



KWALE

DISTRICT ENVIRONMENTAL ASSESSMENT REPORT

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K W A L E D I S T R I C T
ENVIRONMENTAL ASSESSMENT REPORT

Published by:

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Ministry of Environment and Natural Resources
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Environmental Training and Management in Africa (ETMA) Project
of the
United States Agency for International Development,
Southeast Consortium for International Development, (SECID) and
Clark University

SEPTEMBER, 1965

F O R E W O R D

This Environmental Assessment Report for Kwale is the result of collaborative effort between the National Environment Secretariat (NES) of the Ministry of Environment and Natural Resources of the Government of Kenya, and the Southeast Consortium for International Development's Environmental Training and Management in Africa (ETMA) Project. This Project on District Environmental Assessment was initiated in 1978 with the principal objective of finding 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 them being:-

- (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 for the overall national good;
- (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 to decentralise decision-making and policy administration;
- (iii) that incorporation of environmental considerations at the planning stages of any project or programme would help avoid the costly correction of environmental degradation that would otherwise ensue. This makes clear the need to ensure the integration of development planning and environmental management objectives at the District level.

Thus this report, parallel to others in the series, is geared toward making a contribution to the implementation and future formulation of the District Development Plan for Kwale District. Its aim is to ensure that the development of the district takes place without the destruction

(ii)

of the resource base upon which it depends. This would ensure a sustained and enhanced quality of life for the people of Kwale. To this end, the report is complementary not only to others in the series but also to other parallel exercises being undertaken by the National Environment Secretariat.

The basic framework of the project itself derives directly from the Guidelines for Environmental Management (GEM) developed by the United Nations Environment Programme (UNEP) and tailored to meet the specific requirements of the district exercise. It is hoped, therefore, that the recommendations contained in this report will form a truly useful basis for the management of the environment of Kwale District in the dynamic context of the development of the district.

I would like to sincerely 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 District Commissioner, Kwale, for his keen interest and support during the fieldwork, the District Officers and their Divisional Officers for the valuable information and data; the management of the industries visited - Kenya Calcium, Bixa Factory and Ramisi Sugar Factory; Councillors, Chiefs, Assistant Chiefs and the people of Kwale who provided insights which helped attune the report to the realities of the district; Mohammed Ishmael for the valuable information on changes within the Kwale environment in the last fifty years; L. Gerlach for the useful discussion of the socio-cultural anthropology of the Digo people; Kenya Marine and Fisheries Research Institute (K.M.F.R.I.) for their support and marine biologists; A. Robertson for her work on Kayas, B. Kendall for her input on marine resources; the Forest Department for preparation of base maps, and finally the multi-disciplinary National Environment Secretariat and Kenya Marine and Fisheries Research Institute team whose contribution helped make this report possible.

The team that carried out the research and preparation of this report include:

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

D.R. KAMAU
DIRECTOR
NATIONAL ENVIRONMENT SECRETARIAT

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PART I

OVERVIEW OF THE KWALE ENVIRONMENT

1.0 OVERVIEW OF NATURAL RESOURCES

1.1 TOPOGRAPHY, GEOLOGY AND SOILS

1.1.1 TOPOGRAPHY

Kwale District is located in the southeastern corner of Kenya, along the coast south of Mombasa and east of Mount Kilimanjaro (Figure 1).

It can be divided into four major physiographic units with altitude ranging from sea level to 420m in the Shimba Hills and 842m on Kibashi Hill bordering Taita/Taveta District (Figure 2).

Coastal Plain

The Coastal Plain is generally below 30m and extends to 10 km inland with the Mombasa-Lunga Road running almost along the centre of the Plain. The coral reef runs almost parallel to the coastline 300m to 1000m away from the shoreline.

Foot Plateau

Behind the Coastal Plain the land rises rapidly and in places abruptly to the Foot Plateau which lies at an altitude of between 60m and 135m. At the base of the Foot Plateau are Jurassic Rocks which are exposed on the northern part of the district. On the eastern edge of the Plateau there is a long ridge of sandy hills composed of Magarini Sands.

Coastal Range

Rising steeply from the Foot Plateau is the Coastal Range. The Range, otherwise known as the Shimba Hills, lies at an altitude of 150m to 462m and is composed of many sandstone (Mazeras Sandstone) hills which have been protected by the Shimba Grit. Apart from a few summits, the Range is more or less flat-topped. The hills include Shimba Hill (420m) in the south and the isolated summits of Shimba (350m), Mrima (323m) and Ozombo (462m). At their northern end, the hills appear to be terminated by a fault that has shifted the Mazeras Sandstone laterally westward. The Cha Shimba River (also known as Pemba or Manolo) has cut its course through the faulted zone to form the so-called "Mombasa Gap" feature.

Nyika Plateau

The Nyika Plateau extends from the western edge of the Coastal Range as the terrain drops steeply to a plateau which rises gradually from about 180m

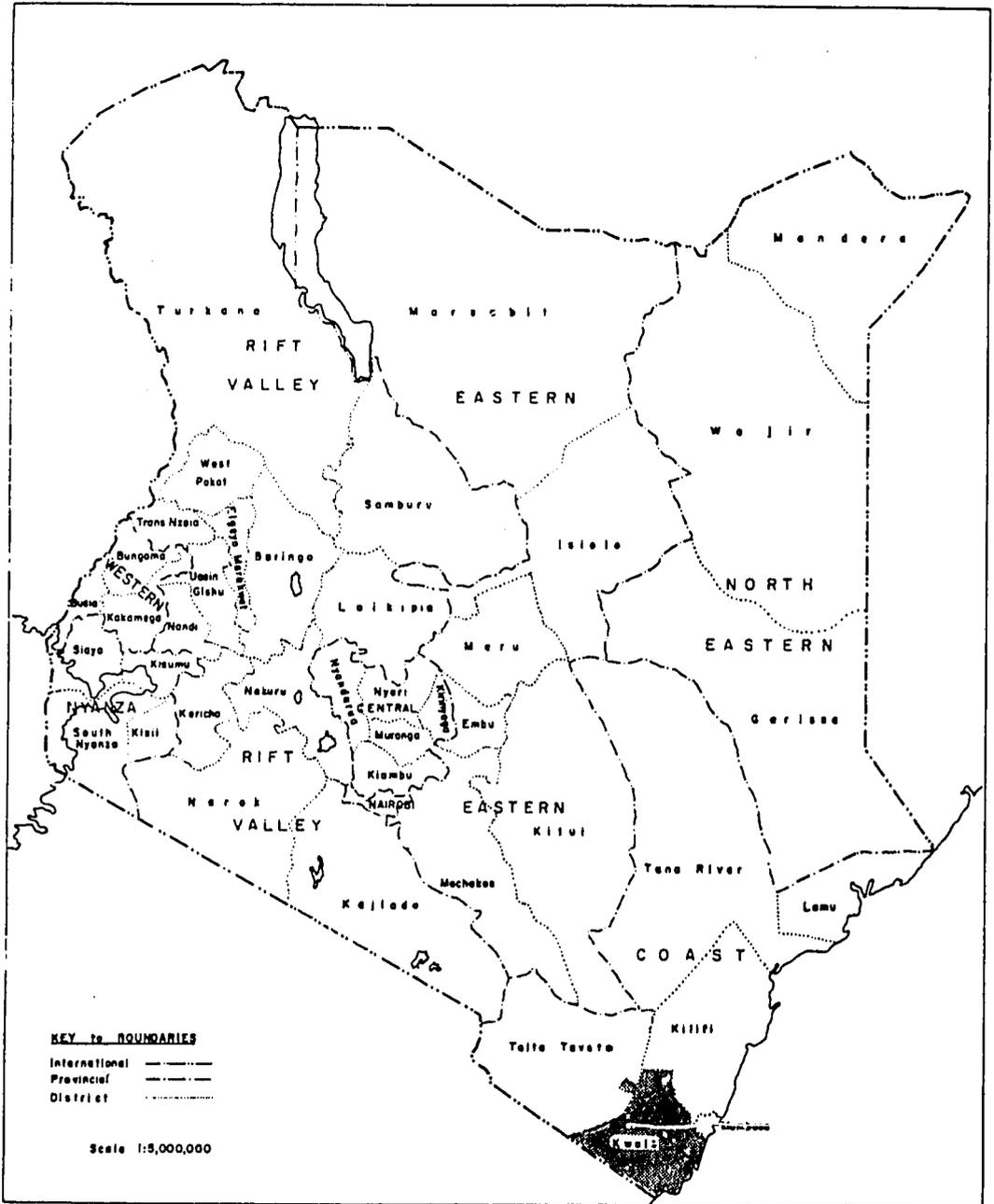


FIGURE 1. LOCATION OF KWALE DISTRICT

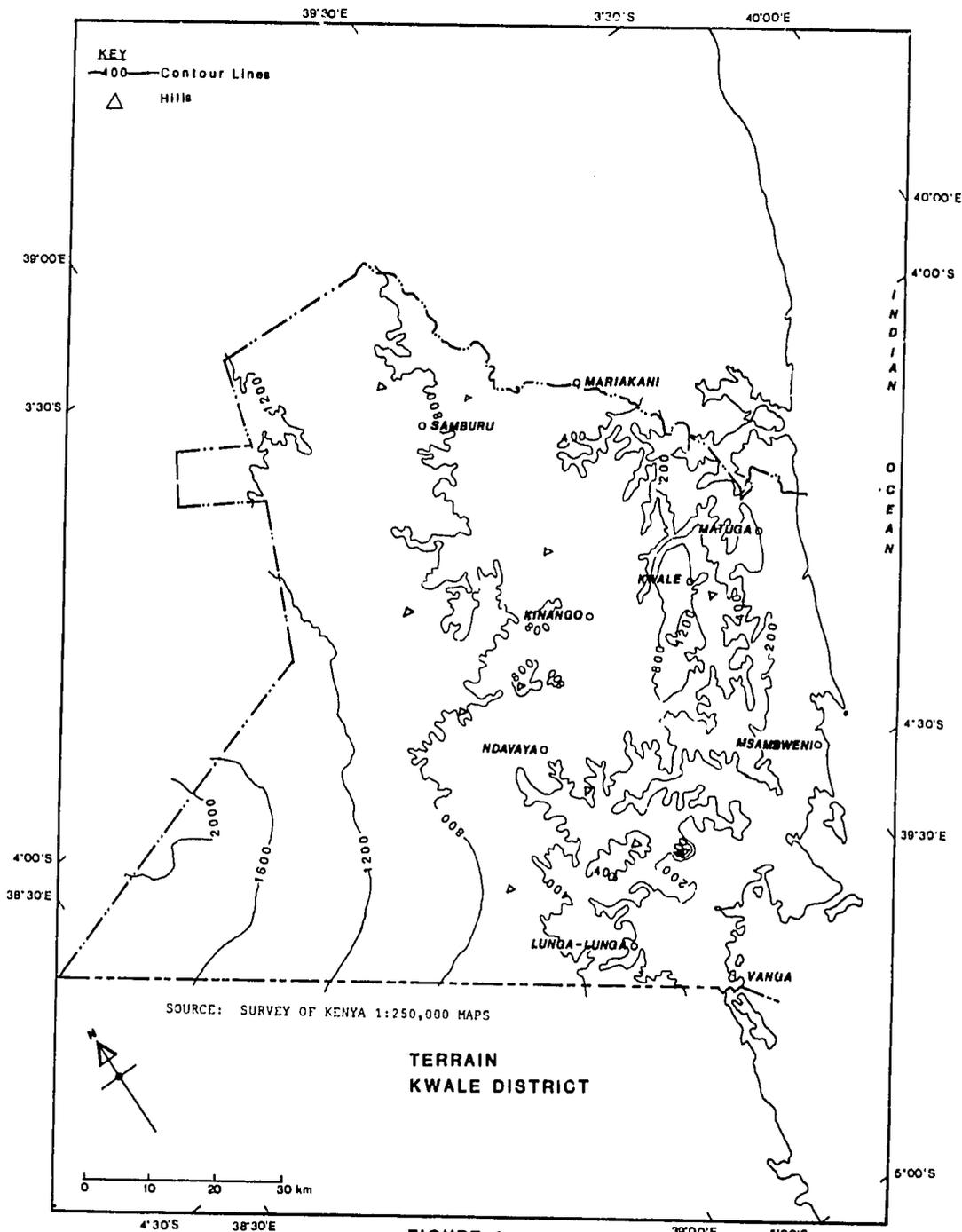


FIGURE 2.

to 300m on the western boundary of the district. It is narrow in the south, becoming wider in the north and is underlain mainly by basement system rocks.

1.1.2 GEOLOGY

The rocks of the district are mainly of sedimentary origin except in the western side of the district (Nyika Plateau) where the basement complex is found (Figure 3). The rocks are mainly metamorphic gneisses and schists. In the sedimentary system of the rocks three well-marked divisions are recognised:

Duruma Sandstone Series,
Tertiary Sediments, and
Quaternary Sediments.

The Duruma Sandstone Series consist of grits, sandstones and shales. Sandstones are at the top and the grits at the bottom of the succession while finer sandstones and shales are sandwiched in the middle. In this series three classes are recognised.

The Lower Duruma Series (Taru Grits) consist of carbonaceous material of Permian and Carboniferous period. The Taru Grits are found in the northern part of the district and are best seen along the Kinango-Samburu Road north of Vigurungani becoming increasingly difficult to trace further south. A block of coal was reported from a railway cutting near Taru (Gregory 1921 and Miller 1952) suggesting the possible existence of coal seams within the series. The Taru Grits reach a thickness of about 170m.

The Middle Duruma Series are composed of Maji-ya-Chumvi Beds and Mariakani Sandstones. Both are of the Triassic period. The Maji-ya-Chumvi Beds have the highest shale content of the Duruma Sandstones. Overlying the Taru Grits, they consist of bluish-black, grey and greenish-grey, gritty, often micaceous shales with interbedded yellowish white silty sandstones. The shales weather to a brownish colour and being more easily eroded than the sandstones, allow the formation of broad valleys along their strike. The Maji-ya-Chumvi Beds are found in the Kinango area becoming, like the Taru Grits, less noticeable towards the south.

The Mariakani Sandstone consists of fine grained sandstones and silty shales that follow conformably upon Maji-ya-Chumvi Beds. They are more sandy and more massive than their predecessors. In colour they are grey, greenish-grey or yellowish but attain brownish tinge, on weathering. Both Maji-ya-Chumvi Beds and Mariakani Sandstone reach a thickness of about 2170m.

38°30' E

39°00' S

40°00' E

KEY



ACHAEAN--Basement System



INTRUSIVE--Jombo Hill, Agglomerates



PERMIAN--Lower Maji ya Chumvi Beds, Lala Grits



TRIASSIC--Mantakani Sandstones, Upper Maji ya Chumvi Beds



UPPER TRIASSIC--Shamba Grits, Z. Zonas sandstones



JURASSIC--Upper Jurassic shales



PLIOCENE--Mogoro sands



PLEISTOCENE--Red wind-blown Sands, Fillington Sands



PLEISTOCENE--Coral Reef



RECENT--Alluvium



FAULT LINE

39°00' E

39°30' S

4°00' S

38°30' E

40°00' E

4°00' S

4°30' S

39°30' E

5°00' S

Map of the Kwale District showing geological features and place names. The map includes a key for geological units, a scale bar, and a north arrow. The title is 'GEOLOGY AND MINERALS KWALE DISTRICT'. The map shows various geological units such as Achaean-Basement System, Intrusive, Permian, Triassic, Upper Triassic, Jurassic, Pliocene, Pleistocene, and Recent. Place names include MARIAKANI, SAMBORO, NATUNA, KWALE, KIRARO, NDAVAYA, MAMBO, LUNGA-LUNGA, and YANTSA. The map is bounded by coordinates 38°30' E to 40°00' E and 39°00' S to 5°00' S.

**GEOLOGY AND MINERALS
KWALE DISTRICT**

0 10 20 30 km

4°30' S 38°30' E

FIGURE 3.

39°00' E 5°00' S

The Mazeras Sandstones and Shimba Grits form the Upper Duruma Sandstone Series and are the dominant topographical feature of the Shimba Hills. They consist of massive cross-bedded, quartzo felspathia sandstones and grits with interbedded shales in the lower horizon. They all reach a total thickness of at least 300m. Outcrops can be seen near the Mombasa Pipeline and in the Cha Shimba River.

The Tertiary Sediments Series in this area are associated with the Magarini Sands found in places like Matuga. These sediments are made of sands and gravels which reach a thickness of about 130m. The Magarini Sands are of Pliocene period and are deltaic and continental in origin. They are highly susceptible to erosion.

The Quaternary Sediment Series in the area are of two types. First there are the coral reef made of Coral Limestone and lagoonal deposits made of calcareous sands and quartz sands. They are of the Pleistocene period, reach a thickness of about 100m and usually lie between 3 km and 5 km inland- as they are of marine and lagoonal origin. Secondly, there are river deposits of alluvium of the recent geological period. These are found in Mangrove Swamps.

The district is endowed with a variety of minerals including iron ore, limestone, zinc, zircon, gypsum, manganese, lead, monazite (a calcium phosphate compound) nepheline (a potassium sodium and aluminium compound) and gorceite (a barium aluminium phosphate compound). Thus there exists a great potential for exploitation of industrial minerals in the district especially on Mrima Hill where several mineral ores such as iron, manganese, niobium, titanium, molybdenum, nepheline and gorceite are known to exist. Preliminary estimates of manganese ore reserves at Mrima Hill place the tonnage at over 600,000 while the tonnage of iron ore is estimated to be between 3 and 15 million.

Sand is another valuable resource. At present it is being collected without proper control and at an alarming rate especially in Tiwi and Waa-

1.1.3 SOILS

The soils of the district vary with the topography and geology of the area (Figure 4).

In the Coastal Plain corals, sand, clay, loam and alluvial deposits are found. The soils of the Mangrove Swamps are very poorly drained, very deep, excessively saline, olive to greenish grey, loam to clay and often with sulfidic material.

The Foot Plateau consists of deep permeable loamy soils suitable for agriculture especially around Matuga.

The sandstones and grits on the Coastal Range yield a fairly good fertile soil well suited for cultivation as evidenced in the Shimba Hills. The steep slopes are very susceptible to soil erosion if cultivated or overgrazed.

The Nyika Plateau is overlain by poor soils except for occasional patches of better quality reddish-brown, sandy soil.

Generally the soils in the district and especially in Kinango have been degraded through erosion. Inadequate rainfall hinders the improvement of the soils. Soil erosion in the district is usually caused by leaving the land bare through clearing of the vegetation cover for cultivation, charcoal burning, building poles, road construction and sand collection. Overgrazing, another major contributor to soil erosion, is particularly serious in the northern semi-arid region where the vegetation cover is sparse.

1.1.4 IMPLICATIONS FOR ENVIRONMENT AND DEVELOPMENT

Bearing in mind the terrain and geology of the district and taking into consideration the poor state (sandy) of the soils in most parts of the district, great care must be taken in cultivation, mining, sand collection and road construction to ensure that minimal soil erosion occurs as a result of these activities. In addition to directly degrading the soil, erosion silts up valuable water reservoirs making them less useful in the dry season. Sand collection especially in Matuga Division is not only a potential source of massive soil erosion but also a threat to the condition of already poor secondary roads in the area. Moreover the owners of the land from which the sand is collected get very little for the sand (about K.Shs. 40.00 per 7 ton lorry). There is need to check this trade.

Due to lack of awareness among the inhabitants of Kinango animal manure is not used to improve the soils on the few patches of cultivated land. The manure can be a valuable fertiliser rather than a source of water pollution.

According to the geological reports, and, theoretically, since the Taru Formation lies in the same belt as the Karoo of South Africa, there is a possibility of coal and associated mineral deposits in the district. This should be investigated more seriously. Mineral ores of industrial

value exist, especially for metal industry and fertiliser manufacturing. Local sources of fertilisers are even more important given the high prices of imported fertilisers.

1.2 CLIMATE AND WATER RESOURCES

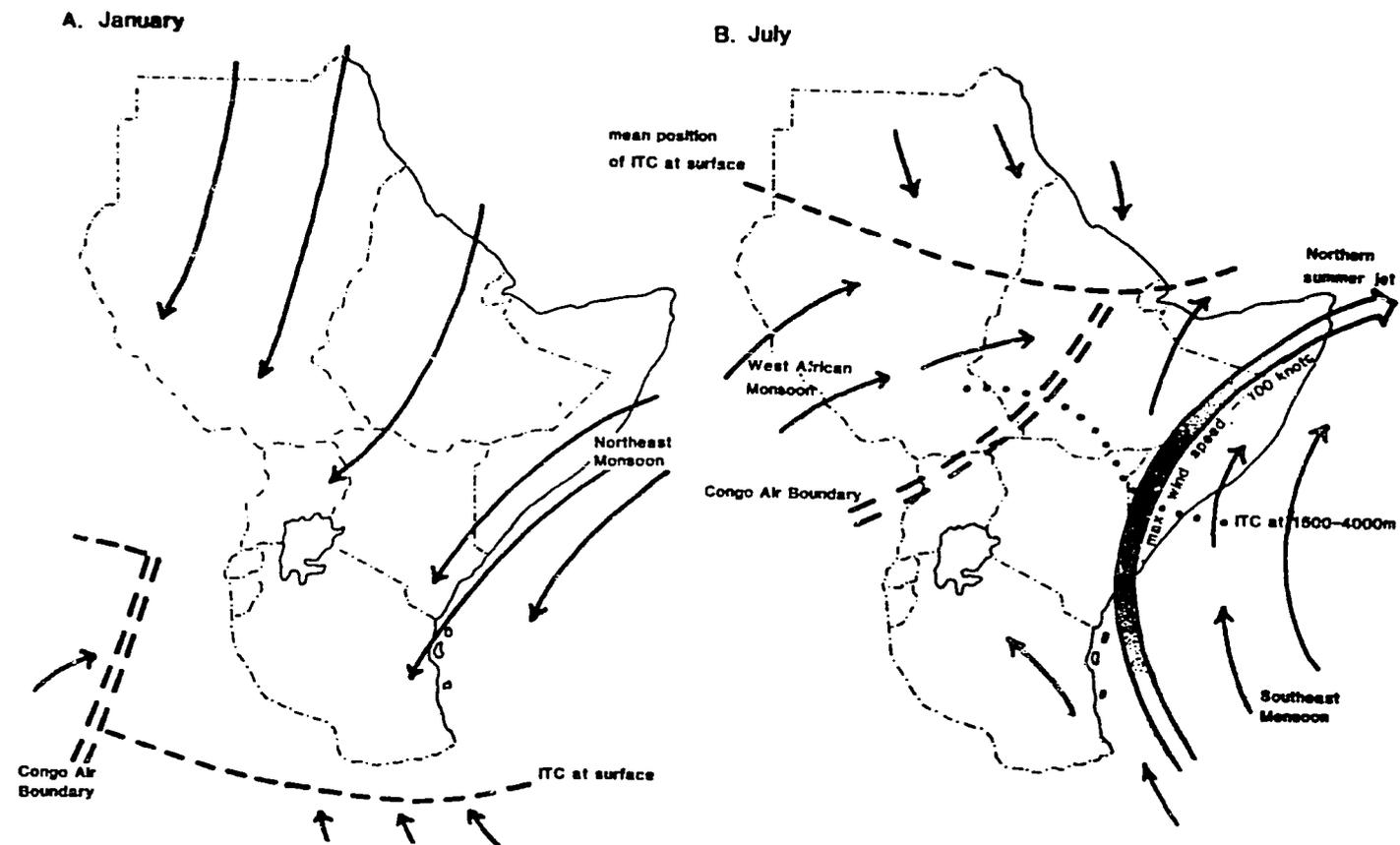
1.2.1 CLIMATE

The climate generally is related to the regional climatic patterns - the semi-annual passage of the intertropical convergence zone and the two monsoons, the northeastern (Kazkazi) in January to March and the southeastern in June to October (Figure 5). The dominant rainy season is March to June, while the short rains in November to December are only locally reliable (Figures 6,7, and 8). The southeastern winds are forced upwards by the tree-covered coastline and further inland by the Shimba Hills. It is estimated that in the coastal lowlands 30% of the cultivated land should be planted with trees, otherwise the sea breezes may not be forced upward enough to cause rainfall (Jaetzold and Schmidt, 1983). The waves in the wind patterns caused by the coastline and Shimba Hills result in a climatic zonation of broad bands which are parallel to the coast.

The coastal lowlands are the wettest climatic zones with average annual rainfall of over 1000mm (Table 1.1). The long rains growing period is over 155 days 6 out of 10 years, while for the short rains the season is usually 40-55 days. The wettest area is around Ramisi, with the climate getting drier to the west and north. Average annual temperatures are above 28°C.

The coastal uplands, centered on the Shimba Hills, are drier, averaging 970-1250mm per year. However, the growing period is in places longer than at the coast especially in the short rains. The long rains are 135-155 days and the short rains vary from 40-75 days (60% reliability). Average temperatures are one to two degrees cooler than along the coast. Further to the lee of the Shimba Hills two climatic patterns are interspersed. The wetter millet zone receives 600-900mm rainfall per year while the ranching zone averages 500-600mm per year. Their average temperatures are similar. The growing season in the long rains (40-105 days) at 6% reliability could be sufficient in some places for crops.

Next to the Shimba Hills area is a climatic zone suitable for several crops. Average annual rainfall is 850-1200mm and the growing seasons total 125-280 days(60% reliability) with the long rains being more productive. Average annual temperatures are 25°-26.6°C.



