERVES - LAMU DISTRICT

SOURCE : Compiled by N.E.S and Forest Department

Shell collection at Kiunga must be stopped and alternative means of livelihood be found for impoverished families so that they need no longer depend on shell collection as a source of income. The breeding grounds of the dugong and marine turtles should be also be protected.

An educational scheme, to help the local people understand their environment, must be set up. This should include explanations as to why conservation is needed in the area.

In so doing, co-operation of the local administrators, chiefs, sub-chiefs, community leaders and teachers, must be sought. This way efforts on conservation may be effective.

#### 5.6 GOAL CONFLICTS AND THEIR IMPLICATIONS FOR THE ENVIRONMENT

During discussions with various heads of Sections and Departments in the district, it was pointed out that there is over-protection of wildlife resources in the area some times even at the expense of human survival. The effects of these conflicts of interest means that the conservation of wildlife will not be appreciated by the people.

The conservation of mangroves is less problematic to the people due to the fact that the majority of these people exploit the mangroves for commercial purposes, also that the forests protect the shores from being extensively eroded by wave action and if removed the inhabitants would be forced to construct more sea barriers. It seems it is for these two reasons that conservation of the mangrove forests have been socially less problematic, rather than the mere appreciation that these forests provide nutrients to various marine organisms, and act as nursery grounds for prawns and good habitats for other commercial organisms such as crabs and oysters.

Mariculture of prawns in Lamu District has not yet started. However, since the large extensions of mangrove forests may attract prawn farmers, some cautionary remarks are necessary. Formation of prawn ponds by clearing portions of mangrove forests should be carefully planned and monitored, especially if prawn larvae or stock seed for the ponds are to be captured from the mangrove environment. The quantity of wild seed is likely to decrease as a result of the destruction of mangrove forests. The seed quality may also be poor as a result of degradation of the mangrove environment. Wild prawns may decrease in number due to excessive tampering with the larvae. Since prawn ponds are usually privately owned, a decline in the availability of wild prawn and other mangrove related fisheries is likely to profoundly affect the local fishermen who depend on fishing for their livelihood.

Similarly, sand dune areas may be utilized as sites for building tourist hotels in future. Sand dunes conspicuously cover many parts of the coasts of Lamu District and are good scenic sites for recreation.

Under natural conditions and in areas where there is less activity, the sand deposits are stabilized by vegetation but where there is disturbance, sand is continually blown away by wind. This implies that if hotels are built without careful planning, erosion may increase in these areas. Sand accumulation in the sea may change the species composition in these areas. It is worth mentioning here that mangroves do not tolerate high rates of sedimentation.

Thus even though building of hotels may help to alleviate unemployment, the problem of increasing sediment transport from dunes or sandy shores to the sea should be carefully considered before embarking on any such projects.

#### 5.7 MANGROVE FORESTS

The mangrove forest reserves extend from Kiongwe in the south-west, to Kiunga in the north-east. They occupy a total area of 46,229.8ha of which 42.3% is merchantable, 33.2% is unmerchantable and the rest is non-forested land.

The mangrove forest has been divided into 4 geographical regions (Table 5.5), as follows:

- (a) Southern swamps
- (b) Mongoni, Dodori and Pate Island swamps
- (c) Central swamps
- (d) Northern swamps

Mangrove forests may be classified by main species and utilization classes. The utilization classes (Table 5.6) indicate the condition of the stand for exploitation purposes. In Lamu, these classes vary from 2.5 cm to over 30.5 cm in diameter.

"Mkoko" is the most commercial species in all the regions, mostly in the form of Fito and Pau. The unmerchantable stands are found on the landward side of the swamps where tidal influence is minimal. "Mkandaa" is also common in such sites. "Muchu", "Mlilana" and the rest, are considered non-commercial regardless of diameter or form, although they are classified as merchantable.

Stocking of the mangrove stands is high averaging over 2,500 stems per hectare. However, majority of the stems are either too short, crooked or too large to be of commercial value. Inventories by the Forest Department show that due to heavy exploitation and poor regeneration the stock is decreasing. Heavy exploitation usually takes place in deep creeks. On the other hand in shallow creeks which

TABLE 5.5

CLASSIFICATION OF THE MANGROVE SWAMPS

LAND CLASS (FORESTED)	SOUTHERN SWAMPS	MONGONI, DODORI & PATE ISLANDS SWAMPS	CENTRAL SWAMPS	NORTHERN SWAMPS	TOTAL AREA (ha)	% OF TOTAL
Merchantable (ha)	5216.4	7279.1	5066.9	1990.9	19553.3	42.3
Unmerchantable (ha)	3705.0	6715.9	4045.9	363.8	15330.6	33.2
Non-Forested Swamy Grassland (ha)	166.8	961.3	147.6		1275.7	2.7
Sand (ha)	3915.9	3036.9	2998.4	62.8	10014.0	21.7
Water (Ponds, Pools within Swamps) (ha)	4.4	48.6	1.6	1.6	56.2	0.1
TOTAL (ha)	13008.5	18041.8	12260.4	2919.1	46229.8	100

SOURCE : Forest Department, 1984

almost dry up during the low tide, the stands are teeming with good poles. The most affected regions are in the central and southern swamps.

TABLE 5.6 UTILIZATION CLASSES OF MANGROVES

<u>Utilization class</u>	<u>Diameter in cm</u>
Fito	2.5 - 3.5
Pau	4.0 - 7.5
Mazio	8.0 - 11.0
Boroti	11.5 - 13.5
Nguzo 1	14.0 - 16.5
Nguzo 2	17.0 - 20.0
Nguzo 3	20.5 - 30.0
<u>Timber-Banaa</u>	<u>Over 30.5</u>

The forests contain the following main species:

<u>Latin Name</u>	<u>Local Name</u>
1. Rhizophora mucronata	Mkoko
2. Ceriops tagal	Mkandaa
3. Bruguiera gymnorrhiza	Muia
4. Avicennia marina	Muchu
5. Sonneratia alba	Mlijana
6. Xylocarpus moluccensis	Mkomati

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Mangrove poles have been the most important export commodity in Lamu District for ages, and their value seems to have increased dramatically in recent years and so has their exploitation. There is some concern within the Forest Department that overexploitation may be taking place and that wrong selection methods have sometimes been used by cutters. The Department has therefore drawn up regulations for the cutting of mangroves.

#### 5.8 SUMMARY OF RECOMMENDATIONS

The following recommendations are aimed at improving the quality of the marine environment and resources in the district. Other forms of use that may occur in the near future are also taken into consideration.

(1) Research on the effects of leached chemicals from garbage and dissolved hydrocarbons to the marine environment needs to be carried out.

(2) The potential yield of inshore fisheries need to be determined. This will help evaluate the state of fishing in the area and plan for future measures to be undertaken to improve the industry.

(3) Since Lamu District has large areas of mangrove forests, prospective prawn farmers may invade these habitats in order to create prawn ponds. If this occurs, it should be based on proper planning to avoid destruction of mangroves. If there is need to culture prawns, use of aquaculture tanks and juvenile from hatcheries should be encouraged, otherwise there may be widespread destruction of the mangroves.

## 6.0

### HUMAN ENVIRONMENT

#### 6.1

#### OVERVIEW OF RESOURCES AND DEVELOPMENT

In the previous sections it has been demonstrated that Lamu District has great potential for development. The district is endowed with a resource base containing potentially good farm land. About 61% of the land has medium to high potential for agriculture. Natural tourists attractions as well as marine resources are also abundant.