SOURCE: Downing, 1982

FIGURE 5. REGIONAL CIRCULATION PATTERNS IN JANUARY AND JULY

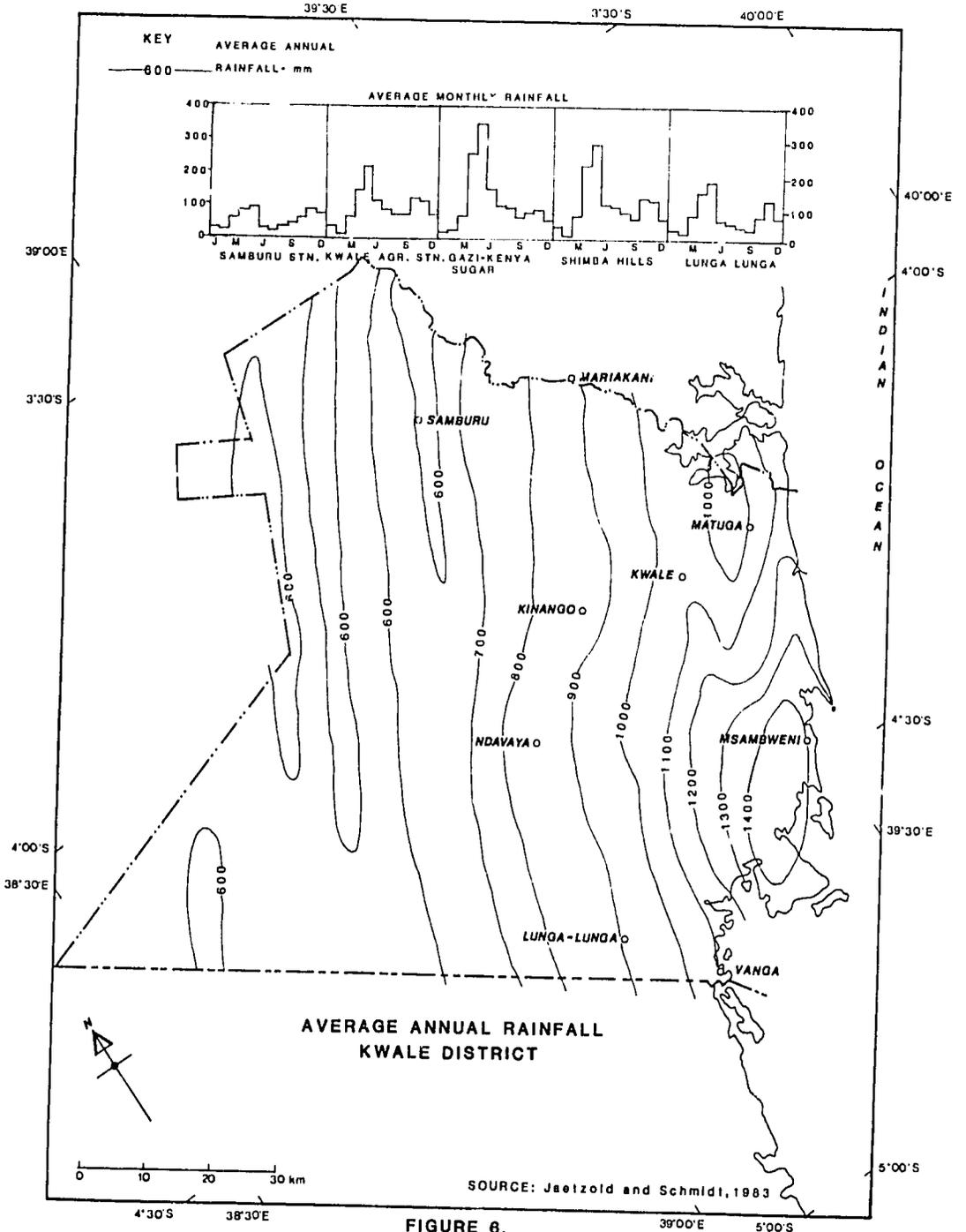
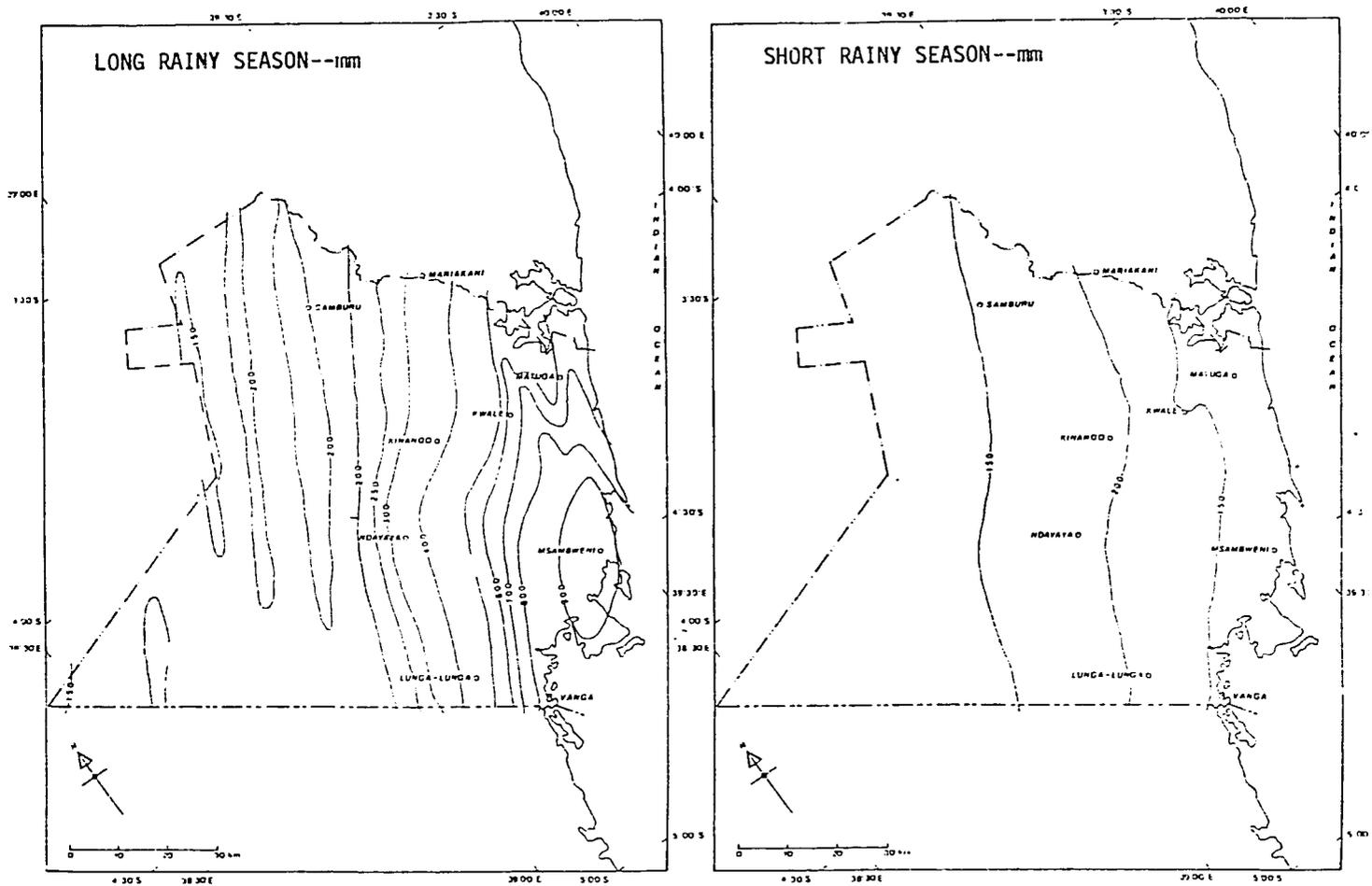


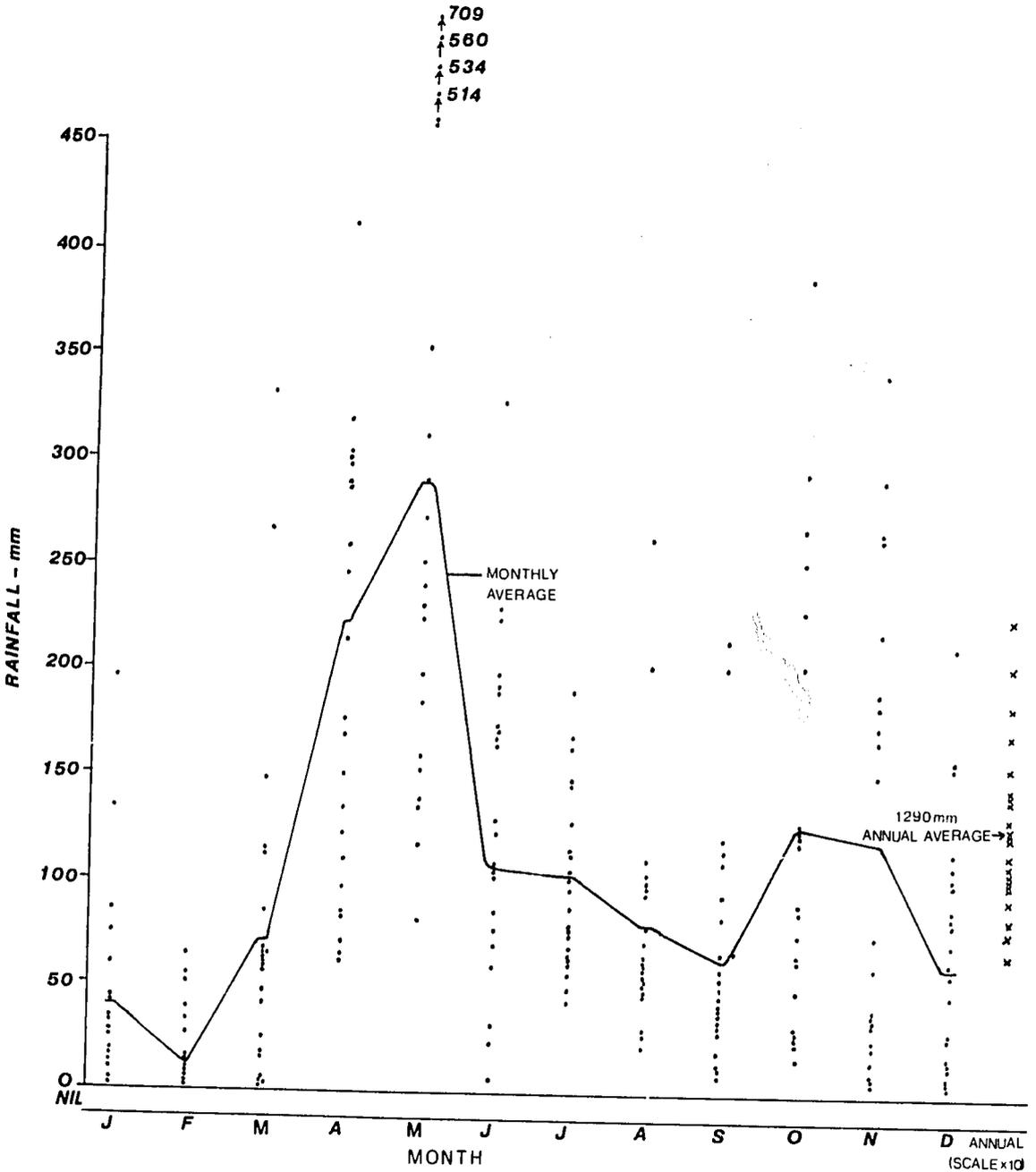
FIGURE 6.

AMOUNT OF RAINFALL EXCEEDED IN 6 OUT OF 10 YEARS



60% SEASONAL RAINFALL RELIABILITY, KWALE DISTRICT

FIGURE 7.



SOURCE: METEOROLOGICAL DEPARTMENT DATA

MONTHLY RAINFALL AT SHIMBA HILLS SETTLEMENT SCHEME, 1962-83

FIGURE 8.

TABLE 1.1 CLIMATIC ZONES, KWALE DISTRICT

ZONE	Annual Average Temperature °C	Annual Average Rainfall mm	60% Reliability		60% Reliability Growing Season	
			LR	Rainfall _{SR}	Days LR	SR
Tropical Lowland	26.6-26.3	1200->1400	750-900	80-150	157-195	<45
Coastal Lowland	26.6-26.0	1000-1350	500-800	100-180	155-175	<40
Coastal Uplands	26.0-24.0	970-1250	380-800	160-200	135-195	40-75
Medium Agricultural	26.6-25.0	850-1200	230-600	80-200	85-155	<40-75
Marginal Agricultural	27.5-24.3	600- 900	150-280	50- 70	40-105	<40-55
Ranching	27.5-24.6	500- 600	100-150	50-120	30- 40	20-30

NOTES: Amount surpassed on the average 6 out of 10 years during the cropping season.

LR - Long Rains
 SR - Short Rains

source: Jaetzold and Schmidt 1983

1.2.2 WATER RESOURCES

Kwale District lacks adequate surface and underground water resources (Figure 9). There are only two reliable surface water sources both of which are to the north of the district. Several seasonal springs from the Shimba Hills catchment area and a few seasonal rivers in the south are other sources of water. The forested catchment areas are protected but some parts have been encroached by farmers.

Rivers Pemba and Mwachi in the northern part of the district are the only reliable surface water sources.

Springs around the Shimba Hills and Rivers Mwambone, Mwachema, Mkurumuji, Ramisi, Mwena, and Umba, have varying degrees of reliability and salinity as they flow towards the Indian Ocean. Pumped water supply schemes based upon these springs and rivers, together with groundwater in the coastal sedimentary formations (also with varying degrees of reliability and salinity) serve as temporary solutions and minor sources of supplementary water for the district population.

In addition to these, there are over 70 earth dams across the district and several others are being developed in the hinterland areas, particularly for ranching purposes. They are, however, unprotected and many are silted, seasonal and unfit for human consumption unless treated.

Boreholes and wells are another major source of water in the district (Table 1.2), Most of these have hard, well-mineralized water but generally without organic pollution. An exception is the Tiwi Borehole No. 1 which has soft water with some organic pollution.

1.2.3 IMPLICATIONS FOR ENVIRONMENT AND DEVELOPMENT

The major importance of the climatic patterns of Kwale District are several:

- the prime agricultural potential is east of the Shimba Hills, except for the area from the Shimba Hills to the coast the district is dry leading to few watering points in the hinterland,
- rainfall is quite variable, both in its distribution and amounts,
- trees are important in causing rainfall over the coastal area, as well as in creating a suitable microclimate.

Water supplies are adequate only in selected areas where boreholes

TABLE 1.2 INVENTORY OF UNDERGROUND WATER RESOURCES

BOREHOLE/WELLS	APPROX. WATER LEVEL	CONDITION	WATER QUALITY	PUMP TYPE
<u>MATUGA DIVISION</u>				
Tiwi 1	-	7-10,000 gals/hr	-	-
2	-	7,000 "	-	-
3	-	4,000 "	-	-
4	-	8,000	-	-
<u>KINANGO DIVISION</u>				
Sapo	11 m	Working	Fresh	Lister 6 cc
Ndavaya	10 m	"	Salty	"
Dambale	12 m	"	"	"
Mtaa*	12 m	Abandoned	"	"
Kituu*	17 m	"	"	"
Makamini*	13 m	"	Salty/Petrol smell	"
Kinangoni*	14 m	"	Salty	"
Banga*	15 m	"	Salty	"
<u>MSAMBWENI DIVISION</u>				
Vanga	-	2 Working	-	-
	-	2 Planned	-	-
Lunga-Lunga 2	-	1,500 gals/hr	-	-
150 Wells	-	-	-	-
<u>KUBO DIVISION</u>				
Seasonal Wells	-	-	-	-

NOTES: * Broke down when taken over by the County Council due to lack of maintenance.

SOURCE: District Water Officer, 1983

or wells are productive, near permanent rivers, or along the major pipelines to Mombasa. For much of the district, the lack of water is a major constraint to intensive utilisation of the land resources.

1.3 VEGETATION

1.3.1 VEGETATION ZONES

The vegetation of Kwale District has not been surveyed since before Independence (Moomaw 1960). The broad classes described in that study can still be distinguished, but the vegetation within the zones, has, in most cases, been greatly modified by agricultural and forestry practices (Figure 10). Appendix 8.2 shows some of the more important plant species in each zone. It is usually accepted that the coastal belt, up to the semi-arid area, was once a mosaic of forest and woodland, and the vegetation types are based on this assumption.

I Acacia Thorn Bushland (Acacia-Euphorbia)

This is a semi-arid vegetation type dominated by species of Acacia and Euphorbia and found from west of a line from Samburu to Kinango and is by far the largest zone in the district. There is very little cultivation and water is the limiting factor in any agricultural development. The major exception is Nyari Estate at Taru where a large sisal estate has been established. The rest of the area is divided between ranching and wildlife. The main tree species are Acacia lahai, A. seyal (mgunga) and A. senegal (kikwata), with Commiphora spp. and Terminalia spp. and the two trees of Euphorbia spp., E. nyikae and E. robeckii. A considerable quantity of charcoal burning takes place with subsequent degradation of the more wooded areas, for example, low hills such as Kilibasi.

II Lowland Dry Forest (Manilkara-Diospyros)

This type of vegetation at one time occupied a considerable area but is now restricted to a narrow belt between the semi-arid Acacia Thorn Bushland and the Brachystegia Woodland. It is a transitional type of vegetation dominated by Manilkara spp. Azelia quanzensis (mbambakofi), Diospyros vaughanii and Brachylaena hutchinsii (muhuhu). It is found between Mariakani and Conja, but fire and cultivation have combined to eliminate the original woodland almost entirely. With good management this zone can carry productive pasture, as demonstrated by the Livestock Improvement Centre at Mariakani. The lowland dry savanna found between

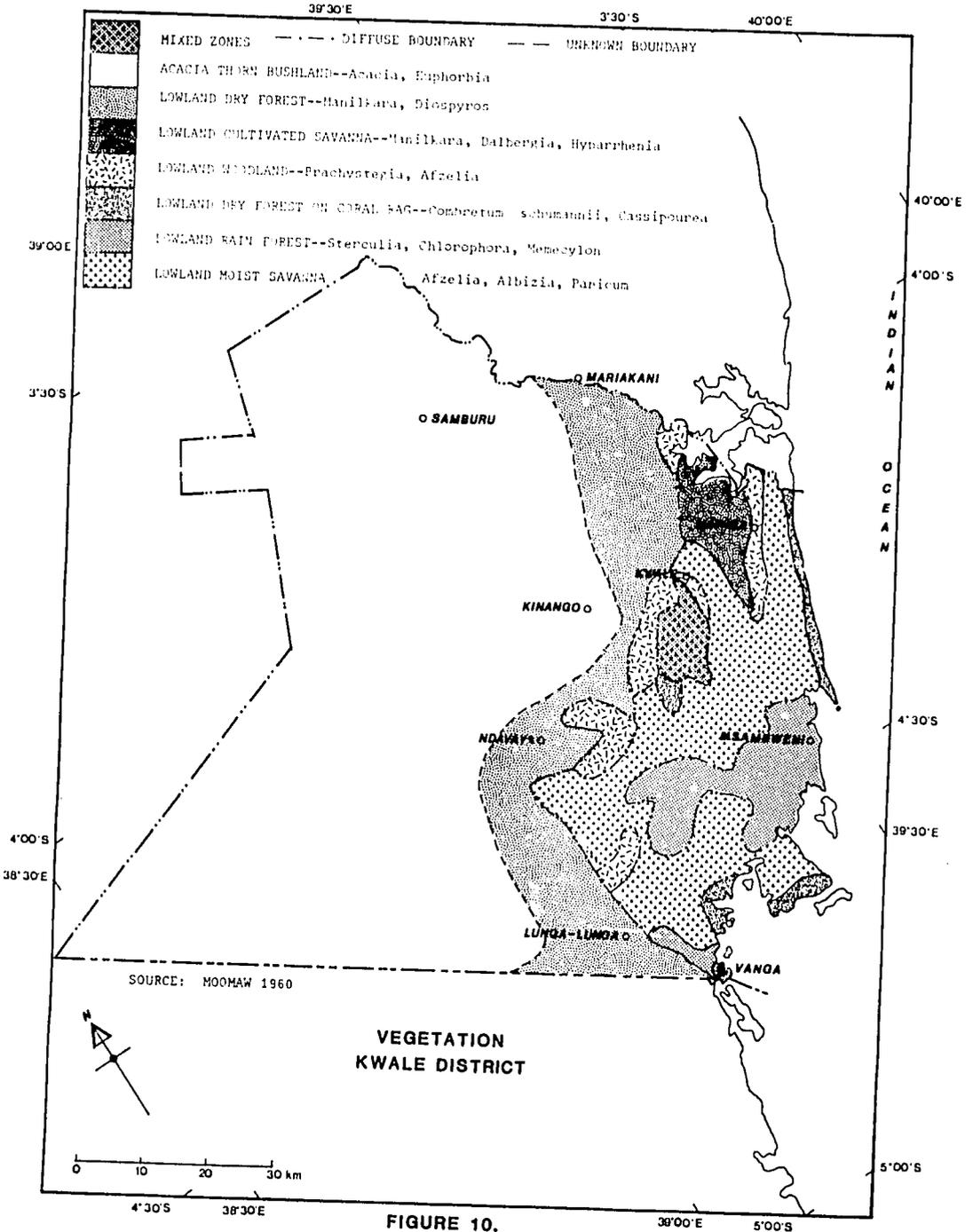


FIGURE 10.

Mombasa Creek and Duguma is characterised by Manilkara and Dalbergia small trees and Hyparrhenia grassland. Other tree species include Pilostigma thunningii (mchikichi), Sclerocarya caffra (mngongo) and Cassia singueana (mbaraka); and the important grasses are Hyparrhenia spp. and Themeda triandra.

III Lowland Woodland (Brachystegia-Afzelia)

The remnants of this type of vegetation are found in the Mwachi Forest, on the Matuga ridge, on the north-east and west slopes of the Shimba Hills, at Mkongani West Forest and on the west slopes of Jombo Hill. The soils are deep and freely draining and with increasing settlement the land use is changing from pasture to crop agriculture. The main tree species are Brachystegia spiciformis (mrihi) and Afzelia quanzensis (mbambakofi), but these are now rare, and the grasses are mainly Digitaria mombassana, Panicum maximum and Eragrostis perbella.

IV Lowland Dry Forest on Coral Rag (Combretum-Cassipourea)

There is a narrow strip of land, usually less than 5 km wide, extending inland from the coast where the coral rock (a previous reef level) is very close to the soil surface and outcrops in some cases. This area stretches from Likoni to Chale Island, with a short stretch at Shimoni and again at Vanga. The red soil between the rock is very fertile. The original forest type can be seen in the remaining patches of sacred forests, the Kayas, as at Waa, Tiwi, Diani and Kinondo and in the Jadini Galu forest. The dominant trees are Combretum schumannii (mgurure), Cassipourea euryoides (mngome) and Adansonia digitata (mbuyu). Dense coastal thicket dominated by Lantana camara, L. viburnoides, Securinega virosa and Bridelia micrantha amongst others, has followed forest destruction and where this has been eliminated by cultivation and fire, a rough weedy grassland dominated by Hyphaene compressa (doum palm) takes over. The palms are usually stunted by repeated seasonal burning and by harvesting to make mats and baskets.

V Lowland Rain Forest (Sterculia-Chlorophora)

This forest type is rich in hardwood species such as Chlorophora excelsa (mvule) and Trachylobium verrucosum, and is being continually depleted by logging with little replacement, despite most of the forests of this zone being gazetted reserves such as Shimba Hills, Muhaka, Gongoni, Ramisi and Umba River Valley, Buda, Mrima and Jombo. The genetic diversity of this forest zone is very high and many rare species occur. For example,

a vine found in Buda Forest is an undescribed species of Ancistrocladus which is unknown elsewhere in East Africa and with its nearest relative in the forests of Zaire. The forest occurs in the higher rainfall areas and there is usually a relatively high water table.

VI Lowland Moist Savanna (Afzelia-Albizia/Panicum)

This is the next most widespread vegetation type and occurs between the hills and the coast. It is derived from the Lowland Rain Forest (V above) and grades into the grassland derived from the coral rag forest. It is nearly all under some form of cultivation. Tree species such as Vitex mombassae (mfundumaji), Fernandoa magnifica (mlangalanga) and Ziziphus mauritiana (mkunazi) survive, and grasses include Panicum maximum, Pennisetum polystachyon and Sporobolus pyramidalis.

Moomaw (1960) associates the palm dominated area in the Shimoni peninsula with this vegetation class although it is probably derived in a different way from the Lowland Rain Forest which contains many palms. This 'Palm Woodland' is dominated by Borassus aethiopum and includes Hyphaene compressa, H. coriacia, Elaeis guineensis and Phoenix reclinata, referred to in Kiswahili as 'minyaa' and is fast disappearing due to the extension of agricultural settlement and uncontrolled fire.

VII Mangrove Thicket (Rhizophora-Avicennia)

The mangrove stands are confined to tidal estuaries, particularly around Gazi, Shirazi, Wasini, Majoreni and Vanga. The main species are Rhizophora mucronata (mkoko) and Avicennia marina (mchu). The landward margins of these areas support a saline grassland which can be used to grow rice as at Vanga.

VIII Coral Cliffs and Beach Crest (Capparis-Ipomoea)

Much of the shoreline of the south coast is low coral cliff, more or less covered with a salt tolerant thicket of low shrubs such as Capparis cartilaginea, which shade the sandy coves below. The more open beaches have a stabilising crest vegetation of Ipomoea and Casuarina trees. This beach crest vegetation is sometimes cleared on residential plots, a practice which can lead to beach erosion.

IX Pans and Ponds (Cyperus-Nymphaea)

There are many small areas of open water (ziwa) in the lower parts

of the coastal strip, formed naturally by impeded drainage or by removal of building sand coral blocks, or materials for road building. These are usually seasonal, being covered with Nymphaea (water lilies) and surrounded with Cyperus spp. when full and then used to grow rice as they dry up.

1.3.2 FORESTRY

There are eleven Forest Reserves and three main mangrove forests in Kwale District (Table 1.3.0 and Figure 11). Forestry plantations in the district have not been very successful. The 5 ha. plantation in Buda Forest was planted in 1961 on an experimental basis for pulp production but the trees are still too small to be used for any economic enterprise. The plantations of pine and other exotic species in Shimba Hills have not done well and have suffered from elephant damage, (See Section 3.1). It is estimated that there will be no economic return from them until at least in 1990. Logging and pitsawing of indigenous tree species is a chronic problem which has proved difficult to control. Despite their high rate of depletion, indigenous trees, especially the ones in high demand, e.g. mbambakofi (Afzelia), mvule (Chlorophora) and mtandarusi (Trachylobium), have been difficult to establish in new plantations.

1.3.3 KAYA FORESTS

The Kaya forest patches have in the past been protected by local traditions but are now suffering encroachment and over-exploitation because of increasing agricultural settlement, and because of the need for fuelwood and building poles for the rising population and supply the tourist industry based in Diani. Kaya means 'homestead' in nearly all the Mijikenda dialects and one guide referred to the forest as 'nganasa', the Masai word for a boma. The Kayas were originally places of refuge for the Duruma and Digo where they hid from invading Masai. Later, as this threat subsided, the forests were used by the elders for prayers, ceremonies and were revered by the rest of the people because they had protected their ancestors. The elders used the plants in the forests for medicinal and religious purposes and stayed there when close to death and were buried there. Some of the Kayas had been places of settlement before the Mijikenda came from the north, as evidenced by ruins of mosques and ancient wells which were presumably built by coastal Swahili people. These ruins were incorporated into the Digo rituals.

The following Kayas have been noted:

TABLE 1.3 FOREST RESERVES IN KWALE DISTRICT, 1983

NAME OF RESERVE	GAZETTED SIZE (ha)	INDIGENOUS FOREST (ha)	GRASSLAND (ha)	PLANTATIONS (ha)		
				PINES	CASUARINA	OTHERS
Shimba	19243.0	3899.3	13956.0	1297.6	-	90.1
Mkongani North	1113.0	1113.0	-	-	-	-
Mkongani West	1366.0	1366.0	-	-	-	-
Mailuganji	1714.7	1421.7	293.0	-	-	-
Gonja	842.0	721.0	115.0	-	2.5	3.5
Gongoni	824.0	628.0	196.0	-	-	-
Buda	668.0	661.0	2.0	-	-	5.0
Mrima	376.8	371.0	-	-	5.8	-
Marenji	1528.5	1523.5	-	-	4.0	1.0
Jombo	906.5	901.5	5.0	-	-	-
Mwachi	418.0	345.8	-	-	-	72.2
MANGROVES						
Vanga	3496.5	3496.5	-	-	-	-
Funzi	2371.5	2371.5	-	-	-	-
Gazi	477.5	477.5	-	-	-	-
TOTAL	35341.0	19297.3	14567.0	1297.6	12.3	171.8

SOURCE: District Forest Officer, 1983

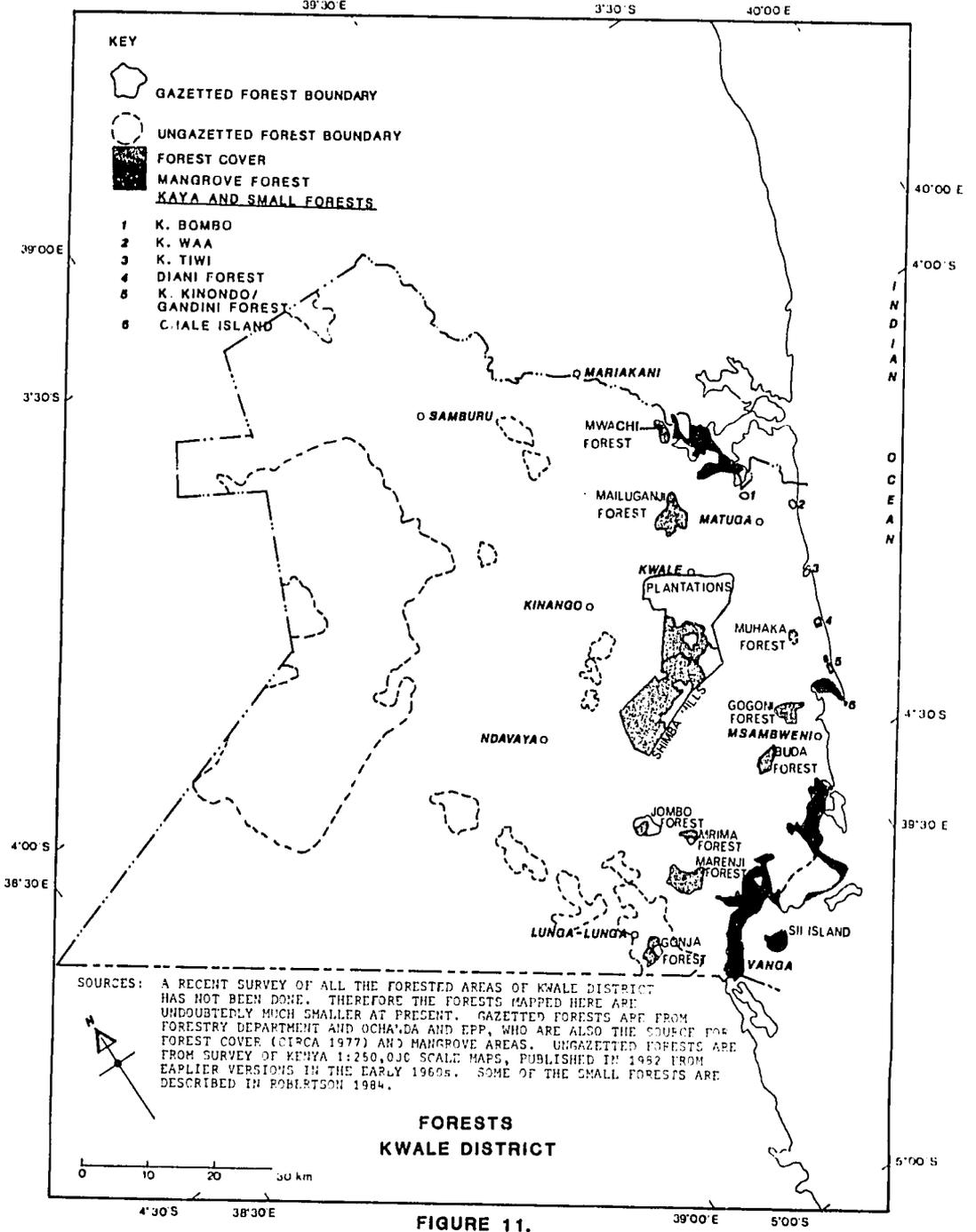


FIGURE 11.

Kaya Mtae, in the Mailunganji Forest, has large caves and is still used although the forest is being logged.

Kaya Bombo, west of Ngombeni, is reportedly still in use.

Kaya Pungu, east of Ngombeni, has practically disappeared, but the caves, and those at Similani nearby, are still sacred. Similani is said to be the most important sacred place for all the Digo.