The large tracts of high potential agricultural land coupled with the sparse population densities, has created a situation whereby there is virtually no population pressure on the land. There are approximately 16.27 ha. of arable land per person in the district.

The distribution of water for human use is however, inadequate. As stated in Section 2.2.2, the main sources of water are wells, djabias and dams. Areas with high population densities, as well as those with potential for the population to increase are poorly served with good drinking water. Mpeketoni Division with a population of 11,770 (1979 census) is served with only 65 wells and 2 dams. The water from Lake Kenyatta is also used for both human and animal consumption. Central Division with a population of 13,850 (1979 census) is also poorly served with water. There are some 150 privately owned wells scattered in various shambas and 19 wells which serve Lamu Town. Faza Division with a population of 11,696 (1979 census) is currently being served by 60 wells and 20 djabias. These are also inadequate.

The Lake Kenyatta Settlement Scheme is a demonstration of the fact that Lamu District has a potential for food production. Productivity is however, lowered by among other factors, the use of low, ineffective traditional technology and inadequate rainfall in areas where most of the farmers are found. The establishment of new settlement schemes will make substantial contributions to food production in the district.

The district has few industries. The major industrial activities include cotton ginning, bread making, processing of coconut oil, making of building blocks, and tourism. With increasing agricultural production, it would

be beneficial to the people to set up some agro-based industries. This will substantially raise the incomes of the people and hence their standard of living.

The population/health facility ratio can be said to be relatively high. There is a district hospital, 5 health centres and 11 dispensaries. However, access to these facilities is poor due to poor communication network and widely dispersed population. This is particularly so during the wet season. The health units are also inadequately staffed.

There is a widespread apathy towards formal education. Parents prefer the "Koranic" type of tuition, for their children. Thus the existing formal education facilities are generally underutilised.

Generally, the population/resource pressure in Lamu District is low except in centres like Lamu Town, where there is pressure on such facilities as housing, water and health centres. In spite of these, there is still room for the migration of more people to the district. Table 6.1 summarises the population and resource trends in the district based on three scenario simulations by NES.

#### 6.1.2 RECOMMENDATIONS

There is need to establish more settlement schemes in Lamu District. This will facilitate a more rapid economic growth as has been demonstrated by the Lake Kenyatta Settlement Scheme.

As an area which can accommodate population over-spills from other parts of Kenya, Lamu District stands the risk of over-exploitation. Therefore, there is need for the district planners to try to balance population growth with the resources in the district.

The development of more growth centres in the district is essential. These will act as alternatives to Lamu Town where population influx has already strained existing facilities.

In the short run, the human carrying capacity of Lamu District is very high. However, the soils in the district are basically sandy and fragile. Bush clearance coupled with the impact of heavy rainfall renders these soils easily erodable. Unchecked population growth will inevitably lead to widespread clearance of vegetation, with the consequence of inducing desertification. This calls for a constant monitoring of population growth and resources in the district.

TABLE 6.1

## POPULATION AND RESOURCE TRENDS - LAMU DISTRICT

Resource/Service	Relationship	Unit	Current Status(1980)	Scenarios		
				Satus Quo	Low Growth	High Growth
Population	Total	1000s	45.9	133.0	121.3	144.1
Roads	Kms needed at current ratio to total population	kms	380.3	1102.0	1005.0	1194.0
Housing	New houses needed, based on additional households	Houses/Year	736.0	17810.0	15417.0	20079.0
Agriculture	Agricultural Land per Capital	Ha/Pop.	12.0	34.8	31.7	37.7
Woodfuel	Per capita consumption for Firewood and timber at 0.78 <sup>3</sup> /person/year	M <sup>3</sup> /Year	35802.0	103740.0	94614	112398
Health facilities	Service Population of 16000 people per facility	Hospitals	1	3	3	3
		H/Centres	5	15	13	16
		Dispensaries	11	32	20	35
Education	Schools needed at Current ratio of students per school	No. of schools				
		Primary	39	113	103	122
		Secondary	4	12	11	13
	Adult	86	249	227	270	
Employment	Labour Force = 85% adults 15 to 64 years old	1000s	19.7	61.5	60.2	63.1
Domestic Water	Natural Sources:15litres/ person/day		192.8	558.6	509.5	605.2
	Rural Communal Posts:25.c/ person/day	M <sup>3</sup> /day	826.2	2394.0	2183.4	2593.8
	Urban Centres 140 L/ person/day		1285.2	3724.0	3396.4	4034.8

6.2

HOUSING

6.2.1 URBAN AREAS

Lamu Town is the only designated urban centre in the district. There are a host of other growth centres ranging from Witu, which is the only designated Rural Centre, to Mokowe, Hindi, Mpeketoni, Manda Bay and Kizingitini, which are designated as Market Centres. Kiunga, Mkunumbi, Matondoni, Siyu, Majengo, Faza, Pate, Bargoni, Manga and Mararani are designated as Local Centres.

Human settlement in the Lamu archipelago dates back to 900 A.D. This early settlements started an evolution of a unique social system and traditional architecture which have remained to a large extent intact to the present day.

Despite the unique inherited architecture, three dominant types of houses can be distinguished in the district. These are:

1. The traditional Swahili house built of thick walls of coral blocks held together with mortar. The walls of these houses have decorative plaster work and they are characteristically flat-topped.

2. The mud and wattle houses commonly referred to as the 'makuti' house. These are usually thatch-roofed.

3. The modern concrete block houses are also coming up within the growth centres. These are usually found in administrative centres such as Witu and Kiunga. They are basically for housing civil servants.

Housing in Lamu's growth centres is generally inadequate. There is acute shortage which if not corrected will worsen soon especially with the on-going influx of civil servants into the area as a result of implementation of the district focus for development. This shortage of residential houses is even more acute in the divisional headquarters outside Lamu Town. The people most affected are school teachers, medical staff and agricultural extension staff. Housing requirements by various Government Departments in the district are given in Table 6.2.

The shortage of residential houses in the district can be attributed to a number of reasons, some of which are:

a) Increase in population has put pressure on the available houses (especially on Lamu Island). The population growth rate within the period 1969 - 1979 was 4.7% per annum. Current estimates however, put this rate at

5.15% per annum. The subsequent increase in population has not been accompanied by a corresponding increase in residential houses.

b) The administration of Lamu Town by the Lamu County Council has also contributed to the problem. The County Council operates no housing scheme on Lamu Island. This is due to difficulties in acquiring plots and lack of finance.

c) Unavailability of building materials particularly during the rainy season when the Lamu-Mombasa road is closed is one major draw back on housing in the district.

d) There is generally a shortage of qualified artisans in the district.

TABLE 6.2 TOTAL HOUSING REQUIREMENTS BY GOVERNMENT DEPARTMENTS IN LAMU DISTRICT - 1984

<u>CATEGORY</u>	<u>UNITS</u>
B	1
C	18
D	59
E	158
F	102
G	41
Village Houses (Mokowe)	14

SOURCE: District Development Officer, 1984

#### 6.2.2. RURAL AREAS

With over 50% of the people of Lamu District living in nucleated quasi-urban settlements along the coastline and on the islands, rural Lamu is generally sparsely populated and characterised by isolated pockets of human settlements. The types of houses found in the rural areas generally reflect the peoples' life style. For instance the Orma, who are basically pastoralists, live in very temporary houses. This is because of their seasonal movements. The houses are made of wattle and covered with grass. They are generally dome-shaped. The Pokomo on the other hand are mainly farmers and sedentary. Being sedentary, they are obliged to live at least in semi-permanent houses. Their houses are built of wattle and mud, and roofed with grass, "makuti", or iron-sheets. These are more permanent than types built by the Ormas.

Another dominant type of house in the rural areas is that of the Bajuni. This type of house is built of mud

reinforced with pebbles of coral rock, and have "makuti" or grass thatched roof.

Housing in Mpeketoni Division reflects the diversity of the composition of the residents. Due to the different ethnic backgrounds in this division, the houses found reflect typical up-country Kikuyu, Luhya, Luo and Kalenjin types as well as the local Swahili type of house.

The above discussion indicates that the standard of housing in the rural areas is generally poor. With few exceptions there are no permanent buildings on the mainland except in the settlements along the coastline.

### 6.2.3 RECOMMENDATIONS

The poor state of housing prevailing in Lamu District is a result of several interacting factors most of which have been discussed above. In view of the existing constraints, the following suggestions, aimed at improving the situation, are made.

1. There is need to initiate research geared towards the improvement of locally available and culturally acceptable building materials.
2. Voluntary participation in housing development should be encouraged. In so doing the people should be motivated to be more receptive to new ideas.
3. The Lamu County Council should embark on residential housing programmes to cover Lamu, Mokowe, Mpeketoni and Witu centres.
4. There is need to provide adequate residential houses particularly at divisional headquarters for civil servants whose numbers will certainly increase in the near future as a result of the district focus programme.
5. There is also need to educate the people on the needs for proper housing. Training workshops under the umbrella of the crafts training centres should be initiated in order to produce the required artisans for building construction.
6. Properly planned service centres should be built in trading centres (e.g. Mokowe, Mpeketoni, and Witu).
7. There is need to improve transportation facilities, in particular roads, so as to facilitate the availability of construction materials.

### 6.3 ENVIRONMENTAL HEALTH

There are several environmental factors that

refuse disposal, treatment and disposal of human waste, inadequate and understaffed health facilities and malnutrition.

### 6.3.1 DISEASES

The prevalence of malaria, schistosomiasis, intestinal worms such as ascaris (round worms), hook worms as well as water and air-borne diseases is quite high. For example, the hospital records show that in the first half of 1983, about 859 people in Mpeketoni Division alone suffered from both urinary and intestinal schistosomiasis. This doubled at the end of the year, and of course there are cases that were not reported to the hospital.

Another devastating disease in the district is malaria. It is endemic on all the islands, especially during the rainy seasons when the prevalence of malaria of the spinal cord or cerebral malaria is quite high. The eradication of malaria in Lamu District has not been easy because of the broad vector range. The disease causing anthropod of the genus plasmodium, is transmitted by different varieties of the anopheline mosquito, each of which has a unique ecological life history. Some of the known species are Plasmodium falciparum, Plasmodium malariae, Plasmodium oval and Plasmodium vivax. With such a large variety of species co-existing in one area, it is very difficult to bring the disease under control.

### 6.3.2 REFUSE COLLECTION AND DISPOSAL

A dweller in a town like Lamu expects regular collection of household wastes as a town service. The refuse collection system is the concern of the municipal administration throughout Kenya. This however, is not true of Lamu Town. There are problems with refuse disposal in the town due to:

- i) Lack of manpower and finance. - five years ago the town had 40 county council employed sweepers. Currently there are no more than 10 sweepers.
- ii) Narrow streets - the streets in Lamu Town are too narrow for any garbage collection van.
- iii) Lack of refuse chambers - the garbage is dumped on open grounds. This often blocks the drainage ways resulting in stagnant water and a resultant breeding of mosquitoes.

### 6.3.3 TREATMENT AND DISPOSAL OF HUMAN WASTE

The collection and safe disposal of human waste are among the most important problems of environmental health. A

good sewage system solves the excreta disposal problem of the town dweller. If the wastes are not properly treated the pathogenic organisms they carry will present dangers to water supplies, fish and human beings. Equally dangerous is the indiscriminate discharge of untreated sewage into roadside ditches, gullies or ravines.

A rural dweller may also have water-carried methods of excreta disposal, and with them he has the problem of preventing water and soil pollution. If he does not have water carriage, the problem is to construct a privy that will prevent contamination of water, exclude access of flies and be otherwise sanitary.

In Lamu District none of these conditions exist. In Lamu Town, the way houses are constructed does not allow for proper construction of a sewage collection and treatment system. Water from the kitchens and bathrooms is drained into the ocean untreated through open drains. Following local custom, pit latrines are constructed inside the houses next to the water wells.

#### 6.3.4 INADEQUACY OF HEALTH FACILITIES

Compared to other coastal districts like Kwale and Kilifi with 3 and 4 medical doctors respectively, Lamu's medical facilities are under staffed. Kiunga Health centre having a capacity of 12 beds has no Kenyan registered nurse and in all has only 7 members of staff. Tchundwa dispensary has only 1 member of staff (See Table 3.16)

#### 6.3.5 RECOMMENDATIONS

To remedy the above situation, health education on issues such as personal hygiene, balanced diet, immunization against diseases, needs to be undertaken. Mothers should also be taught the advantages of breast feeding as opposed to bottle feeding of babies, and family planning in general. Demonstration can be carried out through the various women's groups. Also the people should be organized into self-help groups to clean the towns.

#### 6.4 OCCUPATIONAL HEALTH AND SAFETY

According to Recommendation 112 of the International Labour Organization (ILO) formulated in 1959, occupational health and safety is defined as:

1. Protecting the workers against any health hazard which may arise out of their work or the conditions in which that work is carried out.

2. Contributing towards the workers' physical and mental adjustment, in particular by the allocation of work and assignments to jobs for which they are suited.
3. Contributing to the establishment and maintenance of the highest degree of physical and mental well-being of the workers.

In Lamu district, the majority of the industries are small, usually owned by individuals. These industries employ about 30-50% of the total labour force, most of whom have little formal education. Most of these workers are ignorant about the health hazards they are prone to in their occupations.

Table 6.3 shows the industrial establishments in Lamu District. None of these industries have adequate facilities and precautions against accidents. Accidents do occur but there are no organized statistics available on them. Workers also face such ailments as solvent poisoning, byssionosis, which is an occupational respiratory disease that occurs among workers exposed to cotton, noise induced hearing loss and musculo-skeletal disorders, among others.

#### 6.4.1 RECOMMENDATIONS

Most work places lack people with sufficient knowledge in occupation health and safety. Even in firms with in-plant first aid facilities, the staff have little or no training in occupational health hazards. Thus, education of medical and paramedical personnel, employers and employees alike in health and safety measures is an absolute necessity. Existing laws on safety measures in factories should be strictly enforced.

### 6.5 WATER POLLUTION AND WASTE DISPOSAL

#### 6.5.1 WATER POLLUTION

Industrial water pollution is not a major problem in the district because there are few factories and industries. The district has also a limited number of permanent natural water sources. However, raw waste water and other litter from the islands are usually discharged or dumped directly into the sea. In Lamu Town the situation on the shore is bad and there are indications that the sea water near the shore is polluted.