Kaya Waa, on the cliff edge near Waa, is relatively intact, with one dedicated elder living nearby, and is used for ceremonial purposes.

Kaya Tiwi, behind Diani Reef Hotel, is still in use and strangers are not allowed into it. The elders say that even firewood for sacrifices has to be brought in from outside.

Kaya Diani, behind Two Fishes Hotel, is said to be still in use.

Kaya Kinondo, on the road past Galu beach, is still in use and contains a very rare and only recently discovered shrub (Grevea), as well as a few potentially very valuable timber trees (Calophyllum) seedlings of which are being used to start a trial plantation.

Chale Island, is forested and is still used for prayers.

Msambweni, has an important sacred cave in a grove.

Shimoni, has sacred caves.

A brief survey was done and it was not possible to visit all these sites, some of which may only be sub-Kayas or sacred groves and not full Kayas.

1.3.4 IMPLICATIONS FOR ENVIRONMENT AND DEVELOPMENT

The conversion of areas of indigenous vegetation communities to agriculture, rangeland and degraded bushland is continuing at a fast pace in Kwale District, partly as a result of the increasing demands of the urban area of Mombasa and partly because of the expansion of the Diani Tiwi tourism complex. The workers in the hotels need places to live and Ukunda is growing rapidly with a resultant demand for building poles, thatching materials, fuelwood and charcoal, all of which are taken from the indigenous forests and woodland in an uncontrolled way. The Shimba Hills Settlement Scheme and the settlement area around Jombo have increased the area under crop cultivation and reduced the indigenous forest and woodland cover without any new fuelwood plantations being established. Although some

agro-forestry is practised on these schemes with perennial tree crops such as cashew-nuts being planted, the general trend is for a reduction in the area of woody vegetation with a consequent deleterious effect on rainfall and watershed protection. Immigrant farmers carry out shifting cultivation of tomatoes on the coral rag area with no care for the land and their land clearance technique using fire has destroyed far more of the precious vegetation cover than they use in any one season. They also destroy valuable timber in the remaining forest patches by cutting large trees to make split planks for the tomato boxes. Contractors seeking building materials (sand and coral blocks) for Mombasa have denuded many small areas without any thought for the control of soil erosion or for replanting the bare areas. Sawmillers have cut out the best timber trees and those of easy access leading to this forest canopy. All these factors have led to a loss of natural resources and these will have long-term implications for the district as a whole, despite the short-term gains made by the people who carry out the activities described above.

Industrial enterprises like Calcium Products Limited and Ramisi Sugar Factory cut trees in areas threatened by deforestation to meet their energy needs. In Kinango and Msambweni Divisions charcoal burning is now controlled but cutting building poles (for sale in other areas) and overgrazing due to overstocking are still major problems. All these activities lead to removal of vegetation cover making the already poor soil susceptible to erosion.

A substantial amount of vegetation cover had been cleared to give way to mining on Mrima Hill. However, the mining has been stopped and rehabilitation of the site is currently going on.

Burning of bush and grasslands as a way of clearing for cultivation or allowing easier sprouting of new grass is common in the district. Unfortunately successive burning destroys a lot of valuable vegetation.

1.4 WILDLIFE AND FRESHWATER FISHERIES

1.4.1 TERRESTRIAL WILDLIFE

The wildlife population at lower elevations of Kwale District is generally low. Higher densities are found in the Shimba Hills and adjacent areas, and in pockets of forests throughout the district. Kenya Rangeland Ecological Monitoring Unit's (KREMU's) national counts include data for the Kilifi/Kwale and Tsavo eco-units (Table 1.4). The trends

TABLE 1.4 ANIMAL CENSUSES IN SOUTHERN COASTAL ECO-UNITS

ANIMALS	KILIFI/KWALE			TSAVO		
	1977	1978	1980	1977	1978	1980
Cattle	157,900	188,300	259,200	58,400	67,200	77,200
Shoats	278,800	211,900	247,600	13,900	27,400	5,500
Donkeys	330	200	-	-	-	-
Elephants	610	-	-	14,200	15,800	6,700
Rhinos	50	-	-	820	160	20
Giraffes	190	540	790	2,800	2,800	3,800
Buffalo	560	-	-	3,900	9,400	9,700
Eland	-	120	1,100	4,500	5,300	3,700
Oryx	-	630	1,500	14,800	17,400	10,900
Kongoni	90	540	1,500	2,400	3,000	6,200
Hartebeast	-	-	-	-	-	510
Topi	-	120	-	-	110	-
Wildebeast	-	-	-	-	-	-
Thomson's) Gazelle)	-	-	280	1,600	2,600	1,400
Impala	2,000	1,800	4,700	3,800	3,800	3,300
Gerenuk	-	120	150	630	1,200	1,300
Water-buck	-	270	150	1,600	1,000	2,600
Lesser Kudu	50	560	150	590	1,500	1,100
Zebra	-	370	580	11,400	19,100	23,600
Ostrich	-	-	-	1,900	1,300	1,400
Warthog	1,700	850	910	5,800	5,600	2,900

NOTE: Standard errors are reported in source document: they are proportional to the size of the population and vary from 15% to 100%.

indicate that the number of elephants decreased up to 1980 but, appear to be increasing now, particularly in the Shimba Hills National Reserve (Table 1.5). Buffaloes are numerous in the lower part of the Shimba Hills. Other common animals in the reserve include bushbuck, monkey, baboon and leopard. In 1970-71 roan antelopes were translocated from the Ithanga Hills, where their habitat was threatened, to the Shimba Hills. The translocation has not been a great success. There are probably a number of different reasons why the population has dropped from the original 38 animals, including poaching for food, habitat loss and population dynamics. Already some parts of Shimba Hills National Reserve are being threatened by the surrounding population, particularly the Longo Magadi Forest and Mkombe Valley.

The Reserve is surrounded by small holding mixed farms. Although wildlife is a big tourist attraction which earns the country foreign exchange, farmers in this area need to be protected from wildlife menace. Wildlife damage to crops is most severe in the Shimba Hills settlement area south-east of the reserve. The target crops are maize, cassava, yams, potatoes, sugar-cane and fruits. Baboons and monkeys eat the crops during the day and at night pigs, elephants and buffaloes take over. The farming families have to guard their crops continuously both during the day and at night. Farmers report very high losses and the process of compensation by the Ministry of Tourism and Wildlife is lengthy and can take as long as 5 years, while other claims are rejected. What farmers need is not compensation in form of money but a long-term solution which will enable them harvest their crops.

The Department of Wildlife Conservation and Management maintains a game control post at Wendeyi and has built a high tensile fence to protect farmers from bigger animals like elephants and buffaloes. Most of the smaller animals like monkeys and wild pigs live within the farming areas, along river banks, on uncultivated land etc. and that is where they should be controlled from.

1.4.2 FRESH WATER FISHERIES

Fish farming has not yet taken root in the district. The reasons advanced range from lack of permanent water courses, soil texture to inadequate knowledge of fish farming. There is, however, some fish stocks in some large dams in Kinango although their economic viability in terms of commercial exploitation is not yet known.

TABLE 1.5 WILDLIFE COUNTS FOR THE SHIMBA HILLS

ANIMALS	YEARS								
	1983	1981	1980	1978	1973	1971	1969	1961	PRE'60s
Sable antelope	500	260					102	141	
Roan antelope	11		18	22	8	38			
Elephant	300	200- 250							2,000
Buffalo	500	160- 180							
Giraffe	3								

NOTE: Counts are difficult due to thick forest cover.

SOURCE: 1983 are from District Game Warden's office.
Previous years are reported in Ross, 1981.

Clarias and Protopterus are common species in the district. Although no detailed survey has been carried out in the district families living along rivers rely more on fresh water fish than on more expensive sea fish. Commercial markets for fresh water fish have not been established.

The Fisheries Department plans to introduce and promote aquaculture in Kinango and Msambweni Divisions to alleviate the acute shortage of animal protein in the diet of many people. Fish aquaculture studies will be undertaken by the District Development Committee.

1.4.3 IMPLICATIONS FOR ENVIRONMENT AND DEVELOPMENT

Wildlife is an important resource for the district and efforts must continue to limit poaching and activities which reduce their natural habitat. The resulting concentration of game in ever more limited areas damages the remaining habitat and may cause dislocations. Lions, for example, have moved from the reserve to the ranching region, where they can hunt more effectively. The importance of wildlife to tourism and the issue of the Shimba Hills management are discussed in section 3.1.

The freshwater fisheries can be greatly expanded, first for local consumption and later for commercial markets. Lack of water, infrastructure and technical assistance are major constraints.

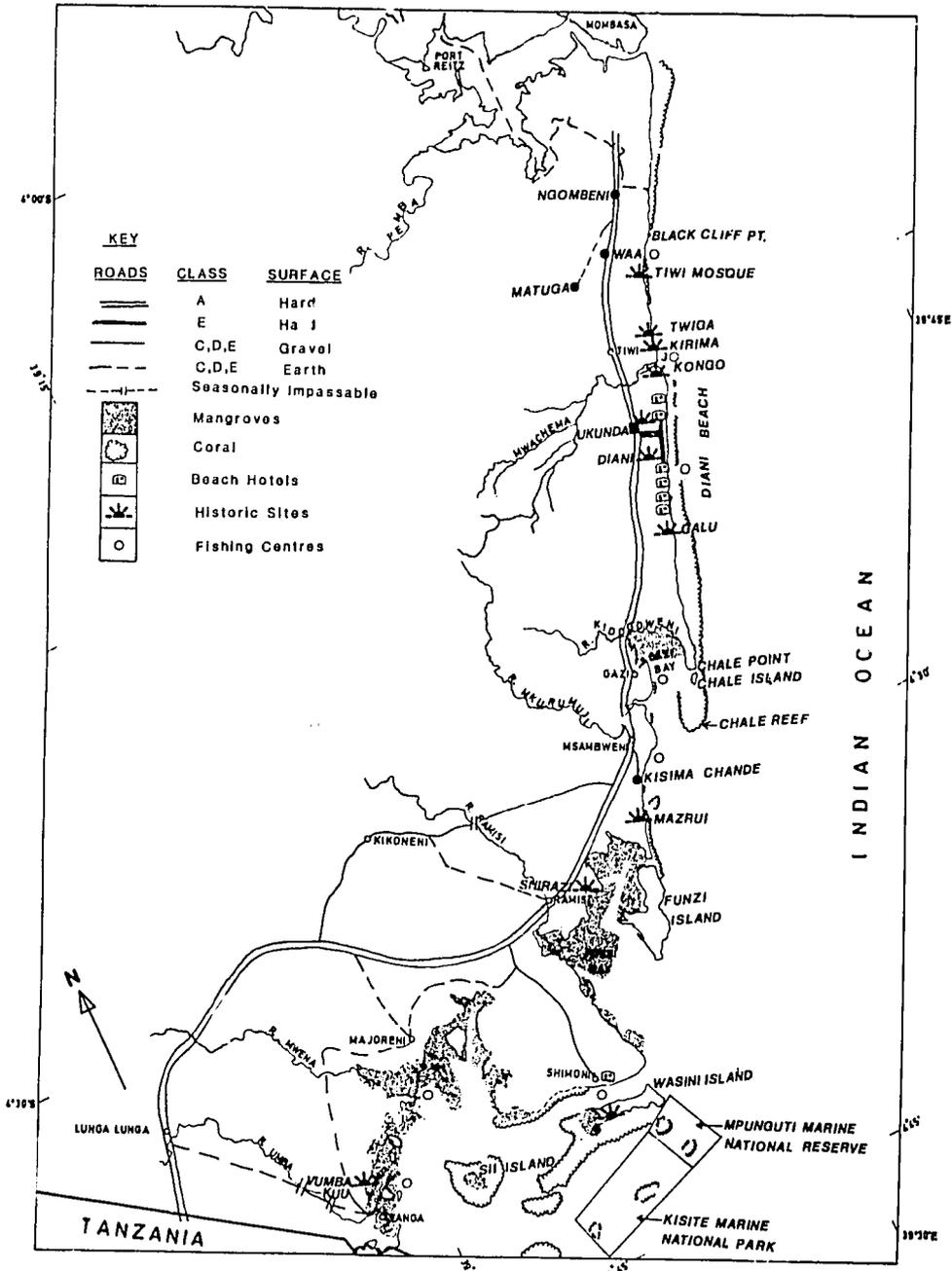
1.5 COASTAL AND MARINE RESOURCES

1.5.1 INTRODUCTION

This section describes the ecology of the coastal and marine resources along the Kwale coast. The coastal zone of Kwale District may be defined to include:

- a strip of land approximately 250 kilometres long from Maganyakulo in Waa location to Jimbo Settlement at the Kenya-Tanzania border,
- the territorial sea which extends seawards 12 nautical miles from the coastline,
- the continental shelf which is a nautical prolongation of the adjacent coastal plain,
- the exclusive economic zone which extends 200 nautical miles seawards, and
- in a cultural sense, the Mwambao, a ten-mile landwards from the sea, which was under the Sultan's rule.

The focus here is more properly on the coastline and adjacent marine resources (Figure 12).



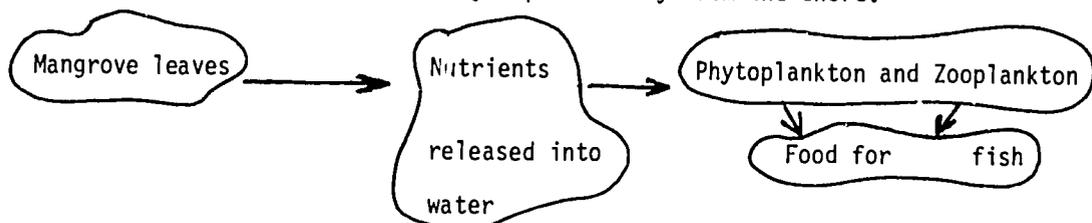
COASTAL AND MARINE RESOURCES , KWALE DISTRICT

FIGURE 12.

The coastline consists of coral reefs, beaches and cliffs, river inlets and mangrove swamps. Although sedimentation is not a major problem in the district, influx of fresh water from rivers e.g. Ramisi and Uмба affect reef formation. Mangrove forests are found along the coast, most notably around Vanga, Chale and Gazi. Mpunguti Marine National Reserve encompassing 11 sq. km and Kizite Marine National Park (28 sq. km) are located beyond Shimoni. In the park fishing and shell collection are prohibited while in the reserve, traditional fishing is allowed.

1.5.2 MANGROVES

The mangrove community is one of the most productive and valuable ecosystems. It has an important interdependence in the ecology of near shore waters and a well defined ecological food chain. Populations of exploitable organisms such as shrimps and crabs are associated with the swamps which also act as breeding grounds or rearing grounds for larvae of commercially important marine fish and crustacea normally captured away from the shore:



There are 8,795 hectares of mangroves in Kwale District distributed as follows:

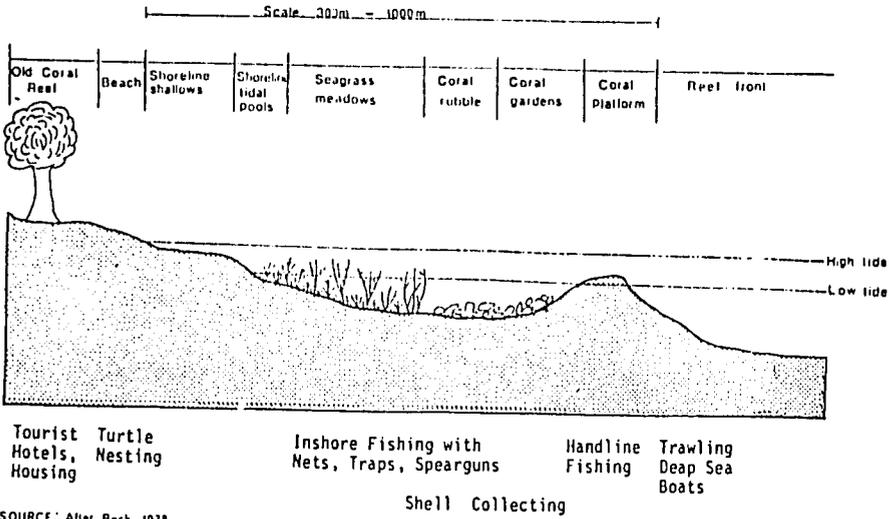
TABLE 1.7

MANGROVES IN KWALE DISTRICT, 1984

<u>Locality</u>	<u>Area in hectares</u>
Maftaha Bay	615
Ras Mwachema	5
Funzi Bay	2715
Vanga	4265

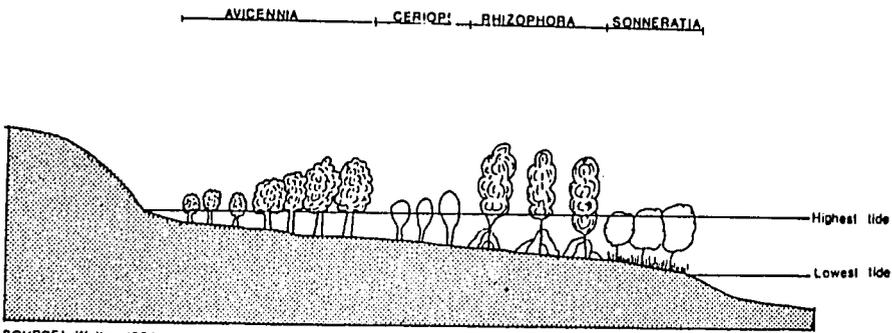
SOURCE: Kokwaro, 1984

Mangrove species occur in distinct zones as they have different requirements for shade, turbidity and salinity (Figure 13). Some of the species observed in the district are Sonneratia alba, Bruguiera gymnorhiza, Rhizophora mucronata, Lumnithera racemosa, Xylocarpus granatum, Avicennia marina and Cerriops tagal.



SOURCE: Alter Bock, 1978.

FIGURE 13. CROSS-SECTION OF CORAL LAGOON



SOURCE: Waller, 1964.

FIGURE 14. CROSS-SECTION OF MANGROVE FOREST.

Mangroves are used for many purposes:

- (a) building poles for houses and boats as they are slim, straight, strong, termite and rot resistant, especially the Lumnitzera racemosa, Rhizophora mucronata, Ceriops tagal and Bruguiera gymnorrhiza;
- (b) Firewood - especially among the Bruguiera gymnorrhiza, Ceriops tagal, Lumnitzera racemosa and Xylocarpus granatum.
- (c) Tannins - Bruguiera gymnorrhiza, Ceriops tagal and Xylocarpus granatum. Tannins, extracted from mangrove barks, are used in tanning leather.

1.5.3 CORAL ECOSYSTEM

The coral reef runs parallel to the coastline at 300-1000 metres from the shore and forms the seaward boundary of a unique and complex ecosystem. The coral species found along the stretch of Kwale District can be grouped into three different coral forms or shapes:

- the branching forms typified by the stags horn coral (*Acropora*),
- the plate-like forms, and
- the massive and generally rounded types.

The Poritidae and the Acroporidae are among the most important families of the reef builders and are well represented in the district. Colonies of many thousands of tiny polyps occupy only the surface of coral - thus the name living coral. These polyps secrete a cap of lime or calcium carbonate around their bodies. Within the coral tissues are the Zooxanthellae which are small chlorophyll - containing protozoa. They live with the coral polyps in a state of symbiosis and although the exact nature is not known, it has been found that corals deprived of their Zooxanthellae are unable to deposit calcium, which is vital to the formation of their protective structures.

The major zones of the coral reef ecosystem are the barrier reef, coral gardens and lagoon, seagrass beds, fringing reef and beach liach (Figure 14).

Corals are limited in their development by several environmental conditions:

- (i) Warm water temperatures 20-28°C,
- (ii) Salinity - close to that of the ocean,
- (iii) Shallow water depths - which permit enough light penetration essential for the symbiotic algae living in the coral reef, and
- (iv) Continuous supply of well oxygenated water - which provides their food.

Coral reefs are slowgrowing. The building of reefs results from a balance between coral growth and destruction, and represents perhaps 7,000 to 10,000 years of coral endeavour (Bock, 1978).

Coral reef has several uses besides protecting the shore from wave erosion. It is a very productive ecosystem and provides food for man e.g. molluscs, crustacea and fish. Many species are found here due to the abundance of food shelter. The coral reef is a major tourist attraction. Old coral blocks are used as building material as is evident in some parts of Waa, Tiwi and Diani.

1.5.4 FISHERIES

Fishing occurs along the entire stretch of the south coast. Rich inshore fishing grounds are found at Shimoni, Vanga and Majoreni. These grounds are mainly coral reefs which include Makokowe, Mwamba, Midira, Mpwa, Mwamba cha Kitungamwe and Marembo reefs. Other fishing areas include Sii, Diani and Tiwi.

Dermesals are normally caught in the inshore waters and include such fish as Lethrino, (chengu - Swahili) Scarus (parrotfish) and Siganus (Tafi). The pelagic fish are normally caught in the open sea. This type of fishing is rare on south coast except in the Pemba Channel which is famous for sport fishing. Other types of fisheries include prawns, crabs, lobsters and the Beche-de-Mer.

1.5.5 IMPLICATIONS FOR ENVIRONMENT AND DEVELOPMENT

The coastal marine resources of Kwale are important for their scenic/aesthetic value (both to local people and tourists), as sources of food, and for commercial exploitation (see Chapter 3). Seawater could be utilised for the extraction of salt as is the case in Ungwana Bay in Kilifi District.

The coastal environment is in many respects fragile and it needs proper management. The major threats are from over-exploitation of shells, fish, mangroves and potential environmental problems resulting from pollution.

2.0 OVERVIEW OF LAND USE AND HUMAN ENVIRONMENT

2.1 LAND ADMINISTRATION AND TENURE

2.1.1 LAND ADMINISTRATION

Kwale District covering 8,322 sq. km is divided into four administrative divisions and twenty-one locations (Figure 15). Matuga and Msambweni divisions are in the Coastal Plain and Foothills. Kubo Division encompasses the Shimba Hills Settlement Scheme while Kinango Division, the largest, contains the dry western part of the district.

2.1.2 LAND TENURE

Most of the land is unregistered or Government Land (Table 2.1). Trust Land predominates in the western areas. Most of Kubo Division, parts of Matuga and Msambweni Divisions have been registered, or have sections under adjudication. Adjudication began in 1969 and by 1983, 22 sections totalling just under 200,000 hectares had been registered.

TABLE 2.1 LAND TENURE IN KWALE DISTRICT, 1980.

	<u>AREA (ha)</u>
Government Land	269,600
Freehold Land	3,400
Trust Land	52,100
Registered	26,300
Unregistered	474,300
Area of water	6,500
TOTAL	<u>832,200</u> =====

SOURCE: Statistical Abstract, 1982.

2.1.3 IMPLICATIONS FOR ENVIRONMENT AND DEVELOPMENT

Throughout the coastal zone of East Africa, land tenure is a complex issue and the lack of clear title deeds has hindered development. The carry-over of Arab and Indian title deeds from the Sultan of Zanzibar's rule and the conflict between traditional land tenure and private land holding are two factors which complicate land tenure in the district (see Section 4.1).

39°30' E

3°30' S

40°00' E

KEY

- INTERNATIONAL BOUNDARY
- - - - - DISTRICT BOUNDARY
- DIVISIONAL BOUNDARY
- LOCALITY BOUNDARY

39°00' E

3°30' S

40°00' E

4°00' S

INDIAN OCEAN

4°30' S

39°30' E

00° S

30° E

SOURCE: SURVEY OF KENYA BOUNDARIES MAP

ADMINISTRATIVE BOUNDARIES
KWALE DISTRICT



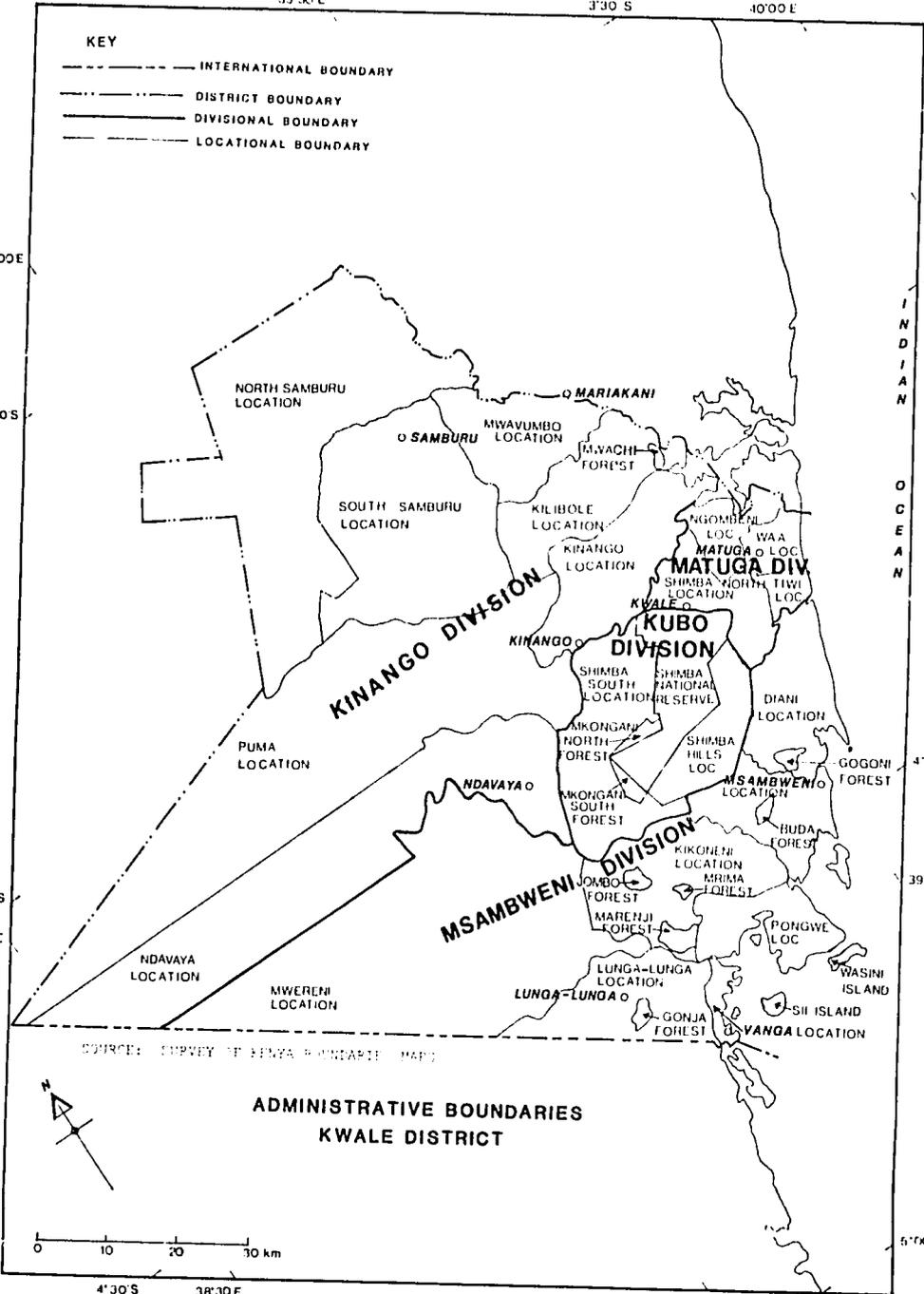
0 10 20 30 km

4°30' S 38°30' E

FIGURE 15.

39°00' E 5°00' S

5°00' S



2.2 AGRICULTURE AND LIVESTOCK

2.2.1 AGRO-ECOLOGICAL ZONES

Kwale District can be divided into five agro-ecological zones (Figure 16). These are: the Lowland Sugar-cane Zone, Coconut-cassava Zone, Cashewnut-cassava Zone, Lowland Livestock-Millet Zone, and Lowland Ranching Zone.

Lowland Sugar-cane Zone

This zone is marginal for sugar-cane but good for coconut and cassava. It is the wettest zone whose average annual rainfall is between 1200mm and 1400mm. It covers an area of 23,500 ha, the whole of which is in Msambweni Division.

Coconut-Cassava Zone

This zone is also suitable for cotton and covers about 95,300 ha.* The climate is generally hot and humid. The rainfall averages 1200mm per year, and is bimodal.

Cashewnut-Cassava Zone

The zone is also suitable for mangoes and cotton. It covers an area of 148,366 ha. of which only 14,700 is agricultural land. The rainfall pattern is similar to that of coconut-cassava zone but averages 900mm per annum.

Lowland Livestock-Millet Zone

The climate here is hot and semi-arid. The rainfall is less than 750mm per annum. This zone is also suitable for growing sorghum, cowpeas, green grams, sisal, castor, soya beans, sunflower etc. It covers an area of about 511,415 ha. but only 507,700 ha. is agricultural - mainly rangelands.

Lowland Ranching Zone

Rainfall is bimodal averaging between 500mm and 600mm per annum. Much of the zone has been divided into ranches. The zone covers an area of approximately 288,600 ha. in Kinango and Msambweni Divisions.

* This excludes townships.

2.2.2 CROP PRODUCTION

The major cash crops grown in the district are coconuts, cashewnuts, mangoes, citrus fruits, kapok and bixa. The food crops include cassava, maize, rice, potatoes and vegetables (cabbages, tomatoes) (Table 2.2). Most crop production is confined to the 'croplands areas' i.e. the lowland sugar-cane and coconut cassava zones located in Matuga, Kubo and Msambweni Divisions. Kinango Division and parts of Msambweni are marginal areas although they are suitable for crops like sorghum, cassava, millet and pulses.