As discussed in Section 3.5.1, Lamu Town receives treated water supply. Water from other sources such as wells, djabias, dams, lakes and ponds is not treated. The quality of water at the Amu Water Treatment Plant is monitored by the Ministry of Water Development officials. In

TABLE 6.3

INDUSTRIAL ESTABLISHMENTS

INDUSTRY	LOCATIONS & PLOT NOS.	WHEN ESTABLISHED	EMPLOYMENT CAPACITY	PRODUCT	SPONSORS	OTHER REMARKS
1. M/S Lamu Ginners	Shela (along	1936	6	Cotton &	Self	Its current sight is non economical It should be built at Mkwowe or Mpeketoni due to Transport charges.
2. Shee Bakari Al-way	Langoni (Amu) Plot 803	1960	10	Simsim, cotton oil & cattle feed, wheat coil (Tambli)	Self	Needs
3. Mangrove Cutters Co-op. Society	Lamu Island	-	Co-op. Society	Mangrove Poles	Mangrove Exporters	-
4. Abdalla Ahmed M. Hilal	Mkomani (Amu) Plot. 931	-	5	Coconut oil simsim & cattle feed	Self	-
5. Bahamadi Brothers	Mkwowe	-	15	Building Blocks		-
6. Naftaly Gitonga & F. Ntungu	Mkwowe	1984	2	Bread	Self	If assisted would expand the supply to Mpeketoni & Witu Division which have no Bakeries.
7. Mohamed Ahmed Abdulkadir	Amu (Langoni)	1963	5	Bread	Self	-
8. Loo Adi Sharoo	Langoni (784/1)	1973	5	Bread	Self	-
9. Fateh Esmail Yusufali	Mkomani (Amu) Plot 629)	1980	5	Bread	Self	-
10. Abdreham ElMafazy & Sons	Mkomani Plot 8/1	1978	12	Curvings like doors frames, chairs, ward- robes etc.	Self	-
11. Said Abdiehman (Lamu Craft)	Mkomani Plot 1005	1980	8	Curvings of various types e.g. beds, Swahili charis, tables etc.	Self	-
12. Boat Builders	Lamu, Matondoni & Rasimi	Inheritance	Depends on orders placed	Boats	Self	Needs assistance on finance to increase

13. Abdalla Ali Skanda & Sons	Mkomani Plot 172	1977	12	Curvings of various types e.g. doors frames, tables, mwahili chairs etc.	assisted by K.I.E	Needs assistance to meet the demand of local people
14. Samuel Maweru Njuguna	Mpeketoni Plot. 55		3	-do-	Self	Needs assistance to meet the local demands
15. Abdrehman Swaleh Atik	Mkomani (Amu)		5	-do-	Self	-
16. Moh'd Athman Maawiya	Mkomani Plot 351		5		Self	-
17. Abdalla Swaleh & Ahmed Abdalla	Mkomani Plot 174		6	Furniture	Self	-
18. Abubakar Ali Swabu	Langoni Plot 751		5	-do-	-	-
19. Francis Thiongao Mwangi	Mokowe	1982	3	Chairs, doors windows, frames etc.	Self	Needs assistance to meet local demands
20. Anne Kiseli	Hindi (Prison)	1980	?	-do-	Self	-
21. Batuli Vae Kale	Tohundwa (Faza)		2	Posho Mill	Self	-
22. Ahmed Ali Abdrehman	Mokowe		2	-do-	Self	-
23. John Peter Kamau	Mpeketoni	1979	2	-do-	Self	-
24. Ahmed & Ali Abdul Hussein	Matondoni		2	-do-	Self	-
25. Said Moh'd Said	Patte		2	-do-	Self	-
26. Moh'd Said Moh'd	Tohundwa (Faza)		2	-do-	Self	-
27. Moh'd Ali Omar	Kwatini/Faza		2	-do-	Self	-
28. Halima Hassan	Mwajumwali (Faza)		2	-do-	Self	-
29. Moh'd Said	Kizingitini		2	-do-	Self	-

SOURCE : Trade Officer, Lamu District

other areas monitoring is done by Ministry of Health officials and in some cases by private well owners themselves.

On Lamu Island and in the Lake Kenyatta Settlement Scheme, the water quality has been found to be poor. Water from Lake Kenyatta is not treated. During the rainy season, the lake is contaminated by faecal matter from pit latrines. Contamination from livestock watering in the lake also occurs. In Central Division water contamination is mainly from flood waters and overflow of septic tanks into wells.

Water quality data (Table 6.4) indicates that most of the water sources are polluted to varying degrees and are under normal health standards not suitable for human consumption unless treated.

TABLE 6.4 WATER QUALITY IN LAMU DISTRICT

<u>SOURCE</u>	<u>COLIFORM</u>	<u>E.COLIFORM</u>
	<u>(per 100ml)</u>	
Lake Amu	1600	225
Lake Kenyatta	25	9
Tana River (near the sea)	1800	Nil
Sporry Well (Amu)	1800	250
Tawakai well (Amu)	1800	Nil
Longoni well (Amu)	1800	550
Mkomani well (Amu)	1800	Nil
Sheia well (Amu)	1800	Nil

SOURCE: District Public Health Officer, Lamu. 1984

#### 6.5.2 RECOMMENDATIONS

1. There is an urgent need to protect public water sources to prevent further contamination.
2. Health personnel should be provided with kits to monitor water quality in wells and other public water sources for pollution. All areas should be covered. More public health officials are needed in the district to undertake this task.
3. Although it is a tradition to have pit latrines and wells close to the house, the people should be advised not to have them next to each other. Soils in the district are highly porous and this leads to contamination of wells.
4. Dumping of garbage and litter, and discharge of waste water directly into the sea should be stopped. Apart from bad smell and sight, sea pollution can upset the balance of the marine ecosystem.

5. In the case of dams to store surface water, it is necessary to fence them out and have different water points for people and for livestock.

## 6.6 URBAN DEVELOPMENT

### 6.6.1 STATUS AND CONSTRAINTS

#### 6.6.1.1 CURRENT STATUS

Currently, about 50% of the population live in trading centres particularly on the islands comprising the archipelago. Life in these centres is virtually "urbanised" in the sense that most of the people depend on trading for their livelihood. Others practise part-time farming on the mainland. This has left the rural areas free from population pressures as discussed earlier.

The district has great potential for tourism, agriculture, livestock and marine development. For the achievement of overall development, however, the symbiotic relationship between nucleated centres and their rural hinterland is essential. An analysis of these centres clearly indicates that, though this relationship exists, it lacks the required dynamism. This stalemate is partly explained by the frontier nature of the rural areas whose resources have been relatively untapped, and also by the decline of trading activities in the old historic towns.

#### 6.6.1.2 LAMU TOWN

In spite of having a large quasi-urban population, only Lamu Town is designated as an urban centre in the district. As a typical Swahili town, Lamu is the joint product of trade and Islamic religion modified by the environment. The town is divided into three political wards: Mkomani which is the area north of Mpya Mosque, Mtamuini lying between Mpya Mosque and the hospital, and Langoni to the south. The first two, largely built of coral, are the traditional quarters of the older families, while the third built of mud and wattle is the traditional quarters of the later settlers.

The cohesive character of Lamu Town has been its main attraction. The town has been aptly described as an "expression of delicate and sensitive social organisations". This is reflected by such a feature as the covered streets, where rooms belonging to one house are supported on the walls of the neighbouring ones.

The town, with its numerous mosques, historical houses, fort and tombs, is a potential attraction for an increasing number of tourists if its accessibility is improved.