The Agricultural Finance Corporation (AFC) has opened a branch at Ukunda, which at the moment serves about 20 percent of farmers with seasonal credit. It is hoped that more farmers will make use of this facility.

One of the major problems affecting commercial farming is the lack of an organised system of supply and distribution of farm inputs such as fertilisers, chemicals and seeds. This results in low agricultural productivity without surplus for marketing.

Another problem that farmers face is the lack of farmers co-operative societies to market the major cash crops, most of which either do not have a ready market or command low prices which adversely affect loan repayment. The district experiences food deficits, partly due to poor storage facilities.

In large-scale agriculture, the Associated Sugar Company Limited has over 4,800 hectares under estate sugar-cane at Ramisi. The Sugar Factory also buys sugar-cane from outgrowers. The Msambweni Development Company has a coconut plantation and a copra processing factory at Msambweni. Other large farms individually owned are: The Kwale Development Farm in Matuga Division which grows coconuts, cashewnuts and vegetables. The Khan Farm in Matuga is under livestock rearing and vegetable growing; and The Nyari Sisal Estate in Kinango Division is under sisal and coffee. Vegetables are grown under sprinkler irrigation.

The majority of farmers in Kwale District practise subsistence farming, and most of them do not use fertilisers and pesticides. The smallholder mixed farms are found along the coast and in the upland regions of Kubo and Matuga Divisions. Traditional farming system which involves burning of the fields is still practised and it damages perennial crops as well as grass cover.

TABLE 2.2 AGRICULTURAL PRODUCTION IN KWALE DISTRICT, 1975-1982

CROP	1975	1976	1977	1978	1979	1980	1981	1982
Cashewnuts	Ha. 17,000	17,384	9767	17,370	20,02.0	2418.5	18,272	18,406
	T. -	-	6000	-	-	174801.8	1222	4090
	Yield -	-	0.6	-	-	72.27	14.9	0.2
Coconuts	Ha. 206	63.5	9133	9609.2	19,786.2	20,000	14,367	14,650
	T. -	-	18,266	-	-	35,000	-	20,000
	Yield -	-	2	-	-	1.75	-	1.36
Sugar-Cane	Ha. 160	206	4900	1,606.2	6,200	6,200	7,200	7,256
	T. -	15,000	27,000	-	-	170,250	96,666	98,844
	Yield	72.8	5.5	-	-	3	13.42	13.6
Bixa	Ha. -	-	241	1,407.0	1,547.9	2,108.0	4,163	4,447
	Tons -	-	480	-	-	3,103.76	2769	3189.3
	Yield	-	1.99	-	-	1.47	0.66	0.7
Sesame (Simsim)	Ha. 470	934.28	984	642.6	-	2,383	1143	-
	Tons -	37	295	-	-	502.5	460	-
	Yield	0.03	0.29	-	-	0.2	0.40	-
Cassava	Ha. 1,230	1,249	1300	2981.3	1381	2,394	2425	3511
	Tons -	-	12000	-	-	40	24250	25080
	Yield	-	9.23	-	-	0.016	10	7.99
Cotton	Ha. 180	241.7	273	152.7	77.6	313.6	268	121
	Tons -	-	45	-	-	222.7	41	5,237
	Yield -	-	0.16	-	-	0.7	0.15	0.04
Sorghum	Ha. 2	1.4	2.0	5.0	-	23.6	128	139
	Tons -	-	1.2	-	-	-	115	110
	Yield	-	0.6	-	-	-	0.89	0.79
Rice	Ha. 189.2	889.2	310	286	228.3	184.3	310	509
	Tons -	-	360	-	-	-	360	407
	Yield	-	1.16	-	-	-	1.16	0.8
Citrus	Ha. 2,129.2	2,2E1	302	822	2,331.4	2,550	2,743	2,922
	Tons -	-	4530	-	-	-	46000	30000
	Yield	-	15	-	-	-	16.76	10.26
Green Grams	Ha. 600	696	750	362.5	30.4	41.8	371	306
	Tons -	-	225	-	-	-	146	150
	Yield	-	0.3	-	-	-	2.54	10.26
Mangoes	Ha. 604	648	784	606.8	944.8	1,000	1,063	1,095
	Tons -	-	8100	-	-	-	9500	1,800
	Yield -	-	10.3	-	-	-	8.9	1.6
Sisal	Ha. -	-	-	-	-	-	-	-
	Tons -	-	-	-	-	-	-	2,500
	Yield	-	-	-	-	-	-	-

NOTE: Yield = Tons/Hectare

SOURCES: Ministry of Agriculture - Annual Reports - Kwale District (1976,1978,1980,1982)

Another major constraint to crop production which smallholder farmers face is the damage to crops by wild animals. This is most prevalent in Shimba Hills Settlement Scheme in Kubo Division due to its proximity to the Shimba Hills National Reserve.

Cashewnuts and coconuts together constitute about 90 percent of all tree crops, in the smallholder arable farming areas. Bixa, which is also grown by smallholder farmers, feeds the bixa processing plant at Tiwi. However, the Bixa factory (capacity of 250 tons/yr) cannot cope with the present production of bixa; this leads to much wastage. There are plans to expand the factory to a capacity of 1000 tons/yr, and to market the rest of the raw bixa.

2.2.3 LIVESTOCK PRODUCTION

A livestock census was carried out in the district between 1980 and 1983. A large proportion of livestock are concentrated in the arid and semi-arid hinterland zones (Table 2.3). The dry hinterland (Kinango) is heavily stocked with indigenous cattle, sheep and goats (Table 2.4).

Apart from the rangelands, there are some large mixed commercial farms along the coastal strip with dairy herds which supply milk to some hotels.

Cattle in the dry hinterland are mainly used for beef production, although, observations made suggest that herds located near good access roads e.g. Kinango, Ndavaya and Mwereni are typically structured for milk production.

Semi-pastoralism is practised in Kinango Division. During the driest period of the year people move from place to place in search of pasture, causing overconcentration of animals at water points. It is during such periods that overgrazing occurs around water points, leading to soil erosion. There are efforts to upgrade cattle through artificial insemination in various parts of the district.

TABLE 2.3 LIVESTOCK NUMBERS, KWALE DISTRICT 1980-1983

Type of livestock	1980	1981	1982	1983
Cattle	31,013	24,484	20,835	45,590
Sheep and Goats	221,080	-	-	-
Poultry	-	195,617	241,520	-
Rabbits	-	-	-	167

SOURCE: Ministry of Agriculture and Livestock Development - District Livestock Development Office, Kwale 1983.

Ranches

The rangelands of Kwale District have been demarcated into ranches or proposed ranches (Figure 17). There are four main types of ranches:

Group Ranches: This is where livestock owners continue to herd their livestock individually in their traditional grazing area but benefit collectively from ranch facilities. A central group herd may be maintained as well. There are six group ranches in the district occupying 212,553 ha.

Company Ranches: These belong to members who have contributed capital to the business.

Commercial Ranches: These are owned privately and have a small number of shareholders. There are seven commercial ranches in the district, occupying 215,876 ha. of land. The ranches usually possess livestock purchased through the Ministry of Agriculture and Livestock Development, Livestock Marketing Divisions' cattle marketing service or through private trade.

Co-operative Ranches: These manage the livestock of the co-operative members collectively through an elected executive who appoints a manager. The members of a co-operative have traditional grazing rights on the delineated ranch.

The traditional rangeland producers on group ranches possess livestock but have limited rangeland available to them.

Livestock diseases

Trypanosomiasis is widespread due to extensive distribution of suitable habitats for tsetse-fly, including remnants of forest in otherwise cultivated areas and the wildlife reserve in Shimba Hills. The transmission of trypanosomiasis is enhanced by wildlife carrier populations such as bush pigs and antelopes. Other diseases affecting livestock include tick-borne diseases and foot and mouth.

The stocking rate in 1983 for each division is given as follows:

Msambweni	-	4 ha/s.u.
Matuga	-	5 ha/s.u.
Kubo	-	6 - 8 ha/s.u.
Hinterland	-	10 ha/s.u.

s.u. = stock unit

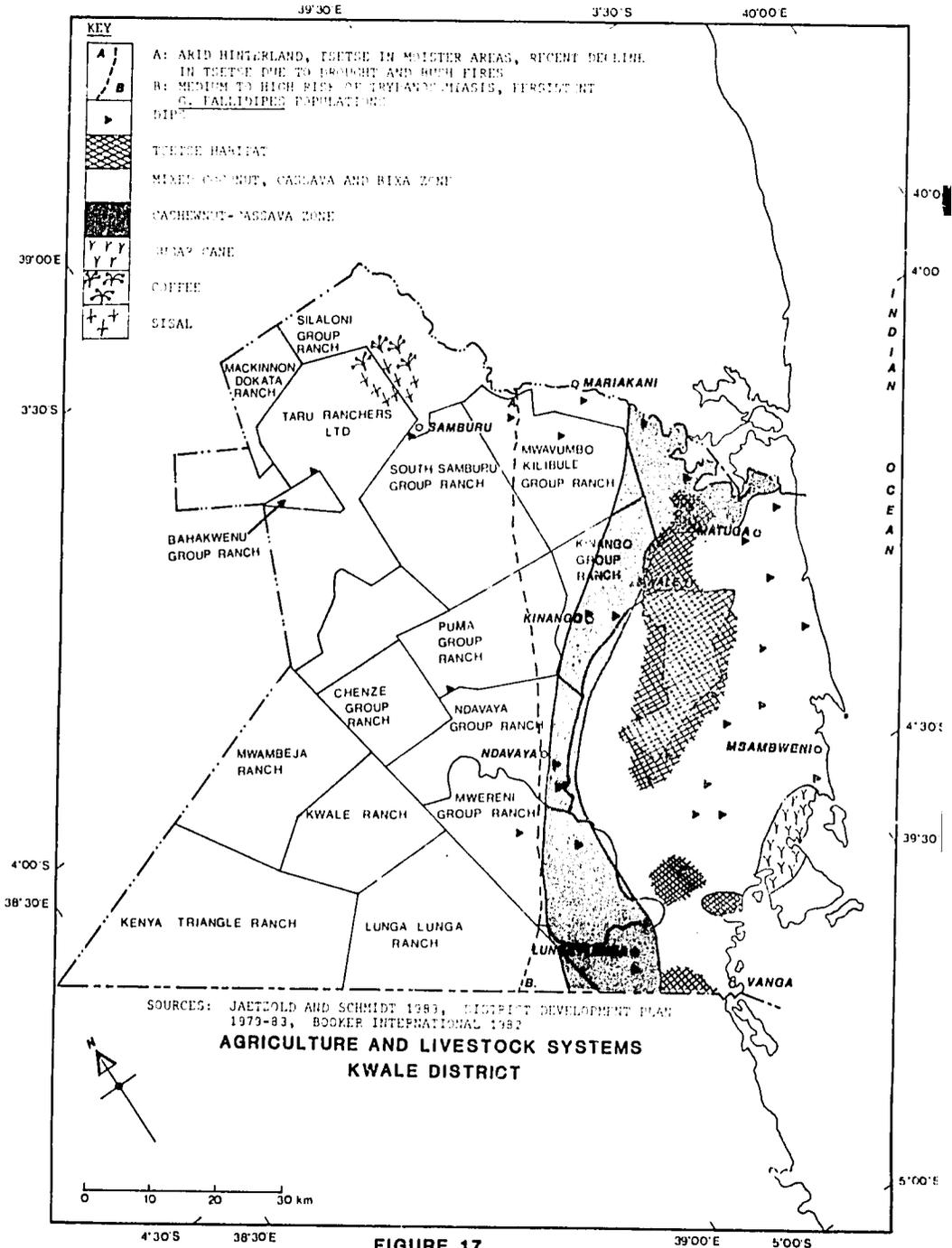


FIGURE 17.

Overstocking is not a problem in Msambweni, Matuga and Kubo Divisions. However, in Mwereni location of Msambweni Division there is overstocking in some areas. Overstocking is a major problem in Kinango Division, particularly in group ranches which are overstocked by about 75 percent.

TABLE 2.4 LIVESTOCK DISTRIBUTION BY DIVISIONS, KWALE DISTRICT, 1983.

Type	Kinango	Kubo	Matuga	Msambweni
Cattle	20,430	8,376	6,197	20,530
Sheep and Goats	160,712	5,815	10,981	40,876

SOURCE: Ministry of Agriculture and Livestock Development
District Livestock Development Office, Kwale 1983.

2.2.4 IMPLICATIONS FOR ENVIRONMENT AND DEVELOPMENT

Although more than half of Kwale District is of low agricultural potential mainly due to unreliable rainfall or poor soils, the full agricultural potential has not been realised. Intensive agriculture is possible in areas such as Matuga and Shimba Hills Settlement Scheme.

The potential for livestock development has also not been fully exploited due to lack of water, especially during the dry season. The delay in the issuing of title deeds to some group ranches has also interfered with the development of the proposed ranches.

2.3 POPULATION

2.3.1 ETHNIC COMPOSITION

There are three main population groups in Kwale District (Table 2.5).

TABLE 2.5 POPULATION BY SEX, TRIBE OR NATIONAL GROUP FOR 1969 AND 1979 IN KWALE DISTRICT

TRIBE OR NATIONAL GROUP	1979			1969	
	MALE	FEMALE	TOTAL	PERCENTAGE OF TOTAL DISTRICT POPULATION	PERCENTAGE OF TOTAL DISTRICT POPULATION
<u>KENYAN AFRICAN</u>					
Mijikenda	114,083	122,394	236,476	82.0	83.0
Kamba	14,367	14,084	28,451	9.9	9.4
Luo	3,110	2,075	5,185	1.8	1.6
Kikuyu	1,570	1,263	2,833	1.0	0.6
Taita	1,212	1,221	2,433	0.8	0.5
Luhya	1,197	709	1,906	0.7	0.3
Swahili/Shirazi	779	740	1,519	0.5	1.4
Others	2,130	1,604	3,734	1.3	0.8
TOTAL	138,448	144,090	282,537	98.0	97.7
<u>KENYAN NON-AFRICANS</u>					
Asians	83	71	154	0.1	0.2
Europeans	34	35	69	< 0.1	< 0.1
Arabs	63	53	116	< 0.1	0.1
Others	175	172	347	0.1	< 0.1
TOTAL	355	331	686	0.2	0.3
<u>NON-KENYANS</u>					
Africans	1,825	1,103	2,928	0.1	0.2
Asians	158	145	303	< 0.1	0.2
Europeans	814	798	1,612	0.6	0.5
Arabs	76	66	142	0.1	< 0.1
Others	72	83	155	0.1	0.1
TOTAL	2,945	2,195	5,140	1.8	1.9
DISTRICT TOTAL	141,748	146,616	288,363	100.0%	100.

SOURCE: Central Bureau of Statistics, 1979

- (1) Wadigo, found mainly in the agricultural areas along the coast around Kwale township, Mkongani and Kikoneni.
- (2) Waduruma, found in the range and marginal areas.
- (3) Wakamba, found mainly in the Shimba Hills.

There is also a cross-section of other ethnic groups found mainly along the coast, within the towns and in settlement schemes.

The population distribution by tribe or nationality in the 1979 census indicated that Kenyan Africans accounted for 98% followed by non-Kenyans (1.8%) and then by Kenyan non-Africans (0.2%). Among the Kenyan Africans, the Mijikenda were the majority accounting for 82% of the total district population.

2.3.2 POPULATION DENSITY

The District is generally sparsely populated, with an overall population density of 36 persons per km² (Figure 18) and (Table 2.6). The distribution of rainfall within the district to a large extent determines the density of the population. The coastal areas, which receive the highest amount of rainfall, because of Shimba Hills have the highest population density, i.e. 137 persons per km² in Matuga Division, whereas the Hinterland areas, which receive the least rainfall have the lowest population density of 25 persons per km².

TABLE 2.6 POPULATION DISTRIBUTION, KWALE DISTRICT 1979

DIVISION	LOCATION	AREA KM ²	POPULATION (1979)	POPULATION DENSITY
Matuga	Tsimba	156	13,601	87
	Waa (Matuga)	53	9,049	171
	Tiwi	32	10,297	32
	Ngombeni	97	13,380	138
Sub-total		338	46,327	137

DIVISION	LOCATION	AREA KM ²	POPULATION (1979)	POPULATION DENSITY
		<u>338</u>	<u>46,327</u>	<u>137</u>
Kubo	Mkongani	138	11,246	61
	Mwaluphamba	147	10,371	71
	Lukore	66	4,734	72
	Majimboni	54	2,899	54
Sub-total		452	29,250	65
Hinterland	Kinango	292	15,132	52
	Kilibole	222	16,749	75
	Puma	945	11,867	13
	Samburu North	1,086	14,802	14
	Samburu South	716	14,795	21
	Ndavaya	291	5,893	20
	Mwavumbo	283	15,475	55
Sub-total		3,835	94,713	25
Msambweni	Msambweni	182	23,883	131
	Pongwe/Kidimu	167	8,876	53
	Lunga-Lunga	609	15,892	26
	Mwereni	1,802	15,904	9
	Diani	252	28,393	113
Sub-total		3,329	118,073	35
DISTRICT TOTAL		7,954	288,363	36

SOURCE: Central Bureau of Statistics, 1979

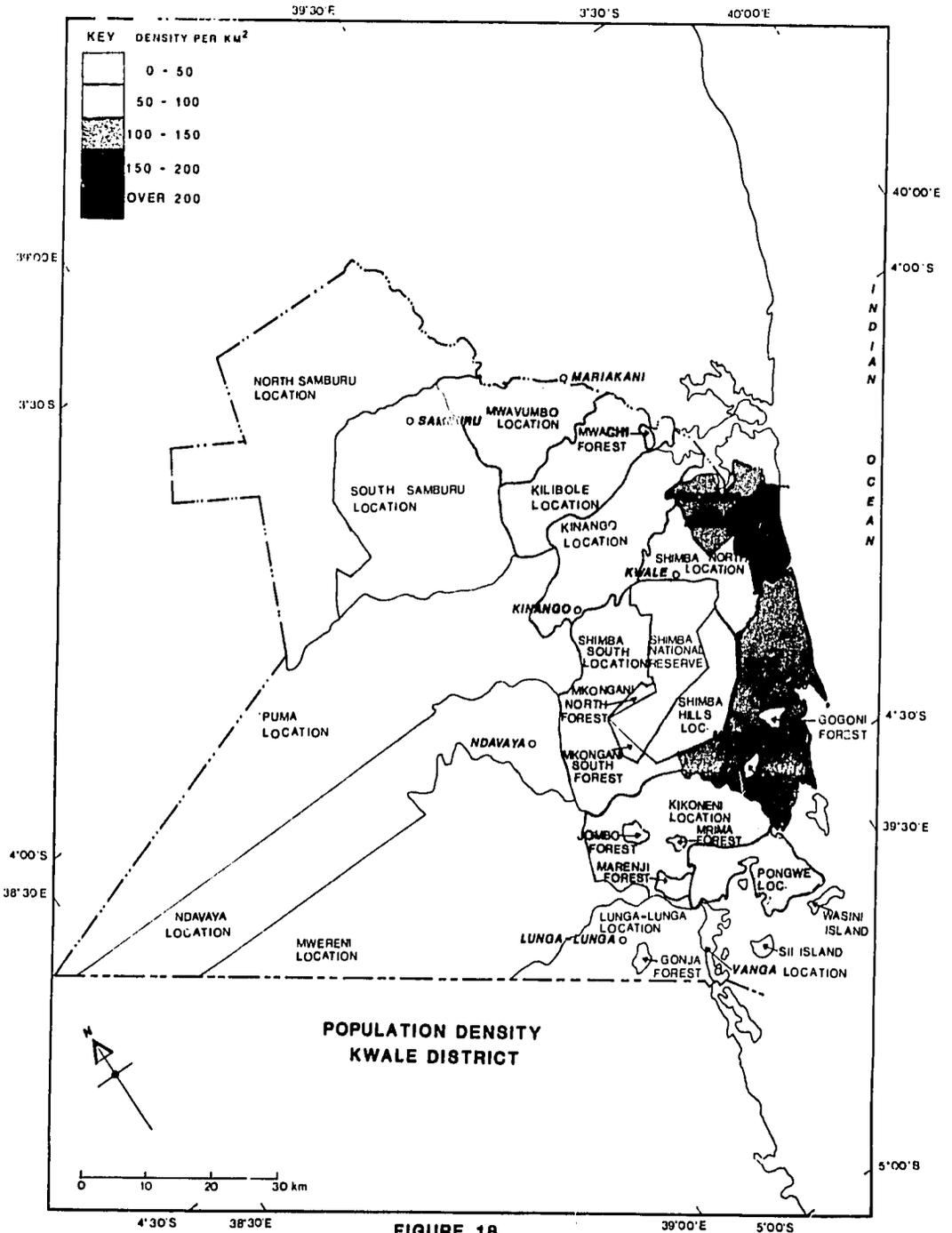


FIGURE 18.

2.3.3 AGE-SEX DISTRIBUTION

The age-sex distribution (Figure 19) indicates a high proportion of children (49% of the district's population) and a high dependency ratio (52.4% are under 15 or over 65). Kwale District recorded more females than males (51.5% of the population was female). This continued through 1979 although the percentage 50.8% shows a reduction.

Table 2.7 illustrates sex proportion by division. The overall sex ratio is 97:100 although it exceeds 100 in Matuga and Msambweni divisions.

Kwale population depicts a broad based population pyramid indicating a high number of young dependants i.e. over 40% of the population is under 15 years. The sex ratio was 98 in 1969 but it fell slightly to 97 in 1979.

TABLE 2.7 SEX PROPORTION BY DIVISIONS, KWALE DISTRICT 1979

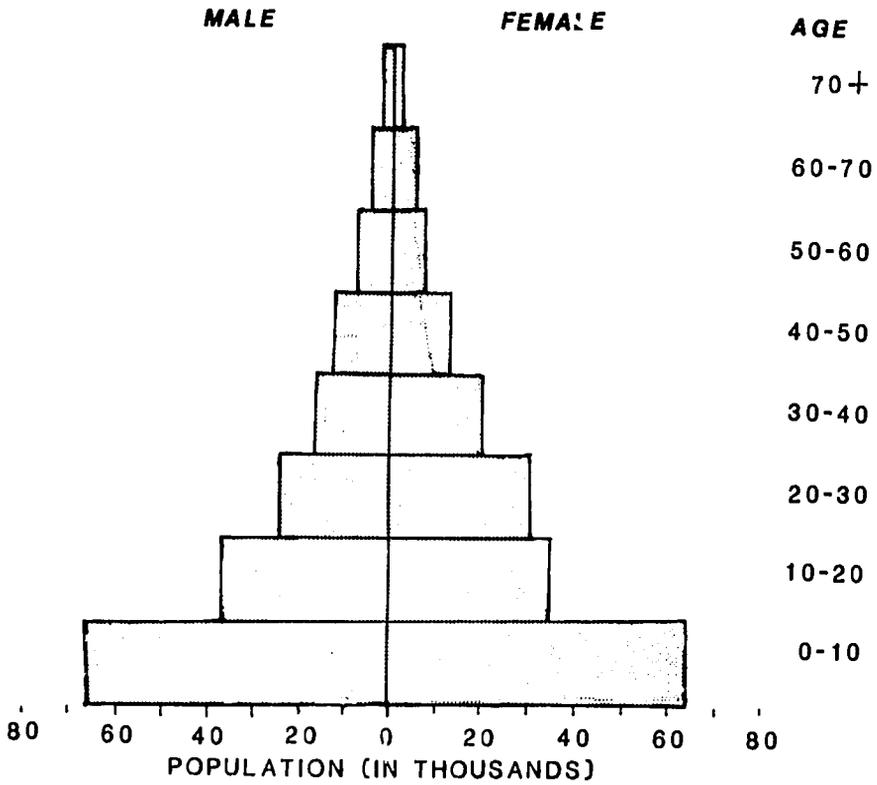
DIVISION	MALE	FEMALE	TOTAL	SEX RATIO*
Matuga	23,377	22,950	46,327	101.8
Kubo	14,318	14,932	29,250	95.88
Hinterland	44,351	50,362	94,713	88.06
Msambweni	55,700	58,373	118,073	102.2
TOTAL	141,746	146,617	288,363	96.7

NOTE: * Sex ratio is the number of males divided by females, multiplied by 100.

SOURCE: Central Bureau of Statistics, 1979

2.3.4 MIGRATION

Population movements have featured prominently in Kwale District (Table 2.8). The 1969 Census indicated a growth rate of 3.8% between 1962-1969. This high rate was partly due to a relatively significant migration into the district from up-country especially Ukambani. The settlement schemes in the district attracted a large number of Kamba people from as long ago as 1952, when the Shimba Hills Settlement Scheme was started. This trend has been enhanced further by the opening



SOURCE: CENTRAL BUREAU OF STATISTICS, 1983

**AGE-SEX DISTRIBUTION
KWALE DISTRICT , 1983**

FIGURE 19.

about 157,800 in 1962 to 205,000 in 1969, an increase of about 30.2 percent during that period. The same trend continued as the population rose to 286,363 in 1979, a 40.3 percent increase in the intercensal period. Between 1962 and 1969 the estimated population growth rate was 3.8 per annum. This rose to 3.92 per annum between 1969 and 1979. The density of population also increased from 25 persons per square kilometre in 1969 to about 36 persons per square kilometre in 1979.

The broad base of Kwale's population pyramid indicates that high growth rates are likely for the future.

Kwale District is currently not over-populated. However, demographic indicators show that the population is on the increase. Reliable figures of fertility of the population are unavailable but estimates indicated total fertility to be 5 (the average number of children a woman will bear). What is certain however is that fertility rate is high since in Kwale the large family as well as early marriages are advocated while at the same time poverty and illiteracy are widespread.

Accurate figures on mortality are also unavailable but a general assessment indicates that it is high, especially infant mortality. Factors contributing to this include malnutrition, bilharzia and the widespread incidence of malaria. Child mortality is however gradually being lowered through the provision of health services and facilities by the Government as well as non-governmental organisations. Hence, the net increase in overall population.

Table 5.1 indicates various population scenarios developed for Kwale District. Data used in drawing up the scenarios (1980 actual population figures) has been simulated in an attempt to portray the status of Kwale population within three possible demographic perspectives.

The assumption that every demographic variable remains constant has been used in formulating the status quo scenario. In drawing up the second scenario (low growth) fertility rate has been assumed to gradually drop by 2% per annum while mortality rate also gradually drops by 1% per annum. The third scenario (high growth) assumes that fertility rate increases gradually by 2% per annum while mortality rates gradually decline by 1% per annum.

2.3.6 IMPLICATIONS FOR ENVIRONMENT AND DEVELOPMENT

Kwale District is currently sparsely populated. However, almost half of the district is semi-arid. This implies that most of the population

is found within the agriculturally viable southern, coastal and central areas. At the same time there is a steady increase in population. Projections indicate that, for example, by the year 1990, Kwale's population will be 458,202 (Central Bureau of Statistics).

Catering for this population calls for an increase in all the necessary facilities and services. Thus more schools, health services, churches, houses, market centres, water supplies etc. will be required. There will also arise an increase in pressure on the arable land leading to such environmental problems as the conflicts between human activities and wildlife, over-exploitation of soils and exposure of good soils to erosion. There will also arise concentrated pockets of population in some areas leading to mushrooming of unplanned human settlements.

The Kwale population structure is such that a large proportion of it is within the dependent age category, under 15 and over 65. At the same time there is a rapidly growing labour force which will need employment. In fact all the people who will need employment in the year 2000 will have been born within the next few years. Thus the high demand for employment over the next two decades is certain.

The needs of a growing population are multiple, but fortunately the district has a strong resource base, and good potential for development. On the other hand, in its quest for development the Kwale populace will change the environment. The implications of population growth on environment are discussed in detail in Section 5.1.

2.4 TRANSPORT, COMMUNICATIONS AND SERVICE CENTRES

2.4.1 TRANSPORT

Kwale District has a total of 1078.7 km of classified roads of which 173.8 km (16%) are tarmac (Bitumen) roads, 388.0 km (36%) are gravel murrum roads and 516.9 km (48%) are earth roads (Table 2.9 and Figure 20). The Diani/Ukunda complex comprising mostly of tourist hotels is the only area that is properly served by tarmac roads from the main Mombasa/Lunga-Lunga tarmac road. All classified roads are constructed and maintained by the Ministry of Transport and Communications while unclassified roads are left to individuals or private organisations until they are classified. The network of roads covers the district adequately but the condition of most rural access roads is poor especially during the rainy seasons when they become impassable or are completely submerged under water.

TABLE 2.9

ROAD NETWORK, KWALE DISTRICT, 1983

TARMAC ROADS			ROAD CLASS/ TYPE	GRAVEL ROADS			TOTAL GRAVEL ROADS (KM)	EARTH ROADS		TOTAL EARTH ROADS (KM)
Road No.	Road Type	Distance (KM)		7	8	9		8	9	
A 14	Trunk International	97.0	Trunk (T)							
A 109	Trunk International	50.1	Primary (P)	48.7	78.0	126.7	34.4	15.0	49.4	
C 106	Primary	16.0	Secondary (S)	3.2	129.2	26.2	158.6	99.5	99.5	
E 965	Minor	10.7	Minor (M)		41.6	61.1	102.7	17.0	348.0	365.0
			Special Purpose (SP)					3.0	3.0	
	TOTAL	173.8		51.9	248.8	87.3	388.0	51.4	465.5	516.9

SOURCE: Ministry of Transport and Communications

39°30'E

3°30'S

40°00'E

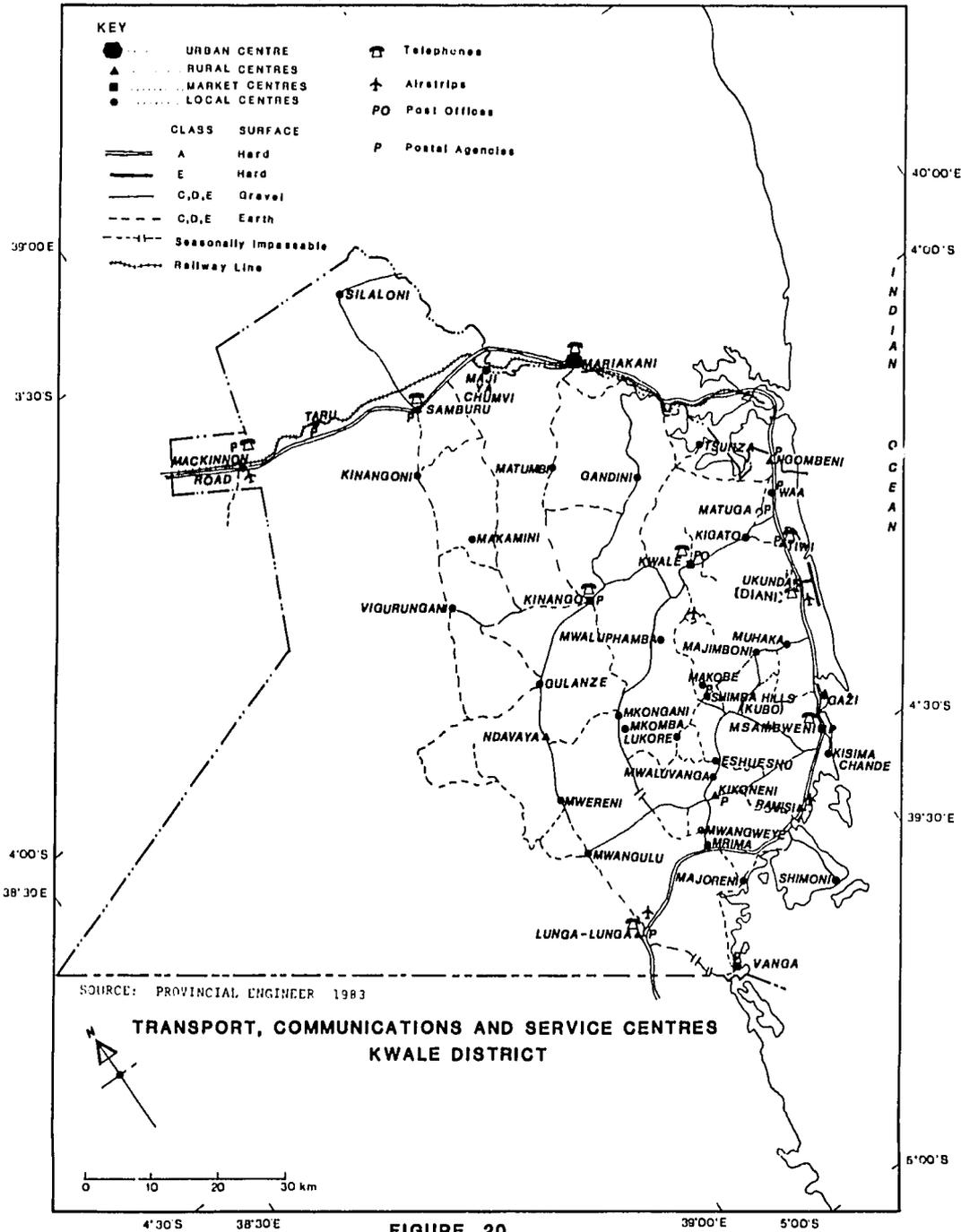


FIGURE 20

There are four murrum airstrips located at Lunga-Lunga, Mackinnon Road, Shimba Hills National Reserve and Ramisi. The private Diani Beach airstrip has a tarmac surface and it is frequently used by tourists.

The Nairobi-Mombasa railway lines serves Kwale District at stations located at Mazeras, Mariakani, Maji ya Chumvi, Samburu, Taru and Mackinnon Road. The Mombasa station is also important.

Small shipping facilities exist at Vanga and Shimoni but these are mainly fish landing points. At Shimoni, motor boats are used to ferry people to and from Wasini Island. There are also private motor boats for hire to local and foreign tourists for ocean expeditions.

In the rural areas, the main forms of transport are walking, cycling and donkey carts.

2.4.2 COMMUNICATIONS

There is one main Post Office in the district at Kwale town and 14 Postal Agencies at Kinango, Matuga, Ukunda, Waa, Tiwi, Msambweni, Vanga, Kikoneni, Lunga-Lunga, Shimba Hills, Ngombeni, Samburu, Taru and Mackinnon Road. The telephone exchanges, except at Diani, are all manually operated and hence, telephone services are generally poor (Table 2.10). In addition, Ngombeni, Waa, Kikoneni, Matuga and Shimoni have telephone services. Other communication services are through the Ministry of Information and Broadcasting in Kwale town, the Radio, Television, National and Local Newspapers. There are also Radio-Call stations at Vanga and at Police posts. The Shimba Hills Police Post has a solar powered V.H.F. Radio-Call.

TABLE 2.10 TELEPHONE SERVICES, KWALE DISTRICT, 1979

Name of Telephone Exchange	Type of Exchange	Existing Capacity (Lines)	Existing Subscribers
Diani	Automatic - STD	200	70
Kinango	Multi-party line (MPL) manual	10	9
Kwale	Manual	70	54
Lunga-Lunga	Manual	30	8
Mackinnon Road	MPL - Manual	10	10
Msambweni	Manual	40	19
Tiwi	2 MPL - Manual	20	20
Samburu	MPL - manual	10	7
TOTAL		390	197

SOURCE: Kwale District Development Plan (1979-1983)

2.4.3 SERVICE CENTRES

Kwale District has four rural centres, eight market centres and twenty-two local centres. There are many other undesignated service centres which usually have a few shops selling essential commodities to the rural people (Table 2.11 and Appendix 8.3).

Along the Coastal strip, people do not walk to reach a service centre, but the distances walked in the hinterland are usually longer. The average distance to a service centre is about 13 kilometres.

The target in the development of service centres in the rural areas is to have one local centre serving 5,000 people, one market centre serving 15,000 people, one rural centre serving 40,000 people, and one urban centre serving 120,000 people. However this objective is far from being achieved.

TABLE 2.11 DESIGNATED SERVICE CENTRES, KWALE DISTRICT

RURAL CENTRES	MARKET CENTRES	LOCAL CENTRES
1. Kwale	1. Samburu	1. Eshueshu
2. Kinango	2. Vanga	2. Maji ya Chumwi
3. Ukunda (Diani)	3. Kikoneni	3. Shimoni
4. Msambweni	4. Tiwi	4. Waa
	5. Ranisi	5. Matuga
	6. Ndavaya	6. Tsunza
	7. Lunga Lunga	7. Majoreni
	8. Ngombeni	8. Gandini
		9. Mamba
		10. Silaloni
		11. Mkongani
		12. Mwereni
		13. Matumbi
		14. Gulanze
		15. Gazi
		16. Kigato
		17. Mwangulu
		18. Kinangoni
		19. Shimba Hills

RURAL CENTRES	MARKET CENTRES	LOCAL CENTRES
		20. Lukore
		21. Mkomba (Miwani)
		22. Vigurungani
		23. Mackinnon Road
		24. Muhaka (Mwabungo)
		25. Makamini
		26. Taru
		27. Majimbori
		28. Mwaluwamba
		29. Makabe
		30. Mwaluranga
		31. Kilulu
		32. Mrima (Mwangweye)

SOURCE: Kwale District Development Plan 1979-1983

PART II

ENVIRONMENT AND DEVELOPMENT

3.0 NATURAL RESOURCES AND CONSERVATION

3.1 THE SHIMBA HILLS: GAME OR FOREST RESERVE

3.1.1 STATUS OF THE SHIMBA HILLS

The forested area of the Shimba Hills was gazetted as a National Forest in 1903 by the Colonial Administration (Figure 21). The reserve was extended eastward in 1956 to its present size of 21,740 hectares and the first exotic trees were planted in 1947. The open grasslands were added in 1984. Management of the area was divided between the Forest Department and Parks Department in 1968 when it was declared a Game Reserve. The conflict between the management aims of the two agencies has never been resolved. The Forest Department licences sawmillers and individuals to cut trees for lumber, fence posts and firewood. Planting of grasslands with pine trees has been vigorous although some planting of indigenous trees has been attempted recently.

Park status was proposed in 1938 and 1960's. The Wildlife Conservation and Management Department aims to preserve the indigenous vegetation of the Shimba Hills and to maintain the habitats of the native and introduced wild game. This entails burning of the grasslands to preserve rangeland for the sable and roan antelope and preserving the diversity in species and sizes within the forests. The crucial questions for management of the Shimba Hills are discussed below.

Wildlife conflicts with surrounding land uses

Earlier plans for the Shimba Hills had included addition of a large tract on the eastern edge of the reserve. This area has been adjudicated and the current owners are unwilling to have it annexed to the reserve.

Wildlife damage to crops are most severe in the Shimba Hills Settlement Scheme east of the reserve. This Scheme was initiated in 1952. Elephants, buffaloes, monkeys and baboons leave the reserve at night and invade the crops, then return to spend the day in the reserve. Some smaller animals, such as baboons and warthogs, live in the bush outside the reserve and are a great menace. The Wildlife Conservation and

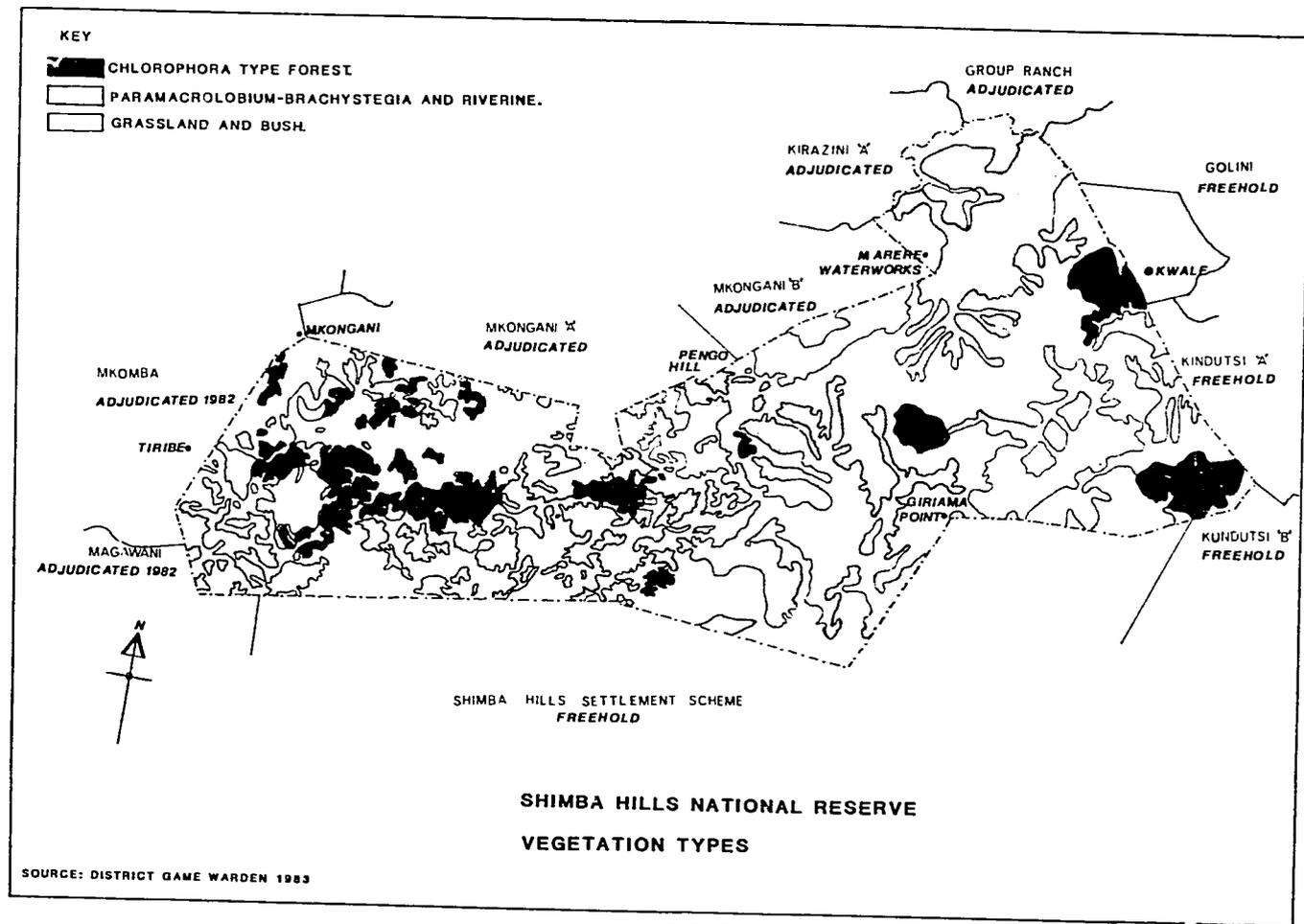


FIGURE 21.

Management Department maintains a game control post and has built a high-tensile fence along the south-east boundary. Plans are to extend the fence to the northern reserve boundary.

Grasslands or Plantations

The stated policy of the Forest Department is to plant all the grasslands in the reserve with pine trees. Planting started about thirty years ago with Pinus caribaea but currently Pinus eliotii are being planted. Most of the pine plantations have not been pruned, and are thus not suitable for lumber. Some cutting for fencing posts or fuelwood has occurred, but in general the plantations are yet to yield an economic return. Much of the new plantations have been destroyed by elephants. Tree planting directly reduces grasslands and restricts the areas where the grasslands can be turned to promote new growth. While a grass fire has little impact on the humid indigenous forest (although successive fires reduce the forest from the edges) it destroys new seedlings and can burn the dry pine plantations. Grasslands are essential for the grazing animals and important for scenic and game viewing visitors. They appear to be a stable element of the natural environment. About 15% of the open grasslands have been planted with exotic trees since 1968. At the planned tree planting rate of 80 ha/year, all the grasslands would be forested by 2000. Recent tree planting has been lower than planned due to financial constraints.

Preservation of indigenous forests

The indigenous forests of the Shimba Hills are one of the last remnants of coastal forest in Kenya. The only other remnants in Kwale and Kilifi Districts are the small Kaya forests in a few areas such as Diani and the Arabuko-Sokoke. Most of the forests have not been gazetted as reserves, in spite of their biological diversity and singularity, and their importance as habitat for wild game. In addition to the forest elephants and buffaloes, the forests are inhabited by many reptiles, small mammals, birds and insects. It is a major zoological refuge for butterflies and an important link in the East African flyway. The natural vegetation has many uses to the local people (Table 3.1). The biological diversity in the indigenous forest includes some medicinal and genetic materials for plant breeding which could be useful to humankind. Species recorded during the survey of Shimba Hills forest are contained in Appendix 9.1

TABLE 3.1 ASSESSMENT OF THE VEGETATION OF THE SHIMBA HILLS

Uses	Number of species	Abundance	Number of species
Internal medicine	106	Common	330
External medicine	72	Occasional	234
Human food	51	Few only collected	5
Dye, Decorations	22	One only collected	38
Rope, Cloth, and Thatch	34		
Woodwork, utensils	30		
Gum, jug stoppers	10		
Green manure	5		
Weed	3		
Magical	27		
Poisonous	16		
Timber	19		
Pesticides	7		
Animal food	28		
N =		391	607

SOURCE: Glover, Magogo, Hamisi, 1969.

The Forest Department has pursued a policy of selective cutting of mature trees for lumber. The mvule tree (Chlorophora excelsa) has been heavily cut, and is now rare in the forest. Other important lumber species are mbambakofi (Azelia quanzensis), mtandarusi (Tsachylobium verrucosum) and mleha (Newtonia paucijuga). The selective cutting directly alters the forest structure. Indications are that cutting has already exceeded replacement. Equally, or more important is the damage done to the surrounding forest during felling and hauling. Clearing the access routes allows fire to penetrate the forest edge. Illegal cutting has also been reported.

Clearly the area has significant potential for forestry. The indigenous trees are in high demand - Chlorophora trees are sold at K.Shs. 383.72 per m³. Pinus eliotii grows well in the area, where it can be protected from elephants. The balancing of the benefits and costs of forestry and game reserve management is discussed in the next section, followed by a plan which may meet both objectives.

3.1.2 BALANCING BENEFITS AND COSTS

Ultimately the management policy for the Shimba Hills must balance the benefits and costs of the competing management strategies. The relevant categories are presented in Table 3.2 assuming single-purpose strategies for either game reserve status or forestry development. The present situation is not likely to continue as planting of the grassland will significantly reduce the tourist potential.

There are several benefits and costs that cannot be quantified. The potential value of the area's plants for medicine or other chemicals is unknown. The aesthetic value to local residents, Kenyans and foreign visitors is very real, but immeasurable.

TABLE 3.2 BENEFITS AND COSTS OF ALTERNATIVE MANAGEMENT STRATEGIES FOR THE SHIMBA HILLS

<u>BENEFITS/COSTS</u>	<u>GAME RESERVE STATUS</u>	<u>FOREST EXPLOITATION</u>
Revenue	Reserve entrance fees.	Sales of timber, poles and firewood.
Regional Development	Tourist attraction for south coast.	Wood supply for Mombasa, local building, firewood for industry.
Ecological value	Genetic resource for future needs.	-
Aesthetic cost	Natural area	-
Expenditures	Reserve development and maintenance.	Tree planting, pruning and forest protection.
Opportunity cost	Foregone forest reserves.	Decreased tourist revenues.
Wildlife conflicts	Damage to shambas.	Damage to plantations less damage to shambas
Aesthetic	-	Loss of wildlife, natural communities.

Comparing the revenues from the Shimba Hills at present reveals that the tourist revenues are some twenty times those from tree sales (Table 3.3), although the tree sales do not include revenues (fairly small) from fence post and firewood sales. The administration and routine maintenance costs of the two departments are probably similar. Proper management as a game reserve would require additional costs for roads and facilities.

The Shimba Hills also plays an important role in the regional development of the southern coastal area. As a game reserve it could add significantly to the tourist potential of the south coast. Where else could a tourist stay on the coast and be only an hour away from the cool highlands, where he can see the famous East African Wildlife? The bandas could be renovated and promoted as a mini-safari resort. Forest products - timber, fence posts and firewood - are also important to the region's development. The timber is currently processed in Mombasa.

TABLE 3.3 REVENUES FROM THE SHIMBA HILLS

Tree	TIMBER SALES	1976-1980	GAME RESERVE REVENUE	
	K.Shs.	Year	Visitors	K.Shs.
Mvule	31,209	1976	9,874	148,396
Mkulu	478	1977	11,054	180,489
Mbambakofi	2,349			
Mtandarusi	8,037	1978	12,124	208,725
Mleha	2,888	1979	13,992	247,387
Mkungumani	121	1980	15,805	275,705
Others	566			
TOTAL	45,648			1,060,702

SOURCE: District Game Warden, 1983

3.1.3 RECOMMENDATIONS: PROPOSAL FOR A MULTIPLE PURPOSE RESERVE

Outlined below is a concept for integrating the conflicting uses of the Shimba Hills into a multiple purpose game and forest reserve. This proposal asserts that both aims - game preservation and forestry - can be achieved through an integrated approach. The details of the proposal will need to be worked out by the relevant agencies.

The highland plateau and fringing hill slopes should be gazetted and managed as a game reserve. Existing pine plantations should be slowly removed over the course of the next ten years. Grasslands should be maintained. Experiments should be undertaken to plant some indigenous tree species. Unless a botanical inventory shows an abundance of commercially exploitable trees beyond what is necessary to maintain the structure of the forest, all tree cutting should cease in this area. Access roads to reach the park should be constructed, particularly the Kubo and Kwale roads.

At the foot of the plateau, along the present reserve boundary, planting of indigenous and exotic trees should be accelerated. A vigorous programme of on-farm planting should be undertaken. A buffer belt of trees would discourage movement of wildlife out of the game reserve. The price of timber should be increased to reflect its real market value and thus encourage local afforestation.

With more attractive prices, a good supply of seedlings and proper extension services, farmers would be eager to raise trees for commercial sales. This will require the Forest Department to establish a station in Shimba Hills Settlement Area.

The farms next to the reserve will always be plagued by vermins eating crops, Therefore tree crops may be a better long-term investment, with agriculture reserved for the more distant areas.

The game control fence should be extended as planned. Part of the revenue from the game reserve should go to support campaigns against menacing animals such as baboons, warthogs and bushpigs.

3.2 MANAGEMENT AND CONSERVATION OF NATURAL VEGETATION

3.2.1 IMPORTANCE OF INDIGENOUS FORESTS

The importance of the indigenous forests cannot be over-emphasised. In Kwale District, these forests occupy 7% of the total area of the district. Despite their small size they are a valuable source of timber, building poles and fuelwood.

The forests and woodlands are fundamental in the protection of water catchment areas and any excisions from them for settlement must be planned with the demands of the water flow and supply in view. The most valuable timber trees in the forests, "Mvule" and "Mbambakofi" tend to be cut out completely if the sawmillers are not strictly controlled and supervised. Little replanting of these valuable trees has taken place as propagation is difficult and costly.

The elders of the Kaya forests have a wealth of knowledge about medicinal and other useful plants. Unfortunately, this knowledge is no longer being passed on to the younger members of the community who have no wish for 'old fashioned customs'. This knowledge must be documented before the elders and the forests disappear. The coastal forests are rich in species and many have yet to be discovered and named. Better

understanding of the indigenous vegetation types, soils and climatic zones is essential for correct management of agricultural land, particularly with regard to pastures and perennial tree crops.

3.2.2 CAUSES OF VEGETATION DEGRADATION AND DEFORESTATION

Most of the deforestation and vegetation degradation in the district is man-made. In the semi-arid areas, there is uncontrolled cutting of certain tree species for charcoal which is sold on the Voi-Mombasa road. There has been no attempt to plant drought-resistant fuelwood trees in these areas. The species preferred for wood-carving are getting rare and yet there are no plans to raise them in plantations. In the gazetted forest areas there is not enough control of sawmillers and timber extractors. This has led to degradation of certain parts of the forest.

Some forests and woodlands are over-exploited for building poles and large trees are cut to make beehives and tomato boxes. Tall grasses grow on clearings thus formed and this allows fire to damage the forest even further. Further destruction of forest areas and woodlands is by clearance of land to grow crops, illegal encroachment and by formal settlement schemes. Usually a larger area is clear-felled than the farmer can cope with during one season. The dry forest on the coral rag is destroyed when residential and hotel development takes place along the coast. With few notable exceptions, the developer usually clears the plot of most of the indigenous vegetation and replaces them with exotics. Two industrial enterprises, namely Kenya Calcium Products Limited and Associated Sugar Plantations cut their fuelwood from the Chale peninsula, Mweremi and Ndavaya indigenous woodlands. They should be required to grow their own fuelwood supplies.

3.2.3 CASE-STUDY - KAYA WAA

A preliminary survey of the Kayas in Kwale District was carried out and Kaya Waa in particular was studied in more detail. This Kaya, covering about 15 hectares, has been protected in the past by the local people. It is located on a cliff edge and in an area where the coral outcrops are very numerous so that clearance for cultivation has not been a major threat. A recent excision to provide building poles for four houses occurred and this has separated the main Kaya forest from an area which contains the ruins of an old mosque and a well which are particularly sacred to the people of the location. The main forest is now bounded by a wide track and therefore clearly delineated. Some clearing has taken place between the track and the forest resulting in scrubby grassland. There is only one active elder

who conducts visitors around the forest telling about its history and traditions.

The area around the Kaya has been surveyed and laid out for residential plots. Few plots have been developed as yet. Presently they are being used by coral block cutters and tomato growers. If the proposed Likoni Bridge is built, this area will become popular as a new Mombasa suburb. The area will be opened up and many more outsiders will want to see the forest as an amenity and as a wood source. Before this happens, the local people should be supported in their wish to keep the Kaya intact.

3.2.4 RECOMMENDATIONS

1. Areas of remaining indigenous forests and woodlands should be re-surveyed and full species inventory made. When this has been done the District Development Committee, (DDC) will have a sound basis to decide on priorities for the protection of the vegetation, particularly on watersheds, river valleys and in amenity areas. All remaining large forest patches should be gazetted and protected from further exploitation.
2. The elders of the Kayas should be given assistance to protect the Kayas from further degradation. This could take the form of inclusion of Kayas in National Park system, as Kaya Kinondo and Chale Island will be if the proposed marine park is formed. They could be National Monuments, particularly where ancient ruins and sociological factors are involved, or they could be Nature Reserves within gazetted forests, as perhaps for Kaya Mtae. In each case the elders should be made honorary wardens, curators or forest guards, with a small stipend, and be given institutional support to deal with violations of the Kaya. The elders should be encouraged to promote educational and touristic use of the Kayas by the formation of nature trails and any revenue so raised should be used for self-help projects in the local community. McWilliam (March 1980) has drawn attention to the need to protect the habitats of rare cave dwelling bats in this area and as the caves are usually associated with the Kayas, this objective could also be achieved.
4. The Shimba Hills Forestry versus Wildlife conflict must be resolved. (See Section 3.1)
5. The tentative plans for a new Marine National Park and Reserve to protect the south coast reefs, particularly around Chale Island and the Galu Peninsula, should be implemented. The Park should include Kaya Kinondo, bat caves and associated sacred groves.

6. An area of the Palm Woodland on the Shimoni Peninsula should be made a National Reserve.
7. Kenya Calcium Products Limited and Ramisi Sugar Factory should be required to plant their own fuelwood sources so that within a laid down time-scale they will no longer need to cut indigenous fuelwood to the detriment of the environment.
8. Charcoal burning in the hinterland should be closely supervised. At present the areas close to the main road are over-utilised and should be left to recover and some areas planted with drought resistant fuelwood species.
9. Shamba clearance by burning should be banned, although the burning of crop residues to destroy pests should continue. Extension officers should point out the advantages of compost making and mulching with weed debris. Most small farmers clear too large an area, plant their crops too far apart and then fail to weed thoroughly, with the result that yields are low and the farmer feels he must plant an even larger area the following season. As the fallow areas get smaller, the soil fertility drops rapidly with declining crop yields.
10. The coral block cutters and the tomato growers should be encouraged to co-operate and to follow a system that allows the old diggings to be infilled with weeds, seaweed etc. thus making rich 'gardens' for vegetable growing, enhancing rather than degrading the environment.
11. Forest Department should be encouraged to use unproductive agricultural land for tree plantations for fuelwood, charcoal, building poles and timber. The revenue from sales should go to forest projects within the district. If this is not possible then land should be leased out to commercial growers to produce forest products. Agro-forestry projects must be encouraged, such as the Car and General's proposed rubber plantation.
12. When areas are laid out for settlement schemes the boundaries should be marked but the settler left with the valuable resource of bush and woodland. He should be encouraged to view this as a cash crop and to plant more fuelwood trees as he clears, turning them into charcoal himself. More use should be made of the exotic tree 'neem' (mkilifi) which grows fast at the coast.
13. At least one area should be selected as a demonstration model of how conservation and development can proceed together. This could be tried with a suitable Kaya and used as an environmental study area for schools in the district.