During the 1969 census, Lamu Town registered a population of 7,403 people. This figure had by 1979 increased to 8,552 indicating a growth rate of 1.5% per annum. The 1983 estimates put the figure at 9,440, a growth rate of 2.5% per annum. This growth rate is modest compared to that of other urban centres in the country. However, for Lamu, it has led to an increased pressure on the available facilities leading to a housing shortage, deterioration of sanitary facilities and lack of open spaces for recreational facilities. To compound all these problems is the fact that Lamu has no urban council. Its affairs are run by the Lamu County Council. This means that the County Council has to distribute its meagre resources to both Lamu Town and the district at large. Lamu Town nevertheless is an urban area of historic and architectural importance and for this to be maintained not only should the ancient monuments be protected but an out-flow of population from Lamu Town is necessary.

#### 6.6.1.3 MOKOWE

Mokowe, which is on the mainland, is separated from Lamu Island by a strait. It is currently designated as a Market Centre and has a lot of potential as a future growth point. There is a project to move the district headquarters from Lamu Town to Mokowe. When this is done, Mokowe will surely expand fast. It is a suitable site for the district headquarters since it has easy accessibility by land to a large population living on the mainland.

It is also surrounded by a hinterland with substantial resources. On the mainland, the Lake Kenyatta Settlement Scheme and also the proposed Hindi-Magogoni Scheme are rich agricultural areas whose produce could be sold at Mokowe. Another important commodity would be fish from the island. Thus, Mokowe has a strong potential for agro-industries. The proposed second port at Manda Bay would have an economic impact on the entire Lamu District.

Mokowe is also an ideal communications node. This advantage can be enhanced through the improvement of the existing means of communications. If the proposed port is built, there will be need for the provision of a better transport network with the possibility of rail and road connections to Nairobi and Mombasa. Such a road/rail connection between Mokowe and Nairobi could also benefit the Lower Tana Irrigation Scheme.

As shown in Section 3.5.1, Mokowe's water supply comes from Lamu Island. In the long run, an alternative source will be required. Other basic infrastructural services e.g. electricity, telephones, etc. will also be

needed. Separate facilities are required since the present trend of development Lamu District indicates the importance of having Lamu and Mokowe towns as separate urban centres, each with its separate functions.

#### 6.6.1.4 RURAL GROWTH CENTRES

Witu is the only designated rural centre. It serves a rich agricultural and livestock hinterland, and is an important stopping point on the Lamu-Mombasa road. It follows then that Witu can act as a growth catalyst, and more attention needs to be focussed on improvements in its infrastructure.

Ideally, a rural growth centre is a carefully selected rural market centre in which all appropriate and needed facilities, services and utilities are congregated to serve the surrounding populations. In Lamu District, Mpektoni, Hindi, Manda Bay and Kizingitini are the designated market centres and currently they are noticeably underdeveloped. Their effectiveness has been hindered by a number of factors which include:

(i) Land Tenure. The pattern of land ownership in some of the centres is not clear. This tends to keep off prospective investors.

(ii) Inadequacy of Infrastructure. Most centres are linked to their hinterland by poor seasonal roads. There is also unavailability of electric power in the active rural growth centres and a general shortage of clean water, proper housing, sanitary and recreational amenities.

(iii) Lack of Development Capital. Loan facilities for the development necessary within such centres are few and where available the loans are inadequate, while their processing takes a lengthy period.

The designated local centres in Lamu District are Kiunga, Mkenumbi, Matondoni, Siyu, Majengo, Faza, Pate, Bargoni, Mangai and Mararani. All these have potential for initiating growth as divisional headquarters and tourist centres.

#### 6.6.2 RECOMMENDATIONS

Urbanisation to most people in Lamu District is a normal, culturally accepted mode of living. The Bajuni, who comprise the largest indigenous group in Lamu, have been living in closely knitted communities for many years. The indigenous groups living on the mainland, notably the Pokomo and Orma, were generally very few and conservative. Thus their impact on the mainland has been minimal. However, with other areas of the country, there has been a general realisation of the need for organised development. Increasing agricultural activities have prompted the need

for closer interaction between the rural areas and the "urban" centres. For growth centres in Lamu District to be more effective the following actions are necessary:

(1) There is need for the Central Government as well as the Lamu County Council, to put more effort into provision of facilities such as electricity, water, roads, and decent housing within the selected centres.

(2) There is also need to start both agro-based as well as manufacturing industries in towns like Mokowe and Witu.

(3) The local people should be encouraged to consider the centres as essential for the development of their areas. This should motivate them to participate actively in the development of such centres. The centres should be properly planned.

(4) Financial institutions should educate the people on the availability of loans. They should also simplify the lengthy procedures involved in acquiring loans.

(5) There is need for the revival of the Lamu Urban Council. This would release the burden of running Lamu Town from the Lamu County Council which would in turn concentrate more of its resources on the other growth centres.

(6) There is need for streamlining the process of acquiring land for business premises within the growth centres.

## 6.7 TOURISMS AND NATIONAL HERITAGE

### 6.7.1 GOALS AND NATURE OF TOURISM

#### 6.7.1.1 INTRODUCTION

The fundamental national goal for the tourist industry is to maximize net economic benefits from the scenic and environmental resources of the country. At the same time tourism is to proceed without compromising cultural values or destroying the environment. Local tourism is being promoted and will provide an increasing opportunity for the local people to benefit from the natural environment. This would enhance public support for environmental protection.

#### 6.7.1.2 LAMU DISTRICT AS A TOURIST AREA

Tourism in Lamu District has a seasonality similar to the general Kenyan pattern. The peak period is between December and February when hotel occupancy rates are 65 to 75%. The lowest season is in May and June, when some hotels close. August has consistently been a peak month due to domestic tourism.

Lamu offers many tourist attractions in the form of mosques, museums, unique architecture, battlefields and tombs. There are forts, archeological sites and ruins of a once famous palace at Pate. A summary of these attractions is presented in Table 6.5.

The registered hotels, which are licensed to sell food and beverages as well as offer lodging facilities in Lamu District are:

Petley's Inn	-	Lamu Town
New Mahrus	-	Lamu Town
Peponi Hotel	-	Lamu - Shela
Kiwaiyu Island Lodge	-	Kiwaiyu Island
Blue Safari Club	-	Manda Island
Ras Kitau Hotel	-	Manda Island
Kiwaiyu Safari Village	-	Mkokoni

Total capacity in these hotels is about 250 beds. This represents 2.5% of the total number of beds available in the country. In addition, there are many privately owned houses which serve both the local people as well as some tourists.

Tourism has not been developed sufficiently in Lamu District although it offers opportunity for wildlife viewing on Dodori National Reserve and Kiunga Marine National Reserve. There are also sandy beaches, cultural features, coral and game fishing.

No accurate data exist on the number of visitors to Lamu District, since only visitors to Lamu Town are registered at the Immigration Office. Visitors stay in hotels, but it is known that a large number of them stay in lodges and privately rented houses. This makes it difficult to keep accurate records of their numbers. Table 6.6 shows the number of visitors to the Lamu museum from 1981 to 1983 and Table 6.7 shows visitors to Takwa National Monument for 1981-1983. This only gives indications of the magnitudes involved and must be treated as such. Tourism provides many employment opportunities, either full-time in hotels, lodges, and private houses, and at the Lamu Museum, or part-time in activities like the provision of boatmen and guides. A substantial number of the employees in the tourist industry originates from outside the district.

#### 6.7.2. WILDLIFE RESOURCES

There is virtually no utilization of wildlife, either consumptive or through tourism in Lamu District. Instead, wildlife has had longstanding notoriety in the destruction of crops all over the district. There are presently two national reserves namely Dodori and Kiunga.

TABLE 6.5

NATIONAL HERITAGE SITES IN LAMU DISTRICT

LOCATION	MOSQUE	HOUSES	TUMBS	WALL	ARTICLES	NOTES
Ishakani	2		2			mapped
Kiungya	2		8			mapped
Kiunguulini		mud and thatch village	conentry			
Mwana Mchana	1	several	1			mapped
Onwa	2		numerous			mapped
Shee Uhuuro		settlement	4			
Uchi Juu	1	several		1		Partly drawn
Shee Jafari	1		1	1		Partly drawn
Jabu	1	settlement	several			Partly drawn
Shinarbaya	1	settlement	1		Porcelain cisterns	
Sandani	1	houses				
Uwani	1		Pillar tombs			drawn
Ashwali	1	village				
Ndu	1		several			
Mbindeni		village				
Dondo	2		2			explored and mapped
Faza	3		1		ceramics	
Chunka	1	village masonry pillar	several			
Atu	1		group			
Shangja	3	many	many			mapped
Kitaka						
Pate	8	numerous	numerous			mapped
Dul						
Muula	2	houses	some	1		mapped
Alaker Rdman Twili				few		
Takwa	1	(A total of 148 other coral-built structures)				mapped
Kitau						
Lamu						
Lamu Gibe	1			some		
Shehu	2	1				
Mitoni Ken	mosque	1	few			
Kipunguini	1		some		Pottery	
Nea			few	few		
Kindo		1		1		
Kipenczi	2	1	many			
Uzhuo	1	1	few			
Mshetani			1			
Uspwani	4	numerous		numerous		greater potential mapped
Shaka	1	house	tombs			
Djowani			1			not seen
Kibirikani	1					
Madrut	1		1		Chinese porcelain bowls & dishes	
Siyu	4		Tom/Port		Tombs	

TABLE 6.6 VISITORS TO THE LAMU MUSEUM

<u>1981</u>	<u>NON-RESIDENTS</u>	<u>RESIDENTS</u>	<u>TOTAL</u>
January	631	267	898
February	620	587	1,207
March	512	247	759
April	308	376	684
May	247	136	383
June	242	143	385
July	599	291	890
August	1,054	770	1,824
September	472	220	692
October	409	237	646
November	405	163	568
December	<u>554</u>	<u>586</u>	<u>1,140</u>
TOTAL	6,053 =====	4,023 =====	10,076 =====
<u>1982</u>	<u>NON-RESIDENTS</u>	<u>RESIDENTS</u>	<u>TOTAL</u>
January	755	423	1,178
February	612	172	784
March	524	206	730
April	278	376	654
May	170	84	254
June	123	79	202
July	363	113	476
August	672	332	1,004
September	388	160	548
October	417	192	609
November	322	110	432
December	420	373	793
TOTAL	5,044 =====	2,620 =====	7,664 =====
<u>1983</u>	<u>NON-RESIDENT</u>	<u>RESIDENT</u>	<u>TOTAL</u>
January	549	381	930
February	494	165	659
March	434	165	599
April	254	486	740
May	170	130	300
June	154	101	255
July	485	186	671
August	910	485	1,395
September	357	198	555
October	325	146	471
November	271	176	447
December	<u>330</u>	<u>713</u>	<u>1,043</u>
TOTAL	4,733 =====	3,332 =====	8,065 =====

SOURCE : LAMU MUSEUM

However, there is rising concern that once established these reserves will interfere with profitable fishing.

TABLE 6.7 VISITORS TO THE TAKWA NATIONAL MONUMENT

January	168	January	138	January	123
February	53	February	149	February	109
March	103	March	73	March	66
April	190	April	152	April	105
May	70	May	42	May	29
June	125	June	31	June	35
July	378	July	134	July	163
August	481	August	327	August	466
September	243	September	167	September	151
October	75	October	133	October	325
November	61	November	115	November	49
December	134	December	134	December	108

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TOTAL	2,081	TOTAL	1,566	TOTAL	1,729
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SOURCE : LAMU MUSEUM

#### 6.7.3 HISTORICAL SITES

In Lamu District there are 45 historical sites and monuments of varying degrees of interest. The site of the 16th - 17th century ruins of Takwa on Manda Island was opened to the public in 1977. In 1981 there were 2000 paying visitors to the site.

The numbers of paying visits to the Lamu Museum has increased by 52% from 6,624 in 1979 to 10,076 in 1981. The museum plans to create greater interest when it completes the restoration of a typical Lamu 18th Century housing which will display period decor, furnishing etc. and acquires Lamu Fort which presently is a prison.

#### 6.7.4 NEGATIVE EFFECTS OF TOURISM

Tourism in Lamu district has been found to have several negative effects, the more prominent ones of which are listed below:

(a) Unwanted Influence on the Swahili Culture. It has been reported that the Swahili culture is being eroded especially when local youth copy the behaviour of tourists who live among them.

(b) Distraction of Youth's Longlasting Productive Employment. The youth are lured into working as boat boys and guides instead of learning trades in which they can develop lasting careers.

#### 6.7.5 RECOMMENDATIONS FOR IMPROVEMENT OF TOURISM

1. Communication between Lamu and Mombasa/Malindi should be improved to facilitate movement of tourists and supplies to hotels.
2. There is need for the establishment of a tourist office in the district.
3. The standard of accommodation should be improved and the industry should be promoted both locally and internationally through appropriate advertising.

#### 6.8 ENVIRONMENTAL EDUCATION

##### 6.8.1 THE ROLE OF EDUCATION IN ENVIRONMENT MANAGEMENT

Kenyans have become increasingly aware of the variety and complexity of environmental problems currently facing them. These problems arise because most people generally regard the natural components of the environment as inexhaustible or unalterable. There is a general lack of understanding of the eventual effects of continued exploitation of natural resources.

There is need therefore, to change the attitudes of the people if rational environmental management is to be achieved. Education for the public is a tool which can be used to create positive attitudes towards environmental management.

In order to be effective, environmental education has to be carried out as a unified educational system including both the young and adults through all levels of formal education, out-of-school education and information through the mass media. At present, environmental education in Kenya is not an obligatory, well integrated and continuous programme. Elements of it occur in the primary school and high school science syllabi, and are further developed at some courses in the University, school clubs, youth clubs and by some non-governmental organisations.

##### 6.8.2 PRIMARY EDUCATION

The science syllabus in primary schools exposes children to an integrated environmental education. It aims at developing the problem-solving abilities of children through investigations within their vicinity. On the other

hand, social sciences and languages lack a similar emphasis although the syllabi include a few environmental topics.

Although it could rightly be said that the current primary school syllabus incorporates a substantial amount of environmental information, its effectiveness is hampered by the following national and local constraints.

- (1) Primary Teachers' Training Curriculum does not focus on environmental education sufficiently to create the right attitude among teachers. It should be revised to include courses that focus directly on environmental education. In addition to formal training, all school inspectors, trained and untrained teachers, need to attend regular in-service courses or seminars to refresh their memories on new trends in environmental education.
- (2) The Teachers Advisory Centre (TAC) in Lamu is not able to cater for all teachers in the district. This situation is made worse by poor communication.
- (3) Teachers do not have relevant books and guidelines to enable them teach environmental education effectively. Thus the development of appropriate teaching materials is an urgent necessity.
- (4) Supervision by the inspectorate is constrained by inadequate personnel and transport.

### 6.8.3 POST PRIMARY EDUCATION

In secondary schools, suitable curriculum units on environmental education are included in the existing frame work for the Kenya Certificate of Education. The main objective is to promote awareness and also develop a concern for environmental quality.