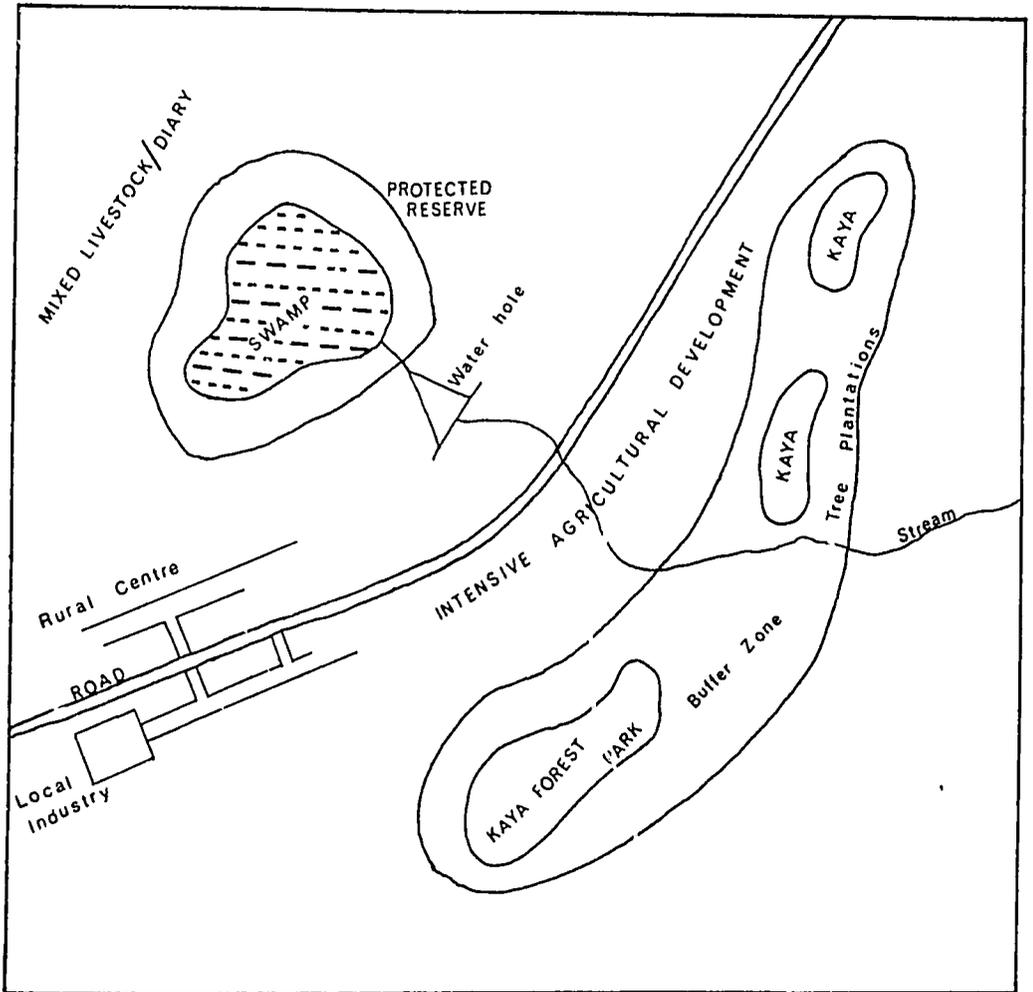


FIGURE 22. MODEL CONSERVATION AREA

14. The Bee-keeping Section of the Ministry of Agriculture should get in touch with traditional bee-keepers and encourage them to use commercial hives, perhaps by offering them credits to purchase hives and a guaranteed market for their honey.

15. More effort should be made to involve the tourist industry in the appreciation of the forest resources of the district through seminars for tour guides and hotel personnel. At present the tour guides concentrate on the marine environment and the wildlife. Nature trails should be developed where tourists can walk and picnic in the shade and in safety to see the forest and watch birds and small animals. A Botanic garden should be developed at Diani where visitors can learn about indigenous and exotic plants. How many tourists are now taken to see the once famous baobab tree at Ukunda that was protected by special decree by the late President?

3.3 MANGROVES

3.3.1 IMPORTANCE IN THE ECOSYSTEM

Mangrove forests or Swamps perform several vital functions in the coastal ecosystem. They supply waters with nutrients from their leaves, which drop and decay, thus enriching coastal waters. Phytoplankton and Zooplankton feed on these nutrients and become food for fish. The Mangrove forests help settle river-borne silt and sediment as water flows over the mangrove roots or pneumatophores. New land is colonised as the mangroves collect silt which builds up a platform of soil particles rich in organic material. As the mangroves spread towards the sea, more silt is deposited and the mangroves gradually encroach upon coral sands, thus they protect the coast by preventing erosion. The deposited silt and sediment contribute significantly to the fertility of inshore waters. Mangrove areas provide a suitable habitat for juvenile stages of crustacea (shrimps, prawns and crabs) and populations of fish (mud skippers) and molluscs (e.g. oysters, barnacles).

In mangrove forests, there is a marked succession of species. Those most tolerant to deep water and high salinity occur on the seaward side and those least tolerant are found on the landward side, and give way in an ecological succession to terrestrial trees and shrubs. The mangrove forest is therefore an ecosystem of great scientific importance as it is a home for many, highly specialised organisms. There are many epiphytes and epizotes adapted to a life of partial sub-mergence and varying salinity.

3.3.2 UTILISATION OF MANGROVES

Mangroves are of economic importance for building poles and boat-making, fuelwood and tannin is extracted from their bark.

The mangrove of greatest economic importance is the Rhizophora which provides building poles and scaffolding during construction. Since 1983, a ban has been placed on the export of mangrove poles. These used to be shipped to Middle East.

Mangroves in Kwale District are not over-exploited at present. Felling is controlled through licencing cutters and allocating quotas that are to be exploited in different zones. The licenced cutters sell the poles to the dealers who sell to the public. Members of the public can pay K.Shs. 400 a month for a permit to carry one head load a day of branches left over from pole cutting. The Forest Department is entrusted with the responsibility of ensuring that the mangrove forests are properly managed to sustain the availability of this useful resource. If cutting does not disturb the substrate, mangroves regenerate fast and naturally.

3.3.3 RECOMMENDATIONS

Felling of mangrove trees should be spread over a wide area instead of being localised e.g. Majoreni.

Licences issued should be consistent with the annual quotas which are allocated for a particular locality and cutters should be checked to ensure that they cut species and types for which the licences were issued. Damaged areas should be left to regenerate or be reseeded.

Research work should be carried out on the mangrove community to investigate its status and to monitor critical ecological parameters in order to formulate a proper management policy which will maintain the resource on a sustained yield basis. It is recommended that the Forest Department in conjunction with the Fisheries Department undertake the research programme. A master plan should then be developed in conjunction with the local authorities and coastal residents.

3.4 CORAL REEF ECOSYSTEM

3.4.1 STATUS OF CORAL REEFS

The coral reef is of great importance for many reasons. It protects the shore from erosion, renders the inshore lagoon safe for swimming and

fishing since sharks rarely cross the barrier reef, and is very productive and provides shelter for many species of molluscs, crustacea and fish. Thus the reef is an important resource. If properly managed, a healthy reef ecosystem will serve the district's peoples on a sustained basis.

Signs of ecological damage observed during the field work were abnormally high numbers of sea urchins, including Echinometra mattiae (a small rock-boring urchin), Diadema sp. and Echinotrex sp. (larger black urchin with very long spines). Also present were large numbers of Tripenistres gratilla. The urchins were present in such vast numbers that they interfered with the normal utilisation of the shallow waters by swimmers, goggles, local fishermen, and tourists who walk to the barrier reef.

Large populations of the crown of thorn starfish, Acanthaster planci, were observed near the Islands near Shimoni (A. Hellier - personal communication). At Diani this starfish was not abundant, probably because it feeds only on live coral, which is scarce at Diani. Both Starfish and Urchins feed on coral and are fed upon by large predatory molluscs. The removal of the predators for the shell trade could have contributed to the increase in starfish numbers (see Section 3.5). This, together with the fact that urchins are also preyed upon by certain kinds of fish (e.g. trigger fish and puffer fish) which have been heavily collected for the aquarium fish trade may have led to plague numbers of urchins.

3.4.2 AQUARIUM FISH TRADE

Export of coral reef fish for the aquarium trade is common in Kwale District. Many of the ornamental fish are essentially solitary in their habitat and are found exclusively within the reefs and channels. Many species now support the aquarium fish trade, of which the most important are the Amphiprion spp. Acanthurus spp. Chaetodon spp. Dascyllus spp. Rhinecanthus spp. and Thalassoma spp. (see Appendix 8.2). Organisation of the industry is such that company operators employ fishermen who collect fish using hand nets particularly during the low tides. At the collecting centre, the fishermen are paid per fish. The fish is transported by cans fitted with aerated tanks, ready for export by air.

An increase of trade in aquarium reef fish may bring about an ecological imbalance in the ecosystem. If many of these fish species were left to mature, they would grow to edible sizes and serve as food

for other fish. The fish are also a major attraction to visitors to Kenya's coral reef. Corals are visited by reef fish for food and protection and these fish contribute to the growth of corals by fertilising the waters near corals. Since most reef fish are territorial, it may take sometime before the fished out niche is reoccupied.

3.4.3 MECHANICAL DAMAGE

Mechanical destruction of the coral reef is also prevalent in several places. Boat anchors, accidental boat grounding, and careless swimming or walking accelerate the destruction of the coral reefs. Once a piece is broken off it no longer provides a stable shelter and the coral polyps die. Large areas of destruction were noted in the marine park and smaller areas in the coral garden near Diani. Fishermen and tour boat operators are equally to blame. In at least one place, Vanga, live coral was being mined for building construction. There is also threat from dynamite fishing spreading from Tanzania into Kenyan waters.

3.4.4 POLLUTION OF THE MARINE ECOSYSTEM

Oil Pollution

Beaches at Msambweni, Diani and Jadini were checked for tarballs, and very few were found. About $\frac{1}{2}$ of tar was collected 2 kilometres north of Diani Beach. At present, this is not an obvious problem, although its impact on the cumulative ecosystem is not known.

Sewage Pollution

Beaches below tourist hotels along the Diani complex are not notably polluted by sewage. While not a major problem at present, it may increase with expansion of facilities if treatment works are inadequate.

Industrial Pollution

A major pollution problem is the effluent which is discharged into the Ramisi River by the Ramisi Sugar Factory. Four sources of pollution are:

1. Heat pollution - water heated to a temperature of 40°C is emptied into the Ramisi River and this could result in increased productivity of algae, lower oxygen dissolved in water and thus cause stress among the fish and other marine organisms.
2. Air pollution - steam engines fuelled by firewood give off CO₂ soot and gases. Sulphur dioxide may leak out of the factory as a result of the sulphur burned in the combustion chamber.

3. Effluents from factory - These include sugar waste and lubricating oils from machinery.

4. Agricultural chemicals - Fertilisers are used in the sugar-cane fields. They can cause blooming of seaweeds that may be harmful to useful algae and affect marine life adversely. Fungicides and Herbicides may have long-term impacts as they find their way to the sea through groundwater and surface runoff.

3.4.5 RECOMMENDATIONS

Protection of the coral reef ecosystem should be a concern of district officials, fishermen, coastal residents, and tourists. Talk/Slide shows should be prepared for use in the tourist hotels and elsewhere. The University of Nairobi's Moana Research Station should take the lead in this regard.

On a more immediate time-scale:

- no further licences should be issued for the aquarium fish trade. A research project should investigate the recovery time of depleted areas, as a prelude to developing a more stringent quota system;
- use of live coral for construction must be immediately stopped;
- buoys should be deployed at all coral gardens. Low tide boat travel should be restricted.

Recommendations regarding fisheries, shell collection and marine parks and reserves are covered in the following sections.

3.5 SHELL TRADE

3.5.1 ORGANISATION OF SHELL TRADE

The Government issues licences to

Collectors,
Retailers,
and Wholesalers.

In addition, shells are collected by tourists, who are often aided by the owners of boats for hire. The Government obtains some revenue from the shell trade and endeavours to control its volume. Two large exporting companies operate from Mombasa and are active in Kwale District.

Table 3.4 documents customs records of shell exports. A licenced collector can collect up to 5 kgs of shells per day. This is kept in check by the Fish Scouts who patrol the beaches. The collectors sell their shells to either wholesalers who export the shells, or to retailers. Most of the shells are exported to Japan and Europe. Generally, fishermen obtain relatively little benefit from the sales. It was observed at Shimoni, for example, that the dealer bought a Bursa bubo shell from a collector for K.Shs. 1.60 and hoped to sell it for K.Shs. 35.00. There is a ten-fold price increase from collector to trader and from trader to retailer. Typical retail prices at Diani are recorded in Table 3.5 and Appendix 9.2.

The system of licensing does not allow the shell collectors to sell directly to the public, which limits their profits. The shell trade can hardly be justified in terms of benefit to the fishermen and collectors. Tourists are allowed to take 5 kgs of shells per person from Kenya, provided that the shells were bought from a licenced dealer.

Shell collectors in Kwale District are organised in several areas:

Funzi: Interviews with the shell collectors revealed that shells are not as abundant at present as in the 1960's. Shells from Funzi are brought to Bodo or Msambweni. However, there is one major dealer on the Island who delivers about 5 sacks to the mainland every two to four weeks.

Diani: There are 10 licenced shell collectors at Diani and the shells are collected every few weeks by a wholesaler.

Vanga: There are 10 licenced shell collectors at Vanga and shells are sold to wholesalers. The species observed in November 1983 included Cypraea tigris (Tiger cowry) - about 300 or more in a sack, Tridaena squamosa, Chicoreus ramosus and Pleuropiace trapezium.

Shimoni: There are four licenced collectors at Shimoni. Local people reported a drastic reduction in the number of shells now being collected, due to a decline in supply.

Wasini Island: There is one licenced shell dealer operating on the Island. Many species of shells are collected including the red helmet shell (Cypraecassis rufa), cowries (Cypraea sp) and cone shells. A few corals and shells of the cephalopod mollusc, Nautilus, were also observed.

Msambweni: Some shell collecting occurs in small quantities.

3.5.2 ECOLOGICAL EFFECTS OF SHELL TRADE

The removal of shells from the marine environment particularly the

TABLE 3.4 EXPORT OF MARINE SHELLS

<u>YEAR</u>	<u>KGS</u>	<u>K. SHS</u>
1964	185.9	3770
1965	266.4	5007
1966	241.4	10684
1967	449.1	12645
1968	764.5	24850
1969	2802.3	709037
1970	17080	920127
1971	16930	761705
1972	15320	794865
1973	45300	834892
1974	674	615037
1975	382	136310
1976	3506	1495521
1977	891	586001
1978	-	722270
1979	84707	984408
1980	97522	650299
1981	66051	1153841

SOURCE: Customs Department Annual Records

TABLE 3.5 TYPICAL SHELL PRICES AT DIANI, NOVEMBER, 1983

<u>SHELL TYPE</u>		<u>RETAIL PRICE</u>
<u>LATIN NAME</u>	<u>LOCAL NAME</u>	<u>K. SHS.</u>
Cyprosa tigris	Tiger Cowry	3-10
Tridacna squamosa		20-110
Harpa major		5-20
Cypraecassis rufa		5-40
Lambis sp.		5-10
Chicoreus ramosus		15-20
Charonia tritonis	Triton	50-500
Nautilus pompilius		40-150

SOURCE: Observations made at Robinson's Baobab, Two Fishes, Diani Kiosks.

live animals, is a great threat to the coral reef ecosystem. The large molluscs are known to be predators of marine organisms such as sea urchins and starfish (Figure 23). Removal of the predators may result in an unusually high urchin population as observed at Waa, Tiwi and particularly Diani. The urchins found to be in large numbers were the black long spined urchins. These are Diadema savigni, Diadema setosum, Echinothrix calamaris and Echinothrix diadema. These interfere with movement while walking across the lagoon to the reef. The shorter spined rock boring urchins included Echinometra mattiae and Echinostrephus aciculatus. The rock boring urchins bore holes and tunnels in the coral blocks both in the fringing reef near the beach, in the barrier reef and reef building corals. This results in places of coral being broken off and carried by waves as a result of the weakening of the rock. This would lead to:

1. Increased erosion to the coast.
2. Entry of sharks into the lagoon, endangering fishermen and tourists.
3. Changes in the tidal and current patterns inshore so that beach sand may be washed away and fish habitats filled in.
4. Direct loss of habitat for reef fish, lagoon fish, crustacea and other organisms.

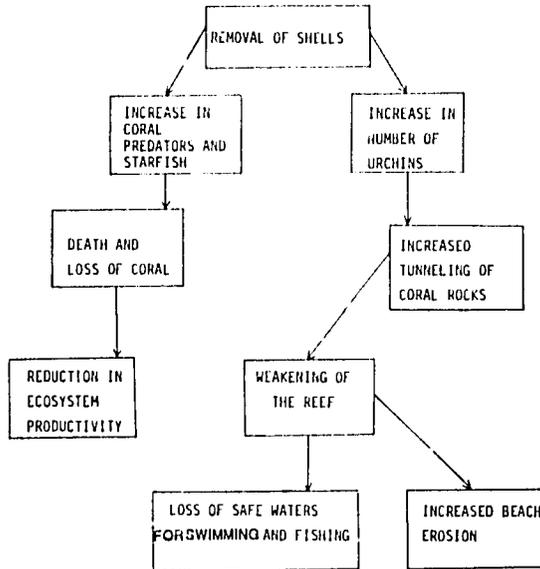
The same will happen if the crown of thorn starfish population explodes. These starfish feed upon live coral, thus large numbers would hasten reef destruction.

3.5.3 RECOMMENDATIONS

As a prelude to the recommendations several points should be taken into consideration.

It is clear that some shell species have already been over-collected giving rise to adverse impact on the marine environment. The shells in general are much scarcer than ten to twenty years ago. The shell trade benefits only the middlemen and wholesalers. The lack of controls on export volume and prices encourages over-exploitation on this valuable resource.

Therefore, a total ban on the export of shells should be imposed. This will have minimal impact on the regional economy. Safeguarding the coral reef is much more important economically, as it is one of the major tourist attractions in Kenya.



SOURCE : Kendall 1983

FIGURE 23. IMPACT OF SHELL REMOVAL ON CORAL REEF

3.6 MARINE PARKS AND RESERVES

3.6.1 IMPORTANCE OF MARINE PARKS AND RESERVES

The Mpunguti Reserve and the Kizite Marine Park are important in the regional economy as tourism is the primary source of employment and foreign exchange in the area. Marine Parks are also important to preserve breeding grounds and unique habitats. The park is an area of preservation of fisheries and the reserve is a fishing ground for only local fishermen. Fishing is controlled within the reserve and only traps, lines and nets can be used. Spearfishing, coral and shell collection are prohibited.

3.6.2 MPUNGUTI/KIZITE

The Mpunguti Reserve and the Kizite Marine Park in the Shimoni area covers an area of 11 km² and 28 km² respectively. The Mpunguti Reserve envelopes the two islands - Mpunguti ya Chini and Mpunguti ya Juu, with their coral reefs and the coral area (Jiwe ya Jehazi) which lies between Wasini Island and Mpunguti ya Chini. The boundaries are marked by buoys. Kizite Marine Park includes the coral reefs of Mako-Kokwe and the Island of Kizite which is a nesting ground for seabirds. The major coral types

are the mushroom, staghorn, brain and finger, among which the coral reef fish species are found. Some of these species are - Zebrasoma veliferum, Cetoscarus bicolor, Amphiprion xanthurus, Pomacanthus maculosus, Pomacanthus semicircularis, Centropyge acanthrops, Chromis dimidiatus, Chaetodon falcula and Coris angulata. Problems facing the park include poaching for fish, shells, ornamental fish, turtles and damage of coral reef by tourists trampling and breaking them. The park and reserve are difficult to patrol due to shortage of fuel. Therefore illegal fishing is likely to occur within the park.

It has been suggested that development could occur on the Mpunguti Islands in the form of bandas and hotels. However, water could be a problem as there is no fresh water on Wasini Island and very little at Shimoni. Permanent settlement within the reserve might help police illegal activities.

A proposal has been made for development of a Marine National Park and Reserve to protect the coral reefs around Gazi and Chale Peninsula. This proposal should be implemented.

3.6.3 RECOMMENDATIONS

Marine park staff should be given special training in swimming, snorkelling, diving, marine ecology and marine park management.

Visitors amenities should be improved:

- (i) The park headquarters where visitors buy their tickets is too far from the jetty.
- (ii) No information is available to the park visitors, e.g. leaflets, booklets, posters or displays.
- (iii) Snacks are not available to the visitors.
- (iv) Glass bottomed boats for those who cannot swim, are lacking.
- (v) Anchorage points should be clearly defined.

The Ministry of Tourism, in conjunction with the Ministry of Transport and Communications should improve the standard of the Shimoni road so as to promote tourism there, as the road is impassable during the rainy season.

A new park or reserve should be developed at the Chale Island/ Peninsula.

Research should be done to identify the coral gardens in this district so as to preserve them.

A discussion was held as to whether the Kizite Marine Park should be reduced in area to include the coral areas of Kizite only and exclude the Mako-Kokwe area. The park should maintain its present boundaries as it is a breeding ground for molluscs, crustacea and fish, which restock the nearby fishing grounds.

3.7 FISHERIES

Fisheries potential in the district is mainly in the Indian Ocean. The Ramisi, Uмба and Mwanachema Rivers are the sources of fresh water fish in the district, but they are of little economic importance. Table 3.6 shows the quantity and value of marine fish landed along the south coast from 1971 to 1982.

Fisheries can be divided into two main groups. The pelagic fish found in the deep sea and caught by trawling while the demersal fish are found in inshore waters. Twenty important species of fish are listed in Appendix 8.2. The bulk of marine fishing in Kwale District is conducted at identified productive points along the entire coastline (Table 3.7). The fishing is done mostly within the continental shelf and reef. The shelf is narrow with an average width of about 3-8 km from the shoreline. The drop in fish catch from 1972 to 1982, as shown in Table 3.6 was partly due to the opening of the Kizite Mpunguti Marine Park and foreign exploitation, especially Tanzanians licenced to fish in Kenyan waters.

Trawler catches show that commercial trawling in the outer edge of the coral formation would prove uneconomical due to the small size of fish found and the strong currents and rough sea conditions especially during the southeast monsoons. Another problem is loss of nets due to the sharp, stony bottom.

3.7.2 FISHING SEASONS AND METHODS

The main fishing season is during the Kaskazi (northeast monsoon) from October to March, when the seas are gentle. However, fish like the Rabbit fish (siganus) can be caught throughout the year. Some pelagic fish, e.g. Kingfish, are mainly caught during the Kusi, i.e. the period of the Southeast Trade Winds.

The most common methods of fishing used are the Malema - which are trap-like baskets, Uzio - fence traps extending from shore out to sea, bottom long line, Jarife - gill net, Zuyia - general net, and the ring nets which are used for sardines.

TABLE 3.6 SOUTH COAST FISH LANDINGS, 1972-1982

<u>YEAR</u>	<u>CATCH IN METRIC TONS ('000)</u>	<u>VALUE IN K.SHS.</u>
1971	1,284.9	1,805,605.85
1972	1,716.9	2,248,586.50
1973	721.3	1,734,260.35
1974	723.9	1,725,452.50
1975	925.0	2,039,755.95
1976	726.7	2,016,088.15
1977	791.2	2,627,385.20
1978	617.9	2,522,084.90
1979	536.4	2,390,039.50
1980	623.5	3,307,445.95
1981	771.9	4,790,559.50
1982	814.4	6,109,572.75
TOTAL	10,254.0	33,366,837.10

SOURCE: Fisheries Office, Kwale District, 1983.

TABLE 3.7 NUMBER OF FISHERMEN AND AVERAGE CATCH, KWALE DISTRICT, 1983

<u>FISHING CENTRE</u>	<u>NUMBER OF FISHERMEN</u>	<u>AVERAGE DAILY CATCH (KG)</u>
Vanga	510	5
Majoreni	321	3
Shimoni	975	4
Msambweni	1,200	2
Diani	861	2
Tiwi	132	2
TOTAL	4,099	18

NOTE: Statistics are for marine fishing only.

SOURCE: Shimon. Fisheries Office - Ministry of Tourism and Wildlife, 1983.

3.7.3 ORGANISATION OF THE FISHING INDUSTRY

A fisheries officer is stationed at Shimoni while assistant officers are found at the various fishing centres. These officers are assisted by the Fish Scouts who are responsible for monitoring fishing in their own localities. Vanga and Msambweni are sub-stations while Diani and Tiwi are outpost stations.

The fish scouts' duties are:

1. To check the size of the gill-nets and basket traps. Girth size should not be less than 11 cm. This requirement allows immature fish to escape. A penalty or a fine up to K.Shs. 1,000/- can be imposed by the courts.
2. To make sure that statistics are being kept well at the fish depots.
3. To check on illegal selling of fish which should be sold only to the Co-operatives, and
4. To see that only licenced shell collectors collect shells.

There are 11 fish scouts in Kwale District, an insufficient number to enforce the regulations. At several fish depots, some fish of the genera Siganus and Lethrinus were measured and found to be less than the legal size.

Selling outside the co-operative structure is also common. The South Coast Fishermen's Co-operative Union comprises of five fishing societies and covers the whole of Kwale District. The members pay a subscription fee of K.Shs. 5/- and shares can be bought of K.Shs. 20/- each. The total membership in 1983 was 735 as shown in Table 3.8. The Co-operative serves as a bridge between the fishermen and the dealers, thereby organising the marketing of the fish. The fishermen must bring their catches to the Co-operative, which pays them on the spot at fixed prices. The Co-operative then sells the fish to the dealers on credit and charges a 10% commission. The prices for fish, crabs, lobsters and prawns are fairly fixed throughout Kwale District. (Shells marketing is not under the Co-operative movement). The fishermen benefit from the Co-operative in several respects.

1. Loans: A new loans' system is being developed with the help of the Norwegian Government which will offer a total of one million Kenya shillings. Loan recoveries will be deducted from the weekly or

TABLE 3.8 SOUTH COAST FISHERMEN'S CO-OPERATIVE UNION, 1983

<u>FISHING SOCIETY</u>	<u>NUMBER OF MEMBERS</u>	<u>FISH SCOUTS</u>
Mwagugu (Vanga)	183	1
Shirazi/Bodo		1
Shimoni	166	2
Majoreni	125	1
Gazi		1
Diani	84	2
Kibuyuni		1
Msambweni	177	1
Tiwi		1
TOTAL	735	11

SOURCE: South Coast Fishing Society, 1983

TABLE 3.9 PRICES PAID FOR FISH IN KWALE DISTRICT, 1983

<u>ITEM</u>	<u>PRICE TO FISHERMEN</u> (K.SHS. PER KILO)	<u>PRICE TO DEALER</u> (K.SHS. PER KILO)
Small fish	4.50	5.10
Mixed fish	7.50	8.60
Kingfish (line) Grade I	13.00	14.90
Kingfish (Net) Grade II	10.40	11.90
Prawns Grade I	20.00	22.85
Prawns Grade II	13.00	14.85
Lobsters	47.00	53.00
Crabs	9.00	10.35

NOTES: Mixed fish are defined as longer than 8"
Small fish are defined as 4" to 8"

SOURCE: South Coast Fishing Society, 1983

monthly earnings of the fishermen. In this case, the society will pay to the Co-operative Union which will in turn repay the Norwegian Government. The loans are to be used only for either modifying or buying fishing equipment.

2. Dividends: If the Co-operative Society makes a profit at the end of the year, the profits are distributed to shareholders depending on the number of shares.

3. Bonus: Similarly, part of the profit is distributed to members, according to how much fish they have sold to the Co-operative that year. For example, in 1983 Majoreni Fishing Society got a bonus of K.Shs. 48,000/-.

There are a number of problems facing the Co-operative Societies. Certain members frequently sell their fish to dealers who offer K.Shs. 75/- per kg for lobsters while the Co-operatives offer (Table 3.9) K.Shs. 47/- per kg. Statistics show that there are many fishermen who are not members of the Co-operative Union and this undermines the Co-operative's effectiveness as a marketing agent. However, the new loan scheme will offer considerable incentive for increased membership.

The lack of cold storage facilities in the depots limits the society's bargaining power with the dealers.

Roads leading to depots are impassable during the rainy season, forcing some of the Co-operatives to hire boats, for example, at Vanga and Shimoni.

The lack of equipment and large fishing vessels limits the range of activities the Co-operatives can engage in.

There are five main dealers buying fish from the Co-operatives in Kwale District. Each trader comes three or four times per week on fixed days. Some fish is sold to local people but most of it is taken to Mombasa. The dealers are:

1. Kenya Cold Storage
2. South Coast Fishermen
3. Msambweni Fish Supply
4. Mwashe Mbwana
5. Ngala Kazungu

3.7.4 RECOMMENDATIONS

As the inshore fisheries will remain the principal fishery for demersal fish and shrimp, further work should be concentrated on the management and development of these fisheries.

The data collection system needs to be strengthened and improved.

The Fisheries Department and the Kenya Marine and Fisheries Research Institute (K.M.F.R.I.) should collaborate closely on technical and policy matters concerning fisheries development, using the new Fisheries Act which provides for adequate protection and management of Marine Fish Resources.

Aquaculture projects should be encouraged as they are more predictable than wild fishing.

It is necessary that the Aquaculture projects should be established using tanks rather than destroying coastal habitats e.g. Mangrove Forests, as their destruction may cause a decline in related inshore fisheries.

3.8 BECHE-DE-MER*

3.8.1 MANAGEMENT OF THE FISHERY

Beche-de-Mer is a commercially important resource, in big demand in the Far East, especially among the Chinese. Beche-de-Mer used to be a prosperous fishery on the South Coast, particularly near the mouth of River Uмба, between the River Mwanachema and Ramisi in Funzi Bay and near Shimoni (Allela, undated). It is currently confined to the Vanga area though there is a small operation in Bodo/Shirezi area which is a landing spot for the surrounding area.

At Vanga, there are about fifty men involved in harvesting Beche-de-Mer by hand. In deeper waters, collection is by skin divers who dive up to 10-14 metres. Processing of Beche-de-Mer involves boiling them in sea water for two hours, after which they are left in a sack overnight to decay slightly. They are then washed and boiled again for two hours, before they are roasted, salted and dried in the sun.

* This is a French word used in commerce for sea cucumber. In the Far East the same things are called Trepang and the scientific term is Holothuria. There are many different holothurians and some, especially the larger species are eaten in areas such as France, Far East and China.