The Mpeketoni and Lamu Village Polytechnics in the district cater for over two hundred students annually. Although they involve a small number of students, it has been noted that the syllabi for various trades do not incorporate relevant environmental information necessary for inculcating a concern for environmental quality.

Post-primary education in Lamu District is available to a very small proportion of children in the appropriate age category. On the whole, the majority must therefore, be reached in a different way, as discussed below.

### 6.8.4 ADULT EDUCATION

Most environmental problems are traceable to actions by adults. Environmental education for the adults

should therefore be seen as a tool to enable them understand the complex nature of their environment.

The adult education curriculum includes a substantial amount of environmental education. In order to make the programme successful all adult educators should have regular in service courses. They should be employed on a full time basis. Currently adult educators are encouraged to make learning more meaningful by inviting extension workers to participate in relevant sessions, but the level of adherence to this arrangement varies from teacher to teacher. The local administration has not been involved sufficiently to assist in making it a success.

The adult education programme also requires close supervision which is now ineffective due to a shortage of personnel and vehicles.

#### 6.8.5. EDUCATION FOR AND DECISION-MAKERS

Administrators and decision-makers both in the public and private sector should be informed on methods of rational utilization of natural resources and in proper environmental management. This can be done through:

- (1) Lectures, journals, exhibitions and mass media propaganda.
- (2) Special instructions in the existing system of general education through special courses organized for the local people.
- (3) Workshops organised at district level on local environmental problems.

Although practise has shown that systematic education is more effective than propaganda, efforts should be made using both methods to stimulate concern for environmental problems and values in those presently responsible for policy and decision making.

#### 6.8.6 PUBLIC EDUCATION

Extension officers normally use available media of communication such as chiefs, 'barazas' village health committees etc, to educate the people. While their programmes are encouraging, movements within Lamu District are restricted as a result of transportation problems.

The National Youth Service camp at Hindi is a good example of environmental management in the area. The public should be encouraged to visit this camp to see examples of good environmental management within their own district.

Voluntary organisations working in the area should also endeavour to teach people about proper environmental management. These include the Child Welfare Society, Family Planning Association, Freedom from Hunger Committee among several others.

Similarly, co-operative societies should organize demonstrations and seminars on environmental education for their members.

#### 6.8.7 RECOMMENDATIONS

1. The local Teachers Advisory Centre (TAC) should incorporate environmental components in their activities in order to effectively assist primary school teachers. NES should provide necessary inputs such as posters, booklets and pamphlets that carry the requisite information.

2. TAC should liaise with the District Education Officer on this issue and in future organize seminars involving relevant organizations, local authorities and teachers.

3. NES should then look into the possibility of organising a seminar at local or district level preferably on a scheduled regular basis.

4. School clubs, e.g. Wildlife Clubs, Young Farmers Clubs, etc. play an important role in creating environmental awareness and they should be encouraged. Schools should be encouraged to form Environmental Clubs.

5. The District Education Officer should organize club competitions for the award of certificates preferably on World Environment Day. NES could provide certificate and other prizes for this purpose.

6. The adult education section should be provided with services and facilities to assist in environmental education and training. Such services should include visual aids and excursions to areas of environmental interest. Total mobilization of individuals or groups who can contribute to environmental education is absolutely essential.

7. Dissemination of information on proper environmental education to administrators is vital and formal in-service training should be encouraged in all Government Training Institutes.

8. Kiswahili pamphlets on the environment should be prepared by NES and distributed in the district. Kiswahili should also be used in dissemination of research findings. These would help to keep adults literate.

9. NES should provide some slides and other materials on the Lamu environment to the Local Teachers Advisory Centres. This will help dissemination of environmental education.

## 6.9 DEVELOPMENT ADMINISTRATION

### 6.9.1 INTRODUCTION

Development Administration may be defined as the means by which initiatives are organized, promoted and implemented. Besides Central Government programmes, district development is initiated from among other sources, the activities of co-operatives, self-help movements (Harambee projects), non-governmental organizations, and private individuals. The organization, close supervision and co-ordination of activities by these bodies are crucial to the development process.

### 6.9.2 THE CO-OPERATIVE MOVEMENT

The co-operative movement started in Lamu District in 1969 with the formation of one primary society, namely, Lamu Farmers' Co-operative Society. It was formed for multi-produce marketing. To date, there are seven primary societies registered in the district with a total membership of 5,508. These societies are involved in a range of activities. There are three (3) multi-produce, one (1) sea fishing, one (1) ranching, one (1) timber and charcoal, and (1) savings and credit society. At present, a fresh water fishermen's society is under formation to cater for fishing on Lake Kenyatta, Mangai, Witu and other fresh water ponds in the district.

The societies are not strong, if compared to similar societies in other parts of the country. Apart from Lake Kenyatta Farmers' Co-operative Society and the Fishermen's Society, the others have no offices or any tangible assets.

The North Coast Fishermens' Co-Operative Union has a monopoly on the fish trade on the North Coast. Most of its members in Lamu district are in Kizingitini.

On the whole, the co-operative movement has not gained much strength in Lamu District. This is reflected in the small number of societies most of which have management and promotional problems. Table 6.8 is a summary of the existing societies.

### 6.9.3. PROBLEMS ENCOUNTERED BY THE CO-OPERATIVE MOVEMENT

#### Marketing

Marketing of the schedule crops has been quite a problem to most farmers. As has been indicated the buying centres are few and far apart, and the societies lack funds for the transportation of produce to these centres.

TABLE 6.8.

CO-OPERATIVE SOCIETIES IN LAMU DISTRICT

Name	Area	Membership ship	Function/ Activities	Status
1) North Coast Fishermen Co-operative	Lamu District	615	Fishing	Active
2) Lamu Teachers Savings and Credit Co-operative Society	Lamu District	165	Savings & Credit	Active
3) Lamu Farmers' Co-operative Society	Amu, Faza, and Kiunga Divisions	834	Multiproduce Marketing	Active
4) Mangrove Cutters Co-operative Society	Amu and Faza Divisions	291	Timber/charcoal*	Active
5) Lake Kenyatta Farmers' Co-operative society	Mpeketoni Location	2,859	Multiproduce Marketing	Active
6) Amu Ranching Co-operative Society	Mkunumbi Location	312	Ranching	Partially Active
7) Witu Farmers' Co-operative Society	Witu Division (Mkunumbi Location) Location)	432	Multiproduce Marketing	Active Active

\*With the ban on Charcoal burning the Society now handles Mangroves alone.

SOURCE : District Cooperation Officer

The prices offered by the National Cereal and Produce Board are usually lower than those offered locally by individual well established traders. Coupled with this there are common complaints of delayed payments to the societies by the Board. Consequently, there are sporadic cases of members channelling their produce through private traders for ready cash.

#### Management

The Ranching Society started with problems which are still encountered in its operations. The Society operates on a ranch given by the Government and has not been able to purchase one of its own. The management is poor and animals die from improper care. In addition, wild animals and cattle rustlers have been a constant threat. Ready market for the stock is usually at Mombasa but transportation is a problem. A major aspect of the society is that members have been reluctant to be elected to the committee to manage their own affairs. Consequently the society's activities have reduced tremendously.

Similarly, the mangrove Cutters Society is poorly managed and therefore not very active. The members are difficult to trace for supervision, consultation and education, as they are usually out cutting poles. They lack funds to provide better and bigger boats to substantially control the trade. At present, the bigger portion of the trade is dominated by private dealers with facilities for transporting the poles to the Middle-East market a factor for some time threatened the existence of the society.