The most sought after species is the Holothuria edulis. This is commonly found in estuarine waters although two other species are also collected. Prices to traders are given in Table 3.10. Grades depend on size of the Beche-de-Mer.

TABLE 3.10 PROCESSED BECHE-DE-MER PRICES PAID TO THE TRADERS

<u>GRADE</u>	<u>PRICE (K.SHS. PER KILO)</u>
First	40.00
Second	20.00
Third	10.00

SOURCE: Fisheries Office, 1983.

Two companies and a businessman are involved in the exporting of Beche-de-Mer. Each company has its own small factory at Vanga. This consists of a Makuti roofed building constructed of poles, a vessel for boiling the Beche-de-Mer and a wire mesh on which the Beche-de-Mer is roasted.

3.8.2 ECOLOGICAL IMPORTANCE

Holothuria have several ecological functions:

1. they are a food source for other marine organisms, and have been found to be food for some important food fishes in Kenya (Kendall: personal communication).
2. they transform minute particles into a food source which is then available to fish and other organisms.
3. they help to create sand by breaking down dead shell and coral material into finer particles.
4. they cause a mixing of nutrients by eating benthic material and making nutrients available to other organisms.

The Beche-de-Mer Industry at Shimoni was reported to have dried-up, which could be a sign of overfishing (Hemphill - personal communication). The ecological consequences of overfishing Beche-de-Mer are:

1. Decline in food for fish and other organisms.
2. Reduction of recycling of mineral substances.
3. Reduction on amount of sand formed.

3.8.3 RECOMMENDATIONS

This industry needs to be checked to ascertain if the present rate of collection can be sustained by the populations of Beche-de-Mer existing around Vanga. The introduction of a quota system should be considered so that the industry can be operated on a sustained yield basis. It may be possible to raise Holothuria in protected areas, but this has not been investigated.

3.9 CRUSTACEA

3.9.1 LOBSTERS

Lobsters are found at Kibuyuni, Majoreni, Shimoni and Funzi Bay, where they are caught by hand, skin diving and with scoop nets. They are usually caught during the northeast monsoons (Kaskazi) when the sea is calm and visibility is good. The primary lobster species are Palinurus longipes, Palinurus ornatus, and Palinurus versicolour. The lobsters are sold to the nearest co-operative e.g. in Majoreni, Vanga, Bodo or Shimoni. The fishermen sell the lobsters to the co-operative at K.Shs. 47.00 per kg except for Msambweni where the price is K.Shs. 45.00. The co-operative in turn sells lobsters to dealers at K.Shs. 53.60 per kg. The dealers then supply the hotels and export surplus lobster tails. At times fishermen sell the lobsters directly to hotels at K.Shs. 75.00 per kg. Fishermen, fish scouts, fisheries officers as well as hotel and restaurant owners all agree that fewer lobsters are being caught now than five years ago.

3.9.2 CRABS

Crabs are found in many places along the coast at Kiromo in Wasini Channel, near Shimoni, at Waga; Sii, along the coast east of Shimoni, at Majoreni, Kuwambale and Chayamamba behind Wasini Island, and at Bodo/Shirazi. They are found mainly in mangrove areas and are caught during low tides. Crabs live in holes up to 24" deep and are caught using a hooked stick which is pushed into the hole, past the crab and is then slowly pulled out to bring out the crab. The species mainly caught in Kenya is the Mangrove crab, Scyllus errata. Fishermen sell crabs to the co-operative at K.Shs. 9.00 per kg and to the dealers at K.Shs. 10.35 per kg. At Majoreni 40 members of the co-operative catch crabs and 15 at Bodo where crabs are plentiful. Crabs less than $\frac{1}{2}$ in weight (most crabs weigh about 1 kg) are supposed to be returned to the sea. Dealers

come to the depots every two or three days to collect them live with appendages intact. Crabs are collected throughout the year although the best season is during the southeast monsoon (Kusi) from March to October or November. Interviews with fishermen reveal a decline of crab catch especially in the Bodo area.

3.9.3 PRAWNS

Most of the prawns caught in Kwale are from Majoreni and Vanga. Gazi, Kiwambale, Tiwi, Bodo and Shirazi are also fished but the catches are small. Prawns are normally caught in plenty during the southeast monsoons (Kusi) March to October with April, May and June being the peak months. At Vanga, prawns are most plentiful during the floods of the River Umba. Prawns are caught using small mesh (prawn net) with stone weights along the edges. Two species are common, the Jumbo prawn (Monodon species) and the smaller size prawn. In Majoreni 25 co-operative members collect the prawns daily from the co-operative depots at prices listed in Table 3.11. There used to be commercial prawn fishing in Kwale District, but it is no longer takes place.

TABLE 3.11 CO-OPERATIVE PRICES FOR PRAWNS IN KWALE DISTRICT, 1983

<u>GRADE</u>	<u>PRICES TO FISHERMEN</u> (K.SHS)	<u>PRICES TO DEALERS</u> (K.SHS)
One	20.00	22.85
Two	22.50	N/A
Three	13.00	14.85

SOURCE: Diani Co-operatives office, 1983

3.9.4 PROBLEMS AND RECOMMENDATIONS

Hoteliers and restaurant owners mentioned several problems experienced in obtaining crustacea. The lobster supplies are poor, and the supply of prawns is low in October and November.

The dealers who buy catch from co-operatives are large companies with cold storage facilities which enable them to maintain a year-long

supply. Such companies have high overheads from running large refrigeration units and thus the hoteliers find their prices high, particularly in times of scarcity.

The problem of declining crustacea catches necessitates delivery of supplies from far away e.g. Lamu for lobsters. The increased costs are passed on to the tourists thus making Kenya a more expensive holiday destination. Several recommendations are suggested:

Quotas should be placed on fishing of all crustacea, particularly prawns and lobsters, to avoid overfishing. In addition, closed seasons should be imposed during the breeding season and on size.

A pilot scheme on prawn mariculture, currently under scrutiny by the Fisheries Department, could have far-reaching effects in terms of future prawn production. It should be encouraged by using tanks rather than destroying valuable mangrove swamps, which are habitats for many marine organisms.

3.10 NATURAL HAZARDS

Natural disasters, i.e. infrequent events in the biosphere, lithosphere, and/or atmosphere associated with impacts on human activity, periodically plague mankind. These result from geological events such as earthquakes, landslides and volcanic eruptions, and also from atmospheric phenomena such as severe storms and lightening. A third group of disasters result from a combination of geological and climatic factors, e.g. floods and droughts. The balance of natural versus man-made disasters is determined by the magnitude of the natural phenomenon and the vulnerability of the human activities.

3.10.1 DROUGHT

Much of Kwale District is semi-arid and experiences drastic changes in climatic conditions making it prone to the third category of disasters. Some parts of the district especially Kinango Division, experience a period of drought every year. The district is not self-sufficient in food and during the dry seasons relief has to be sought from outside the district (Table 3.12 and Appendix 9.6).

3.10.2 FLOODS

After the seasonal drought, heavy rains come in April and May, accounting for 45% of the annual rainfall in the coastal belt and 30% of the annual rainfall in Kinango. The rain is intense and due to lack of adequate vegetative cover in Kinango, it results in flash floods

(Table 3.13). These floods have been known to cause destruction of crops, washing away bridges, prolonged wetness curtailing road communication etc. In Mbauni Village of Msambweni division, houses sink whenever it rains.

TABLE 3.12 DROUGHT IN KWALE DISTRICT

<u>YEAR</u>	<u>INCIDENT</u>	<u>RESULT</u>
1944	Drought all over the district.	Wheat and sugar had to be brought in from Taveta.
1970-1974 and 1976-1977	Drought in Kinango Division. Matuga Division and most parts of the district experienced a drought period.	The drought culminated into animal diseases and deaths. Yellow maize was brought from outside the district - to relief hunger.
1982	Shimba Hills experiences dry weather three to four months every year, but 1982 was more severe.	
1983-1984	Drought in Kinango Division.	Livestock movements to water points, dams dried up.

SOURCE: Ministry of Agriculture Annual Reports.

3.10.3 WIND STORMS

Apart from floods and droughts, strong winds which find few wind-breaks have been known to rip-off roof tops of buildings with loss of life in certain cases. Windstorms are a threat to property and life in the district and especially in the hinterland. There are a number of incidents of roofs being ripped-off (Table 3.14).

3.10.4 FIRE

Bush-fires usually caused by farmers clearing land for cultivation are common with devastating results. These are common during the dry seasons and especially in Kinango Division. In November 1983, 540 tree seedlings planted by the Forest Department were destroyed by such fires. The fires destroy the only available vegetative cover thus laying bare the land, making it prone to soil erosion and flooding.

3.10.5 RECOMMENDATIONS

Climatic conditions in Kwale District are naturally harsh at certain periods of the year. Drought is a common phenomenon, especially in the hinterland. Drought-resistant and drought avoiding crops should be promoted in the area to supplement the staple food crops. A balance between cash crops and subsistence crops have to be employed to ensure food-sufficiency of the area. Since the reliability of rainfall is low for some areas of the district, agricultural practices in these areas must be planned considering the frequency of dry and wet years rather than the arithmetic normal.

There is a need for the Rural Access Roads Programme to emphasise making and maintaining cut-off drains to control the storm waters during the rainy seasons.

Although climatic conditions do not favour the afforestation programme, windbreaks using indigenous trees as a long-term solution and quick growing exotic trees as a short-term solution, should be tested and subsequent results be applied in the relevant areas.

Uncontrolled bush-burning should be discouraged at all costs. The Chief's Act should be enforced to penalise offenders. Burning fields and bush for grazing and agriculture can be organised on a communal self-help basis, and thus protect tree seedlings, other fields, and the natural vegetation.

TABLE 3.13 FLOODS IN KWALE DISTRICT

<u>YEAR</u>	<u>INCIDENT</u>	<u>RESULT</u>
1921	Ndugu Si Mtu rains	Crops destroyed, trees fell, prolonged wetness. There was hunger afterwards and people migrated to relatively safer places.
1981	Kinango Division Flash floods	Prolonged wetness making roads impassable. Ndavaya and Chigutu bridges washed away.

TABLE 3.14 WINDSTORMS IN KWALE DISTRICT

<u>YEAR</u>	<u>LOCATION</u>	<u>INCIDENT</u>
1967/68	Ndaveya Primary School (Kinango Division)	Part of the school was destroyed by wind.
1977	Mamba Primary School (Kinango Division)	School roof was ripped-off. One or two children were killed.
1978	Kinango Primary School (Kinango Division)	School roof ripped-off.
1980	Gulanze Primary School (Kinango Division)	Roof ripped-off.
1981	Wasini Island (Msambweni Division)	One school roof ripped-off.
1982	Nduani Primary School	Roof blown off.

4.0 LAND USE AND DEVELOPMENT

4.1 LAND TENURE

4.1.1 HISTORY AND IMPORTANCE OF LAND TENURE

The land tenure problem in Kwale District, like in other places along the East African Coast started in the years preceding independence when the Sultan of Zanzibar declared the ten-mile coastal strip to be under his rule. The owners of the land were Arabs and Indians, many of whom now cannot be traced. Elsewhere in the district, various degrees of communal ownership existed over land and individualised land ownership was rare.

Traditional land ownership in Kwale includes inheritance of the unadjudicated land by clans, particularly in Kinango Division, where land is communally owned. Communal land ownership constrains some forms of development because no single member of the clan or village to which a particular piece of land belongs has more rights than others. If there is need for compensation, then the whole clan or village must be compensated.

A case in point is the Taru Sisal and Coffee Estate in Kinango Division, which was established by an individual on land that was communally owned. There were problems in trying to procure a title deed because the whole clan to which the land belonged wanted to be compensated.

In some cases group ownership has resulted in overgrazing and desertification, where traditional range management practices have been disrupted. However, in the dry areas, adjudication may result in parcels which are too small to be viable in the dry seasons. Less than 30 percent of the district has been adjudicated and land registration and adjudication is going on. There are a number of large land holdings, especially in Matuga, Msambweni and Kubo Divisions. In Shimba Hills Settlement Scheme in Kubo Division, the settlers were initially issued with temporary occupational certificates and had to pay a certain rate to the County Council every year. Recently, title deeds have been issued.

TABLE 4.1 REGISTERED SECTIONS IN KWALE DISTRICT, 1983

<u>Section</u>	<u>Area (ha)</u>	<u>Number of parcels</u>	<u>Date registered</u>
<u>Matuga Division</u>			
Golini	4708.00	1033	May 1975
Kundutsi 'A'	3314.00	1595	June 1973
Kundutsi 'B'	4679.00	1461	March 1973
Ngombeni	2744.00	273	June 1982
Waa	1678.00	1968	April 1981
Tiwi	2350.00	2420	August 1981
<u>Msambweni Division</u>			
Mwananyamala	2963.00	612	September 1973
Bumbani 'A'	2627.00	809	July 1973
Bumbani 'B'	2296.00	789	March 1973
Bumbani 'C'	2347.00	814	March 1975
Mnasini	3032.00	754	February 1978
Mrima	2232.00	677	August 1973
Kichani	1564.00	319	May 1982
Mchinginni	3610.00	924	November 1982
Majisini	3223.00	1679	February 1979
Msambweni	2000.00	2739	August 1981
Mwereni	44050.00	14	
Pungu, Fuel	139.00	128	
<u>Kubo Division</u>			
Shimba Hills	17101.00	1972	April 1976
<u>Kinango Division</u>			
South Samburu	63947.00	59	
Mwavumbo	27295.00	44	

SOURCE: Lands Adjudication Office, Kwale, November, 1983

TABLE 4.2 ADJUDICATION PROGRESS IN KWALE DISTRICT, 1983

<u>Adjudication completed, but title deeds are not yet available</u>	
<u>SECTION</u>	<u>AREA (HECTARES)</u>
Majoreni	3366
Ukunda	1854
Maweche	<u>1688</u>
TOTAL	<u>6908</u>
<u>Adjudication in Progress</u>	
<u>SECTION</u>	<u>AREA (HECTARES)</u>
Wasini Island	450
Marenje	3603
Kirazini 'A'	7300
Mkongani 'A'	4043
Mkongani 'B'	3439
Yungi Island	169
Makokoni	3000
Mbegani	2600
Mwanguda	3713
Kidimu	2725
Kiwegu/Jego	5175
Chumi	2900
Funzi Island	800
Mwabungo	70
Gandini	3750
Kidomaya	3175
Gunduni	2225
Shimoni	3525
Kilibole	22430
Ndavaya	29947
Vanga	6175
Dalgube	113
North Samburu	114271
Shirazi Bodo	498
Mkomba	4600
Mahuruni	1975
Kirindini	36700
Kundutsi 'C'	<u>100</u>
TOTAL	<u>239614</u>

NOTE: Land Adjudication takes place in Trustlands only.

SOURCE: Land Adjudication Office, Kwale 1983

4.1.2 ADJUDICATION PROGRESS

The total land area of the district is 832,000 hectares, and the trustlands cover an area of 505,564.20 hectares. The remaining 326,435.80 hectares consist of Government land, private lands and/or game reserves. An area of approximately 60,000 hectares remains to be declared adjudicated sections within Lunga-Lunga, Puma and Kinango locations (Table 4.1). It should be noted that the area being quoted here is the total area before land adjudication and registration. Adjudication work is in progress in several adjudication sections (Table 4.2).

4.1.3 RECOMMENDATIONS

Adjudication work should be accelerated, particularly in the agricultural areas, so that people can get title deeds which will enable them to develop their lands.

Title deeds to the group ranches should also be issued, so they can be protected from illegal land transfers and use the title deeds in obtaining loans.

4.2 AGRICULTURAL DEVELOPMENT

4.2.1 INCREASING AGRICULTURAL PRODUCTIVITY

Along the coastal strip and in places extending up to 40 kilometres into the interior lies an area of medium to low potential for arable agriculture. This constitutes 6 percent of the total land area of the district. An additional 2 percent of the land around Kikoneni and Jombo, can be classified as medium high to high potential for arable agriculture (Kwale, District Development Plan 1979-1983). Thus while most of the district is dry, there exists a sizeable area of arable land whose productivity can be increased.

Increased agricultural production can be achieved by expanding the cultivated area and by increasing yields using available technology. Although, it is the Government's policy to achieve increases in output largely through the achievement of higher yields, there is some unused land in Kwale District - especially in Kubo and Msambweni Divisions, that could be cultivated.

To cope with the increasing population in the district, land has to be used more intensively. To achieve this objective production methods must be improved and more investments applied to develop the land.

At present, there is no large-scale irrigation scheme in the district. The Government may consider assisting the expansion of small schemes such as the Vanga Minor Irrigation Scheme to cover a larger area.

4.2.2 CONSTRAINTS AFFECTING AGRICULTURAL PRODUCTIVITY

There are several constraints to increasing agricultural production. Lack of finance to improve the farms is one of the major constraints facing farmers. Although the Agricultural Finance Corporation (AFC) has a branch at Ukunda, few farmers go for loans; either due to lack of security or lack of awareness about the existence of this facility.

Poor roads, and in some places none at all, restricts the development of agriculture. Most bridges are damaged by heavy downpours, thus rendering transportation of crop produce from farm impossible in some areas.

The Likoni ferry toll is expensive for most farmers in Kwale District.

There is also the problem of unreliable rainfall, particularly in Kinango Division, which results in perpetual crop failure.

The soil types - i.e. sandy loams and sandy clay loams - are poor in nutrients. These soil types also contribute to soil erosion in parts of Kinango and Kubo Divisions. Destruction of crops by wildlife, especially on farms around Shimba Hills National Reserve, discourages farmers. Compensation is erratic, often delayed for several years.

Another constraint that farmers face is the low prices offered for their cash crops. In the absence of organised marketing co-operatives, crops such as bixa, are sold at throw-away prices - much of the crop is wasted.

The communal land ownership affects the development of agriculture, particularly in Kinango Division due to lack of incentive and means to use modern methods to improve agriculture.

4.2.3 RECOMMENDATIONS

Agricultural production in most areas of Kwale District, can be increased through the use of improved seeds, improvement in the standard of crop husbandry, more application of fertilisers and increased measures to control pests and diseases. Research could also be carried out to identify new crops and crop varieties which are appropriate for arid and semi-arid areas. Drought-resistant crops such as sorghum and millet should be emphasised.

Farmers require title deeds as security to enable them obtain development loans.

The use of low-cost mechanical technologies like ox-plough that would increase labour productivity in the district should be encouraged.

Simple transport technologies such as carts, which can be used to facilitate transportation of agricultural produce in the district, should be designed and distributed.

Farm management methods geared towards increasing the amount and variety of both agricultural and livestock production, should be emphasised.

Producer price of cash crops, for example, coconuts, cashew-nuts and bixa should be stabilised and controlled to prevent prices from falling below the farmer's production costs.

In addition to improving the production methods of staple food crops, the Ministry of Agriculture and Livestock Development should encourage the introduction of food crops that will complement the dietary needs of local people.

4.3 LIVESTOCK AND RANGELANDS DEVELOPMENT

4.3.1 RANGELAND DEVELOPMENT

Ninety-two percent of Kwale District is of low to very low agricultural potential, ideal for ranching. It is the Government's policy to transform rangeland areas and the traditional systems of livestock management into demarcated ranches under groups or private ownership (Table 4.3).

The rangeland development will also be one way of meeting the national food security policy whose major objective is to ensure an adequate supply of nutritionally balanced diets in all parts of the country. (Government of Kenya, National Food Policy Paper 1981).

There are plans to intensify the production of livestock on rangelands through a programme of establishing large-scale ranches, disease control programmes (Table 4.4), genetic improvement, improved artificial insemination, institute herd and pasture management, and improvement of veterinary services (Table 4.5).

The development of range areas in the district like in other parts of the country, is constrained by a number of problems. Some of these problems are discussed in the following section.

TABLE 4.3

RANCHES IN KWALE DISTRICT, 1983

RANCH NAME	Size Ha.	Membership	Land Tenure	Registration	Status	Number of Livestock
Kenya Triangle (Private Co.)	81,750	23	State	1973	Operating	3,500
Lunga-Lunga Ranch (Directed Agr. Co.)	52,266	200	Trust	1972	Not operating in Kinango. Stock is elsewhere	68
Mackinnon/Dokata (Private Co.)	40,400	34	Trust	1973	Operating	2,500
Hwabeja (Private Co.)	40,760	18	State	1972	Not operating	Nil
Chenze Co-operative Society	32,000	200	State	1968	Not operating	45
Kwale Ranchers (Private Co.)	32,000	50	State	1973	Not operating	Nil
Samburu South (Group Ranch)	63,655	3,333	-	1976	Operating	37
Mwavumbo (Group Ranch)	24,000	3,330	-	1980	Not operating	Nil
Ndavaya (Group Ranch)	28,000	Adjudication in process			Not registered, but operating	112
Gora (Individual Ranch)	11,825	1			Pending	Nil
Hwereni (Group Ranch)	40,560	3,000		1975	Operating	-
Kilibole (Group Ranch)	Not determined	In progress			Proposed	-
North Samburu (Group Ranch)	Not determined	In progress			Proposed	-
Kinango (Group Ranch)	Not declared as adjudication is still in progress				Proposed	-
Puma (Group Ranch)	Not adjudicated	Not registered			Proposed	-

SOURCE: District Livestock Development Office, 1983

TABLE 4.4

LIVESTOCK DISEASES, KWALE DISTRICT, 1980-1982

	<u>1980</u>	<u>1981</u>	<u>1982</u>
Foot and Mouth		9	5
Rinderpest	Nil	Nil	Nil
East Coast Fever	52	31	37
Anaplasmosis	20	22	142
Trypanosomiasis	421	Endemic	35
Rabis		Remained under Quarantine since 1977	
Fowl pox	-	-	54
Black Water Disease	-	-	4
Red Water	-	6	2

SOURCE: District Livestock Development Office - Kwale, 1983

TABLE 4.5

LIVESTOCK PROGRAMMES AND SERVICES, KWALE DISTRICT, 1983

<u>Service</u>	<u>1983</u>	<u>1982</u>	<u>1981</u>	<u>1980</u>
Bull Scheme	-	5	4	4
Bulking plots	-	9	10	9
Beekeeping	No change	223	-	194
Rabbit production	-	23	-	-
Poultry project	-	5	18	-
<u>Dips</u>				
<u>Division</u>	<u>Operating</u>	<u>Not Operating</u>	<u>Proposed</u>	
Kinango	9	5	6	
Msambweni	11	-	14	
Kubo	8	-	5	
Matuga	4	-	4	
TOTAL	32	5	29	

Spray Races

	<u>Operating</u>	<u>Non-operating</u>
Kenya Triangle	2	-
Maruma (Kiteje)	-	1
Sisters of Saint Joseph (Kwale)	1	-
Mbuguni Government	-	1

SOURCE: District Livestock Development Office, Kwale, 1983

4.3.2 PROBLEMS AND CONSTRAINTS RELATING TO LIVESTOCK PRODUCTION

The unreliable rainfall and infertile soils in the rangelands have limited the production of animals as well as crops. Kinango Division, which is the major livestock-rearing area, receives between 500mm to 900mm of rainfall per year.

Limited technology and lack of finance affects the development of rangelands, since the local people are unable to exploit land and water resources in these areas.

The inadequacy of the road network affects the delivery of goods and the provision of better extension services to these areas.

Although the present rate of population increase on rangelands is lower than that of better watered areas of the district, it is still serious when related to the carrying capacity of the land at the present level of technology.

There is also the problem of wildlife endangering domestic animals through diseases, predation, competition for grazing land and destruction of structures such as dams, water pipelines and water storage tanks.

There is no organised marketing of livestock and livestock products in Kwale District. There are two auction yards - one at Kinango and another one at Mwangulu. There are no large slaughter houses at the moment, and there is no milk processing plant in the whole district. Farmers, therefore, do not have a reliable outlet for their milk.

Other constraints include the lack of readily available steers for fattening; delay in issuing letters of allotment to ranches; and delay in land adjudication particularly in areas earmarked for group ranches.

4.3.3 PROGRAMMES UNDERWAY

Kwale District is under the Kenya Livestock Development Project (K.L.D.P.) Phases I and II. This project has financed some ranches to an estimated K.Shs. 14 million through the Agricultural Finance Corporation (AFC). So far only company ranches have been financed. The Range Management Division has plans to draw up ranch development plans for company ranches and two group ranches. The Government will also provide grants to group ranches for the development of water and other resources.

There are programmes to control tick-borne diseases through construction of dips, and spraying with chemical acaricides, usually once a week (Tables 4.4 and 4.5). The other control measure on animal diseases is vaccination against rinderpest, a service provided by the Ministry of Agriculture and Livestock Development.

4.3.4 RECOMMENDATIONS

The Kwale District rangelands should be brought under livestock production. For this objective to be attained several measures should be undertaken without delay. These include development of adequate water supplies; construction of more cattle dips; provision of credit facilities to improve ranches and provision of adequate extension services.

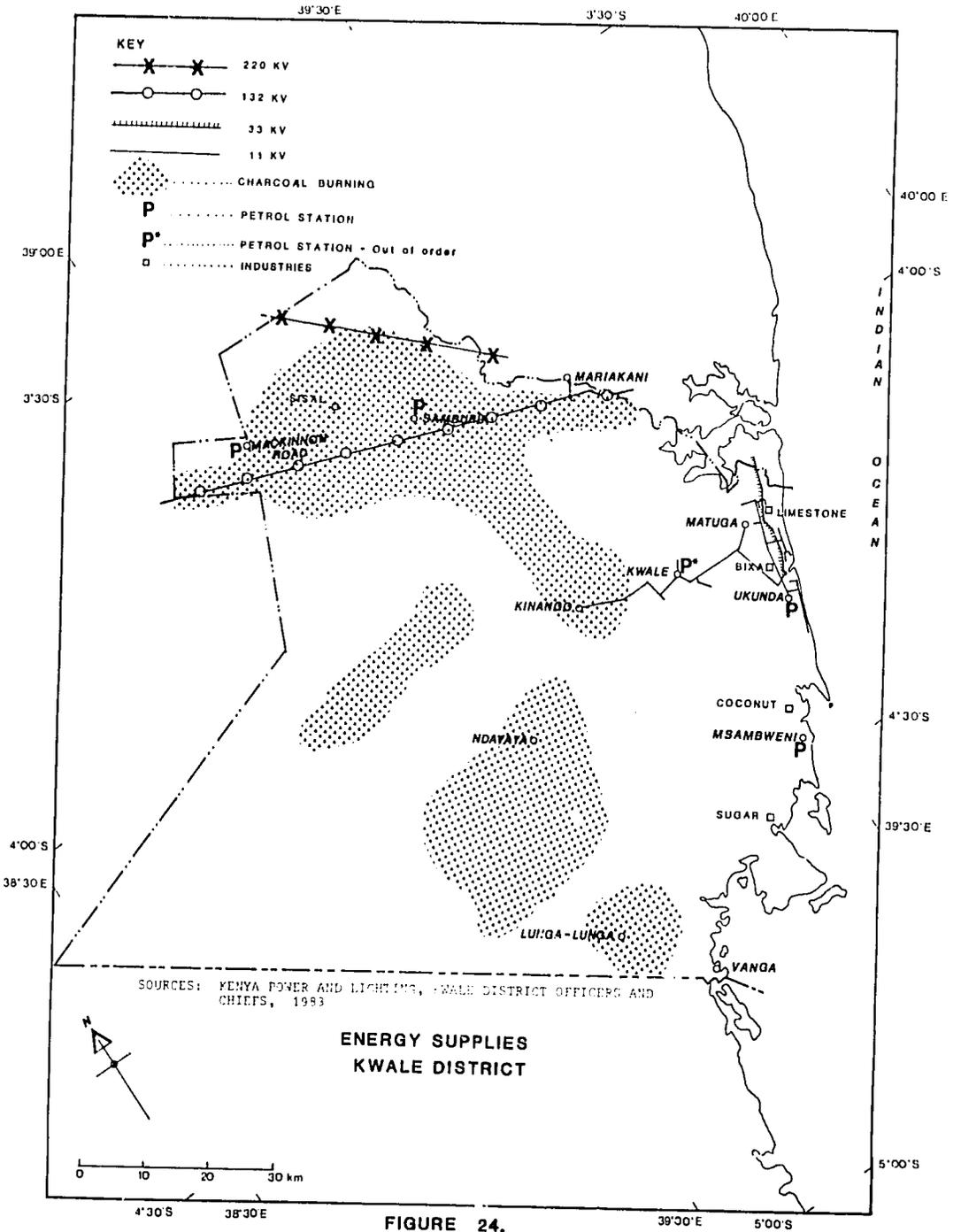
4.4 ENERGY SUPPLY AND DEMAND

4.4.1 INTRODUCTION

The main source of energy in the rural household is fuelwood. The demand for woodfuels (firewood and charcoal) in the rural and urban areas is continuously rising while sources of supply are diminishing. In the near future, the demand is expected to outstrip supply and the consequences will be destruction of vegetation, soils, water and the whole ecosystem. Other sources of energy in the district include Gas, (LPG) Liquid Petroleum Gas, Paraffin (kerosene), Diesel, Electricity and Solar Energy. Their use in the rural areas and by the majority of the urbanites is limited because they are either too expensive or not available. Figure 25 and Table 4.6 provide comparative data for Coast Province, which also holds true for Kwale District. Figure 24 depicts the District's energy sources.