#### Lack of Fisheries Facilities

The fishermen have no facilities for deep-sea fishing and transportation or cold-storage facilities for their catch. Fish-collecting boats come from Lamu and Mombasa and are not very regular at Kiunga. The fishermen, especially at Kiunga, usually have to await the arrival of the boats before they go fishing. Alternatively, they dry the fish to preserve it for longer periods.

The fish-breeding areas are endangered as the fishermen prefer to use nets with small mesh set to get maximum catches which depletes breeding stock. The fishermen concede that they can only be assured of profits when they operate this way.

#### Illiteracy

Generally, most members of any one society in the district are illiterate or semi-literate and lack co-operative knowledge. Although the staff of the societies are employed through the Ministry of Co-operatives and trained, success of the co-operative movement can only be realised if members are enlightened. This is presently not possible because the Ministry is greatly under-staffed and runs only one vehicle in the district.

### 6.9.3 SELF-HELP MOVEMENT

Since the achievement of independence, the self-help movement (Harambee) has been a strong driving force behind the present social and economic development in Kenya. Through Harambee, people make contributions in materials, funds, labour and in other ways to identified projects.

In Lamu, as elsewhere in the country, women organize themselves in groups from location to district levels to try and elevate standards of living socially and economically, by providing better homes for members of the groups, educational facilities for their children, and water and health facilities for the community. They earn incomes through farming, goat and sheep keeping, dress-making, selling handicrafts and other business undertakings. At present there are 25 women's groups with a total membership of 717 carrying out various activities which are indicated on Table 6.9 .

There are other Harambee Projects under the Community Development Programme which include 26 primary school buildings, two (2) day care centres, one (1) village polytechnic workshop, one (1) maternity clinic.

The level of participation in self-help efforts is very low. The few women's groups that exist have members ranging between 12 and 90. On Lamu Island, there are no women's groups. This is partly due to the fact that women are not allowed to mix freely with men.

There is also a shortage of officers to promote self-help projects. There are only 2 Community Development officers, 1 Community Development Assistant. Consequently, there is no follow-up on projects, and hence the performance of the movement as a whole is poor.

### 6.9.4 RECOMMENDATIONS

Transport, being a major constraint to development in Lamu District, should be given priority in the district development plans and programmes. Motor-cycles, which are cheaper to purchase and maintain should supplement the few existing vehicles. More important still is the maintenance and regular repair of vehicles and repair of access roads. Even in the absence of government transport, field officers could cover large areas by public means if these areas were accessible by road.

The attitude of the local community towards development should be changed completely. The elders who have influence over their community should be educated and convinced to adopt change.

TABLE 6.9

WOMEN GROUPS IN LAMU DISTRICT

No.	Name of Groups	Membership	Locations	Projects	Evaluation of Success
1.	Kanini Kega W/G.	16	Mpeketoni	Cotton/vegetables planting	
2.	Old Land W/G.	33	-do-	Cotton planting and	Fair
3.	Bahati W/G.	21	-do-	Vegetables planting	Good
4.	NPK Mother W/G.	21	-do-	Utensils/Clothing	-
5.	Uziwa Mungano W/G.	30	-do-	goat keeping	-
6.	Kiongwu Kangei W/G.	24	-do-	Farming/Building	-
7.	Usida W/Group	17	-do-	Farming	-
8.	Mwangaza W/Group	20	-do-	Utensils	Good
9.	Utamaduni W/G.	16	-do-	farming and poultry keeping	Good
10.	Pandanguo W/Group	40	Witu	farming/Poultry	Very Good
11.	Nyakinug W/G.	90	Mpeketoni	farming/shop Building	-
12.	Umoja W.Group	30	-do-	farming & Shamba	-
13.	Muireri W/Group	30	-do-	farming of poultry keeping	-
14.	Muigithania W/G.	18	-do-	Cotton/Vegetable growing	-
15.	Tumaini W.Group	18	Mpeketoni	farming	Very Good
16.	Kilimain W.Group	20	-do-	Cotton/Goat keeping	-do-
17.	Uziwa Usafi W.G.	23	-do-	Cotton/M/C.	-do-
18.	Baharini W.Group	40	-do-	Cotton/Vegetable	-
19.	Mpeketoni Building Group	12	-do-	Building	-
20.	Upendo W.Group	20	-do-	farming	-
21.	Moa W.Group	15	-do-	farming of Goat keeping	-
22.	Tewe W. Group	17	-do-	-do-	
23.	Faza W. Group	60	Faza	Sewing of Handcraft	Very Good
24.	Witu W. Group	46	Witu	Poultry	Very Good
25.	Wetethia Utethia W/G.	40	Mpeketoni	farming	-d.-

SOURCE : District Social Development Officer, Lamu

## PART III

### SUMMARY

#### 7.0

#### THE LAMU ENVIRONMENT

In the preceding chapters some of the main environmental trends in resource use and the related socio-economic factors in Lamu District have been described. Some serious environmental problems have been identified and recommendations for dealing with them proposed at the end of each section. In this section some priority problems which need immediate attention are identified so that development may proceed without undermining the natural and human resources on which it depends. The list is not exhaustive but it includes problems related to agricultural development, water supply, health facilities and services, marine resources, conservation of national heritage, urban settlements and increasing environmental awareness among the people.

All these problems have multiple causes and effects, and therefore they each require co-ordinated action by various ministries, departments and non-governmental organizations, as well as individuals, if they have to be dealt with effectively.

#### 7.1

#### AGRICULTURAL PRODUCTIVITY

Agriculture is not well-developed in Lamu District but with the establishment of settlement schemes like Lake Kenyatta and others which are planned, agricultural productivity will increase. The main problems currently facing agricultural development include inappropriate land tenure, wildlife menace, poor transport network and lack of organised marketing.

#### 7.2

#### WATER

Most streams in the district are seasonal and for from settled areas. The water obtained from most wells is of poor quality owing to the chemical nature of the aquifers. Wells must also be protected from contamination to reduce the incidence of water-borne diseases.

#### 7.3

#### HEALTH FACILITIES AND SERVICES

The health facilities and services are far apart, insufficient and sometimes inaccessible due to the poor transport network. The roads in the district become impassable during the wet season, cutting off some of the health facilities from the users. Public transport is insufficient where available. Health

programme like nutrition, sanitation etc. are also hampered by the lack of transport facilities and the security situation in some areas.

7.4

MARINE RESOURCES

There is need to conserve the marine resources which include mangroves, fisheries, shells etc. from over-exploitation and pollution. Researcher should be carried out within the coastal waters next to settlements, to establish the effect of leached chemicals from garbage and dissolved hydrocarbons on the marine environment.

7.5

CONSERVATION OF NATURAL HERITAGE

7.5.1

INDIGENOUS PLANTS

Large areas of Lamu District are still covered by natural vegetation. Care should be taken in order to strike a balance between conservation and resource use as population increases and settled areas expand.

7.5.2

MONUMENTS

The coastal areas of Lamu District contain a large number of relics of settlements which should be preserved for future generations. These include tombs, mosques and Lamu Town itself.

7.6

URBAN SETTLEMENTS

The problems of housing and waste disposal are of major significance within Lamu Town. Litter, garbage and waste water are discharged directly into the sea causing pollution and bad smell.

7.7

EDUCATION

Programmes on environmental education should be increased in order to increase awareness among administrators, extension officers, students and the public, on the local environmental issues, and to enhance environmental management.

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