4.4.2 WOODFUEL

Firewood is the main source of energy for cooking, heating and lighting in the rural areas. It is readily available in Kinango but rather scarce



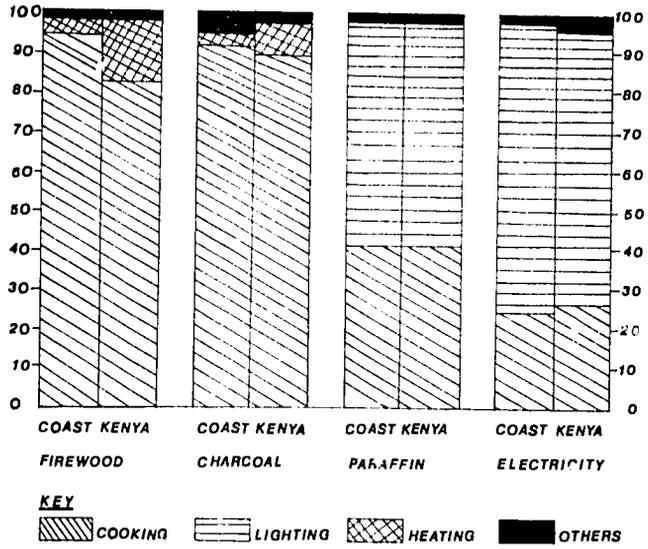


FIGURE 25. THE USAGE OF ENERGY IN KENYA AND THE COAST PROVINCE

SOURCE: CENTRAL BUREAU OF STATISTICS, 1980

TABLE 4.6 DISTRIBUTION OF HOUSEHOLDS BY DISTANCE FROM SOURCES OF ENERGY IN THE COAST PROVINCE

<u>DISTANCE</u>	<u>FIREWOOD</u>	<u>CHARCOAL</u>	<u>PARAFFIN</u>	<u>GAS</u>
0-0.9 km	50.45%	81.12%	75.17%	71.79%
1.0-1.9 km	26.43%	8.53%	14.90%	7.35%
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%	-
7.0 km and over	0.58%	-	1.96%	1.44%

SOURCE: Central Bureau of Statistics, 1980

in the lower regions of Shimoni and Ramisi. Selling of firewood and charcoal along the roads is common. Each bundle of firewood costs about two shillings. The Kinangoni Women's Group in Kinango Division cuts or collects dry wood to sell as firewood. The firewood used by Ramisi Sugar Factory is either brought locally or cut down in the surrounding areas. The Kenya Calcium Products Factory located at Tiwi is another major user of firewood which is cut down in the surrounding areas.

Woodfuel will continue to be the main source of energy in the rural areas and centres for a long time. Cutting down of trees for woodfuel as well as the seasonal bush burning which destroys young trees that would replace the old trees is a major environmental problem in Kwale. The high demand for woodfuel has resulted in destruction of forests such as the Kayas and Mangroves. This could lead to the extinction of some plant species. Deforestation will lead to soil erosion as in the Shimba Hills Settlement Scheme, lack of water due to destruction of water catchments and a complete change of the district's environment.

Charcoal is in high demand in towns like Mombasa, Kwale and Kinango for cooking purposes both in homes, hotels and butcheries. Charcoal burners cut down trees indiscriminately mainly for communal lands or group ranches where nobody lives. Such areas include Puma, Lunga-Lunga, Samburu, Mwereni, Kindomayo, Perani, Kasemeni, Ngondo, and Chega. The fee charged by charcoal burners varies from five to ten shillings per bag depending on locality. The same bag can fetch about K.Shs. 25 in Kinango town, K.Shs. 30 in Kwale town and K.Shs. 45 in Mombasa.

A charcoal burner can produce about 40 bags of charcoal per month. The money is usually spent on purchasing basic needs, and the burners claim to have no other alternative sources of income. The charcoal business is a booming trade for the middle men who may transport about 300 bags per trip, sometimes during the night. Charcoal burning licences and transportation permits are the responsibility of the local district officers in the divisions.

The ban restricting charcoal production and transportation is not effective because the fines are too low and enforcement inadequate. However, the majority of the urban people depend on charcoal for cooking and heating and they must have it. Thus charcoal continues to be in high demand with increasing population and urbanisation. The charcoal industry is essential to Kenya's development and with proper management it could be carried out without destroying the environment.

A constraint for both fuelwood plantings and reforestation is that tree breeding and planting is hindered by lack of water (rain or irrigation), especially in the dry hinterland where almost all seedlings planted die. There is lack of interest by the public due to drought and because currently they do not walk far to get woodfuel. Lack of individual land ownership further hinders tree planting by individuals who may not reap the benefits from the trees later and may not be able to ensure they are protected from animals and fire. Likewise the promotion of energy-saving jikos is hindered by the traditional methods of cooking and the use of wood fires to dry and cure grains.

Activities underway

Although each chief is supposed to have a tree nursery this has not been fully achieved. There are tree nurseries at Kinango and Shimba Hills. The demand for seedlings at Kinango Tree Nursery is very low mostly due to drought. The tree nursery has about 65,000 seedlings with both indigenous and exotic tree species. The demand for seedlings when issued free is higher than the supply. The seedlings are normally sold at 25 cents each. There are plans to expand the nurseries to meet the demand. The Local District Officer and Forester found the survival rate of the seedlings planted in the farms to be 85% in Shimba Hills (personal communication).

The Matuga Agro-forestry sub-centre was established in May 1983, to carry out research and demonstrations, establish tree nurseries, train and assist farmers and conduct extension services to promote agro-forestry. The centre also researches, produces and promotes improved charcoal saving jikos. When fully established, the centre will have a one-acre tree nursery with about 50,000 seedlings both indigenous and exotic tree species. Farmers who wish to start agro-forestry are given seeds or seedlings free. With agro-forestry the farmers can benefit from both crops and trees which could be used for firewood, charcoal, fencing, fruits and for enriching the soils. The response from the farmers so far has been poor. The main problems facing the centre are financial, transport, technical manpower and water.

4.4.3 OTHER RENEWABLE SOURCES OF ENERGY

There is very little use of new and renewable sources of energy in the district. Solar energy is used in some of the tourist hotels along the Diani Beach Complex mainly for heating water. A Solar Powered Very High Frequency (V.H.F.) Radiocall is used at Shimba Hills Police Post for communications. Local people use solar energy for drying fish, copra, and

firewood. Wind energy and biogas are not developed or utilised in the district.

4.4.4 PETROLEUM AND ELECTRICITY

Petroleum sources of energy are paraffin (kerosene), petrol and diesel. Paraffin is used in the rural areas for lighting and sometimes for cooking, mainly in urban areas. Petrol and diesel are used primarily in transportation. Power alcohol that is used in blending petrol to save the country's foreign exchange is to be introduced in Coast Province in the near future. Industrial diesel is used at Ramisi Sugar Factory both for providing power and generating electricity. This is an expensive source of energy for an industry.

The demand for electricity in the rural areas is high. The electricity supplied for the district comes from Kipevu Thermal Station in Mombasa. It is transmitted through a 33 kW power line along or near the Mombasa Lunga-Lunga road to Ukunda/Diani Complex and a branch extends to Kwale town, Marere Water Works and to Kinango. The towns supplied with electricity, include Ukunda/Diani Complex, Kwale, Matuga, Ngombeni, Waa, Tiwi and Kinango. The areas that have diesel generators are Msambweni, Gazi (private), Ramisi (private) and Lunga-Lunga (private).

Rural electrification through harambee efforts by the public is minimal and this hinders any assistance from the Government or other organisations. Rural electrification is an expensive development for the Government because electricity is usually transmitted from far. Transformers for electricity distribution are also too expensive for the rural people to afford on individual basis. Ramisi Sugar Factory is to be supplied with electricity to stop the use of diesel which is more expensive. Other areas earmarked for electrification include Msambweni, Shimoni, Kikoneni, Shimba Hills and Lunga-Lunga which are important social, administrative and commercial centres. The growth of service centres is very slow but electrification may help in the establishment of small industries and encouragement of rural investment.

4.4.5 RECOMMENDATIONS

Although deforestation in Kwale is not as serious as in other districts, this is the best time to act, before it reaches a critical stage. Since woodfuel is likely to remain for a long time the main source of energy for the majority of the people, what is needed is proper management of the

existing tree resources and reforestation to cope with the ever rising demand. The expansion of existing tree nurseries and establishment of new ones, coupled with public education about the importance of trees is needed. Demonstration of feasible pilot tree plantations on selected farms would encourage the public to appreciate and participate in tree planting. An inducement to the public to plant more trees should be established whereby licences for charcoal burning are issued only to those who plant trees which are cared for and survive.

The seasonal bush burning to accelerate the growth of grass should be controlled or banned as this destroys not only the young trees which would regenerate the forests but also destroys old trees.

The public should be encouraged to use woodfuel saving jikos for both firewood and charcoal as they would save some money through the use of small quantities of woodfuel and get more energy to accomplish their needs. The new charcoal burning methods which are superior to the traditional methods should be encouraged. These would in turn save many trees that would otherwise have been cut down for the same amount of energy needed.

The public should be encouraged to practise agro-forestry for woodfuel. Even fruit areas if pruned can be used for firewood. The present Agro-forestry Sub-Centre at Matuga should be improved financially and expanded.

Development of alternative sources of energy like solar, wind and biogas should be given higher priority. The use of biogas, solar and wind energy through extension services and pilot projects would familiarise and encourage the local people to appreciate the technology. Windmills could be used to pump underground water from boreholes especially in the higher dry hinterland where wind speeds may be high enough. Windmills are cheaper to run and maintain than diesel pumps. All these suggestions would fully succeed if supported by the local people.

Rural electrification could encourage the establishment of small-scale industries such as agro-industries and making of light metal structures like window and door frames. Creation employment in the rural areas and promotion of the growth of service centres are two priorities in the district. Electricity can also substitute for diesel water pumps and generators which are more expensive to run. Electricity should also be supplied to rural areas and low charges be levied to encourage consumers.

5.0 HUMAN ENVIRONMENT

5.1 POPULATION GROWTH AND RESOURCES

5.1.1 RESOURCE PROJECTIONS

Kwale District has a great potential for development. Its resource base is wide and varied, including prime arable land, reliable rainfall in coastal areas, proximity to a ready market in Mombasa, natural tourist attractions, and employment generating industries, as well as a growing human population. The viability of this resource base, however, can be evaluated through analysis of trends depicted in the population scenarios (Table 5.1). The district is actually not overpopulated at present, but regardless of the assumptions used in formulating the scenarios, the population is growing steadily (as illustrated on the low growth scenario where the population will double in 21 years). Agricultural land is plentiful. The population/arable land ratio is about 112. There is no apparent pressure on land. However, the adequacy of this land as a resource base has to be assessed rather cautiously especially in view of the fact that the population is on the increase.

The district is well endowed with income-generating resources e.g. farming (large-and small-scale), fishing, hotel industry and ranching. However, these resources are generally underutilised. There exists widespread under-employment as well as unemployment in the district. This trend will continue in future. The people's attitude towards work, especially manual labour, is one factor contributing to unemployment.

Malnutrition among the children is widespread in the district. Food deficiency prevailing in the local diet is partly due to dependence on such food crops as cassava and the coconut. This shortfall is expected to prevail unless both agricultural productivity as well as eating habits are greatly changed.

The existing rural and urban infrastructure is inadequate. Education facilities for the widely scattered populace are insufficient. Health amenities are also few and widely scattered. Water resources are unevenly distributed, and access roads are generally poor. The demand for all these services is certain to increase in future, necessitating their expansion and improvement (Table 5.2).

5.1.2 RECOMMENDATIONS

There is need to moderate the population growth rate. This may be

TABLE 5.1

POPULATION SCENARIOS FOR THE YEAR 2000 - KWALE DISTRICT
(POPULATION IN THOUSANDS)

AGE	1983 PROJECTED			I STATUS QUO			II LOW GROWTH			III HIGH GROWTH		
	MEN	WOMEN	TOTAL	MEN	WOMEN	TOTAL	MEN	WOMEN	TOTAL	MEN	WOMEN	TOTAL
0-4	35.5	35.7	71.2	65.3	66.0	131.2	46.7	47.2	93.9	95.1	95.8	190.9
5-9	29.1	28.9	58.0	52.2	53.0	105.1	41.4	42.0	83.4	68.7	69.5	138.2
10-14	22.2	21.3	43.5	42.8	43.5	86.3	37.0	37.6	74.6	51.4	52.0	103.4
15-19	16.7	16.4	33.0	35.9	36.0	71.9	33.1	33.2	66.4	40.1	40.2	80.2
20-24	12.9	14.7	27.6	30.3	29.9	60.2	29.3	28.8	58.0	32.3	31.7	64.0
25-29	10.8	13.2	24.0	24.2	24.0	48.0	23.9	23.7	47.6	25.0	24.8	49.8
30-34	9.0	11.1	20.1	18.8	19.1	37.9	18.8	19.1	37.9	19.2	19.4	38.6
35-39	8.0	9.2	17.2	14.4	15.4	29.9	14.5	15.6	30.1	14.6	15.6	30.3
40-44	6.7	7.3	14.1	11.2	12.7	23.9	11.3	12.8	24.2	11.4	12.8	24.2
45-49	5.7	5.7	11.5	8.9	10.4	19.3	9.0	10.6	19.6	9.0	10.6	19.6
50-54	4.6	4.2	8.8	7.2	8.4	15.6	7.3	8.6	15.9	7.3	8.6	15.9
55-59	3.4	3.1	6.5	5.7	6.6	12.3	5.9	6.7	12.6	5.9	6.7	12.6
60-64	2.6	2.4	5.0	4.4	4.9	9.3	4.6	5.0	9.6	4.6	5.0	9.6
65-69	1.8	1.7	3.5	3.2	3.5	6.7	3.4	3.6	7.0	3.4	3.6	7.0
70-74	1.1	1.1	2.1	2.2	2.2	4.4	2.3	2.4	4.7	2.3	2.4	4.7
75+	0.9	1.0	1.9	2.0	2.2	4.2	2.3	2.5	4.9	2.3	2.5	4.9
TOTAL	170.8	177.1	347.9	328.6	337.8	666.4	291.0	299.3	590.3	392.5	401.4	793.8
Average Annual Growth Rate %						3.93			3.3			4.84
Doubling time-years						17			21			14
Number of children under 15 for every person 15 over			.99			.93			.74			1.19

NOTE: Status quo assumes no change infertility, mortality or migration.

SOURCE: Central Bureau of Statistics and National Environment Secretariat Population Model 1984

TABLE 5.2

POPULATION AND RESOURCE TRENDS - KWALE DISTRICT

RESOURCE SERVICE	RELATIONSHIP	UNIT	CURRENT STATUS (1983)	STATUS QUO	SCENARIOS	
					LOW GROWTH (YEAR 2000)	HIGH GROWTH
Population	TOTAL	1000s	347	666	590	794
Roads	KMs needed at current ratio to total population	KMs	1547	2969	2630	3540
Housing	New houses needed based on additional households	Houses/Year	10706	57887	44096	81114
Agriculture	Agricultural Land per capita	Ha./pop.	2.2	4.2	3.7	5.0
Woodfuel	Per capita consumption for firewood and timber at 0.78m ³ /person/year	M ³ /Year	270660	519480	460200	619320
Health facilities	Service population of 16000 people per facility	Hospitals	3	6	5	7
		Health Centres	7	13	12	16
		Dispensaries	12	23	20	27
Education	Schools needed at current ratio of students per school	NO. of schools:				
		Primary	197	378	335	450
		Secondary	14	27	24	32
		Adult	287	551	488	657
Employment	Labour Force=85% Adults 15 to 64	1000s	165.2	317.1	280.1	378.0
Domestic Water	Natural sources 15 litres/person/day					
	Rural Communal Posts 25 litres/person/day	M ³ /day	3470	6660	5900	7940
	Rural individual connections 70 litres/person/day		2429	4662	4130	5558

achieved through educating the people on the virtues of the small family, more efforts in eradication of widespread poverty and through the family planning programmes. Estimates show that the average number of children is seven to eight, while polygamous marriages are traditional. These, coupled with the practice of early marriages has contributed to the high number of dependent population. Hence, there is need to put more effort in the existing family planning programmes, for example, by increasing transport, equipment and staff (here not only professionally trained health workers but also local community leaders who identify with the people more easily) and educating the people through the adult literacy campaign.

The burden of family planning is mostly borne by women, but there is need to arouse male interest in family planning.

Planners can help immensely in propagating family planning by incorporating it into various aspects of community development e.g. sports clubs, religious groups, cultural troupes, women's clubs, schools, factories, clinics, trade unions and agricultural extension workers.

The family planning exercise should be more appealing to the respondents. This can be achieved, for example, through the creation of family planning centres as separate entities from hospitals.

Leaders should be genuinely committed in their efforts to curb high population growth rates. Many of the young generation men understand the issue, they know the burden they have to bear economically, to support a large number of children. The older people are more difficult to convince. This is unfortunate as they are the leaders and they serve as models. Programmes that could change the attitudes of the older generations should be encouraged wherever possible. This may mean making maximum use of all the available forums so as to reach them.

Medical science has developed an array of family planning methods, whose application requires the recipient to be knowledgeable. Unfortunately, the majority of the recipients are illiterate and have of necessity to depend on family life educators as well as media reports. However, due to rumours and irresponsible media reporting, confusion about what method to use reigns high among most of the people. This underscores the need for a clear and systematic way of propagating family planning. The concept of spacing children for three years or more is an age old practice among the Mijikenda and should be encouraged.

5.2 WATER-SUPPLY

5.2.1 WATER-SUPPLY SYSTEMS

At present, there is a general shortage of portable water especially in the rural parts of the district. There are a number of water-supply projects supplying portable water in limited quantities to some few areas of the vast district - viz boreholes, shallow wells, springs etc. (Table 5.3). Rivers and dams are few and streams last only during or just after the rainy season, after which they dry up.

Water is never enough especially for the people in the rural parts of Kinango Division. In this particular division only 8% of the population have access to portable water. The only source of water for Samburu South, Ndayaya, Puma and the ranches is Nyalandi Dam. Water is sold by vendors at a price of between K.Shs. 1.50-2.00 per tin (debe) or much more in times of drought. Due to this price and the unreliability of the water from vendors, women are left to walk long distances, heavily burdened and over rough terrain for a pot of dirty water. Water fetching, therefore, takes away time and energy that could be used more productively.

United Nations Children's Fund (UNICEF) calculates that the human body needs a water intake of as much as 6 litres a day, and considers an additional 38 litres an absolute minimum for body hygiene and other household uses. Clearly, such needs cannot be met where water must be purchased by the tin (debe) or carried over long distances. Table 5.4 shows the seasonal water demand in the district.

5.2.2 PROBLEMS

The main problems and constraints in providing improved water supplies in the district are mainly due to inadequate reliable water sources, mechanical problems, financial and the chemical nature of the underground water. The district has very few reliable water sources and the situation is worsened during the dry seasons. Only two rivers namely Ramisi and Mwachi supply enough water along their courses all the year round. The underground water is usually saline and hot in places such as Kikomeni Springs.

Mechanical problems are common in areas that have been supplied with "clean" portable water. These are mainly machinery breakdown, pipeline bursts and lack of proper maintenance. The saline nature of the water in many boreholes also causes excessive wearing of pump seals. And because of shortage of trained maintenance personnel and transport problems, repairs usually take some time.

TABLE 5.3

WATER-SUPPLY SYSTEMS IN KWALE DISTRICT

WATER-SUPPLY SYSTEMS	NUMBER	AREA SERVED	PRODUCTION CAPACITY	NUMBER OF PEOPLE	PROBLEMS
<u>PIPELINES</u>					
MARERE	> 156 connections	Kwale Town	-	5,000	Organic pollution during rains
	> 6R connections	Some areas of Kiririgo Division	-	2,000	Inadequate
	-	Some areas of Matuga	-	-	-
	-	Waa-Likoni	-	-	-
LIKONI-SOUTHCOST	-	Matuga	700-800 M ³ /day	-	Hard water
MZIMA SPRINGS PIPELINE		Malera Mackinnon Road	-	-	-
<u>BOREHOLES</u>					
TIWI	4	Tiwi	7,000-10,000 gallons/hr) 5,000	Moderately hard water
		Ukunda	7,000 gallons/hr		
		Vanga	4,000 gallons/hr		
		Waa	8,000 gallons/hr		
LUNGA-LUNGA	2	Vanga	1,500 litres/hr		
<u>WELLS</u>					
MSAMBWENI	53 connections	Msambweni area	-	-	Salty water
<u>RIVERS</u>					
PEMBA	-	Kwale Town	-	-	Turbid and coloured. Some organic pollution Hard Water
UMBA	-	Lunga-Lunga	-	-	-
VANGA	-				Moderately Hard Water
RAMISI	-				Organic pollution Healthy upstream at Dariguba. Polluted downstream at Ramisi Bridge
MWACHI	-				-
<u>SPRINGS</u>					
KIKONENI		Kikoneni	-	-	Hot and salty high chemical pollution (i.e. Nitrate)
MALERA		Kwale Town Kinango Kayabobo Matuga	-	-	Polluted during rains
<u>DAMS</u>					
KIKONENI	-	-	-	-	Not yet operational
SMALL EARTH DAMS	> 160	Ranch Lands	-	-	Seasonal. Not fit for human consumption, silted.

SOURCES: District Water Office - Kwale
Kwale District Development Plan - 1979-1983
Pollution Control Division MOWD 1983

TABLE 5.4 SEASONAL WATER DEMAND IN KWALE DISTRICT (LITRES)

WATER-SUPPLY	JANUARY-MARCH	APRIL-JUNE	JULY-SEPTEMBER	OCTOBER-NOVEMBER
Kinango	3,503	3,368	3,570	3,608
Msambweni	6,008	5,426	5,940	5,896
Marere	366,260	324,274	292,227	297,400
Lunga-Lunga	2,761	1,774	1,686	1,777
South-Coast	138,381	111,091	118,916	125,504
Kwale	5,773	5,423	5,328	5,731

SOURCE: District Water Office - Kwale, 1983

The rising price of petroleum-based fuels has also added a new economic element to the problems already facing the water-supply systems. Siltation of earth dams and contamination of water is a common problem.

5.2.3 PLANNED IMPROVEMENTS

The proposed Water-Supply Projects are:

<u>Project</u>	<u>Area to serve</u>
Kiconeni Rural Water-Supply Phase IV	Kiconeni
Wasini Island Water Project	Msambweni
Japanese Environmental Health Water Project	Kinango/Msambweni
Mkongani Water-Supply (Boreholes)	Kubo
Samburu Water Project	Kinango

In addition to the above projects, a few that are on-going are:

- /International
- (i) The rehabilitation of boreholes in the Msambweni Division. Drilling and supply are being provided by the United Nations/Development Organisation (UNIDO).
 - (ii) The European Economic Commission (E.E.C.) assisted Water Project at Vanga, and
 - (iii) The United Nations Development Programme (UNDP), South-Coast Hand Pumps Project which is drilling boreholes and wells which will supply a further 400 people with clean portable water in Msambweni.

The current and the proposed water projects are generally inadequate particularly for Kinango Division. The problem with the current water projects is that most of them become partially or fully inoperative due to financial, technical or human constraints.

5.2.4 RECOMMENDATIONS

The rehabilitation of silted and damaged dams in the dry areas should be given high priority. More dams should be constructed particularly in the drier areas.

Communal water drawing points or water selling kiosks at convenient sites along the pipelines should be emphasised rather than insisting on piped water which is expensive to provide and will take a very long time to implement.

Where possible the idea of supplying piped water to rural homes on loan and then add extra charges in the monthly bills to recover the loans is good although the public may not afford high charges and repayment period may be too long.

Construction of water tanks to harness roof-water especially in public centres like shops, schools, dispensaries and health centres should be encouraged. Rain-water could also be collected on slanting cemented surfaces and stored in underground tanks. Use of clean locally available materials for storage of roof-water in homes and other areas would lower the costs.

Windmills which are cheaper to run and maintain than diesel pumps should be used to run boreholes where wind speeds may be fast enough for economic use.

5.3 ENVIRONMENTAL HEALTH

Generally, most health problems are related to the environment although the relationships may not always be obvious. Diseases are borne in water, air and land and transmitted by various vectors that have different characteristics and habitats. Thus an attempt to 'clean' the environment, e.g. through education would tackle the root cause of most diseases.

5.3.1 MORBIDITY AND MORTALITY

As it is characteristic with all areas with a low socio-economic status like Kwale District, the main health problems are the so-called diseases of the poor. The leading causes of deaths are measles, broncho-pneumonia, malaria, gastro-enteritis, malnutrition, hepatitis, anaemia and neonatal tetanus. All these diseases are "preventable" and can be controlled with improved health facilities and better health education and information.

Regarding morbidity, the most common diseases are malaria, upper respiratory tract infections, intestinal worms, diarrhoeal diseases, measles, schistosomiasis, acute eye infections and anaemia. The incidence of schistosomiasis within the community is much higher, but the community thinks it is normal and therefore they do not seek medical help.

The health problems are therefore enormous. Malnutrition and lack of clean drinking water and sanitation cause periodic occurrences of gastro-enteritis and considerable mortality and morbidity among children.

TABLE 5.5 HEALTH FACILITIES IN KWALE DISTRICT, 1983

DIVISION	LOCATION	NAME AND STATUS OF HEALTH FACILITY	BED CAPACITY	NUMBER OF STAFF	POPULATION SERVED ('83 ESTIMATE)	BED POPULATION	HEALTH FACILITY POPULATION
Msambweni	Msambweni	Msambweni Hospital/IDH	106	171			
	Pongwe	Shimoni Dispensary		2			
	Msambweni	Tumbe Hospital Leprosy/IDH	65				1:14,203
	Vanga/Lunga-Lunga	Vanga IIC, Lunga-Lunga Dispensary	2	8	142,034	1:821	
	Mwereni	Kiima-Ngodo Dispensary		2			
	Diani	Diani Dispensary		2			
	Diani	Muhaka Dispensary		2			
	Kikoneni	Kikoneni Health Centre		8			
Matuga	Tsimba	Kwale Hospital	12	41			
	Waa	Waa Dispensary		2			
	Waa	Matuga Dispensary					1:10,930
	Tiwi	Tiwi Rural H.T. Centre	16	2	54,649	1:1952	
	Ngombeni	Ngombeni Dispensary		2			
Kubo	Mkongani	Mkongani Dispensary					
	Lukore	Lukore Dispensary					
	Lukore	Kibunguni Dispensary		2		N11	1:8793
	Lukore	Kichaka Dispensary		2	35,173		
Kinango	Kinango	Kinango Hospital	119(116)	131			
		Lutsangani Dispensary		2			
		Kibandaogo Dispensary		2			
		Taru Sub-Health Centre		7			
	Killibole	Mwanda Dispensary		2			
		Bofu Dispensary		2			1:10,358
	Samburu North	Samburu Dispensary		2	113,936	1:957	
		Makamini		2			
	Ndavaya	Ndavaya Dispensary		2			
	Mwavumbo	Mazeras Dispensary		2			
		Mnyenzeni Dispensary		2			

NOTE: A new maternity unit not yet operating has an additional 32 beds.

SOURCE: Office of The Provincial Medical Officer, Coast Province, 1983

Worm infestations and consequent anaemia are almost universal. Though no reliable figures of the deaths exist, the infant mortality and under-five death rates are thought to be fairly high. The close association between diarrhoea and malnutrition has been convincingly demonstrated elsewhere. Both conditions thrive in similar socio-economic and cultural surroundings and, by perpetuating each other, contribute to the high rates of childhood morbidity and mortality. Malnourished children have a higher incidence of severe diarrhoeas leading to dehydration and related mortality.

The high rates of neonatal tetanus imply that a large proportion of babies are delivered under filthy conditions. This can be reduced by improved maternity care, and the situation can be further improved by registering all traditional birth attendants and training them. The training should include application of hygienic methods, referring of complicated cases to hospitals before it is too late and also ensure the registration of births in the district.

5.3.2 HEALTH FACILITIES AND PROGRAMMES

Health care for the rural and urban population is provided by three hospitals, one rural health centre, three health centres, one sub-health centre and twenty dispensaries (Table 5.5 and Figure 26). The staff establishment for the district is shown in Table 5.-.

TABLE 5.6 HEALTH STAFF ESTABLISHMENT KWALE DISTRICT, 1983

<u>DOCTORS</u>	<u>NURSES</u>	<u>PROFESSIONAL MEDICAL STAFF</u>	<u>TECHNICIANS</u>	<u>SUPPORT STAFF</u>	<u>TOTAL</u>
6	154	26	34	99	419

SOURCE: Kinango Hospital Staff, 1983

The doctor/population ratio is 1:48,061 and the nurse/population ratio is 1:1872 for the district. The national figures for doctor/population and nurse/population ratio are 1:11,950 and 1:1,120 respectively. The greatest distance from a village to the nearest health centre facility is in Kinango Division, (about 35 km i.e. Kilibasi to Taru sub-health centre).

The programmes underway are geared towards the most important (and interrelated) factors causing high mortality and morbidity in young children and their mothers i.e. communicable diseases control, vector control, family health nutrition, and foot safety, environmental health, water quality,

39°30' E 3°30' S 40°00' E

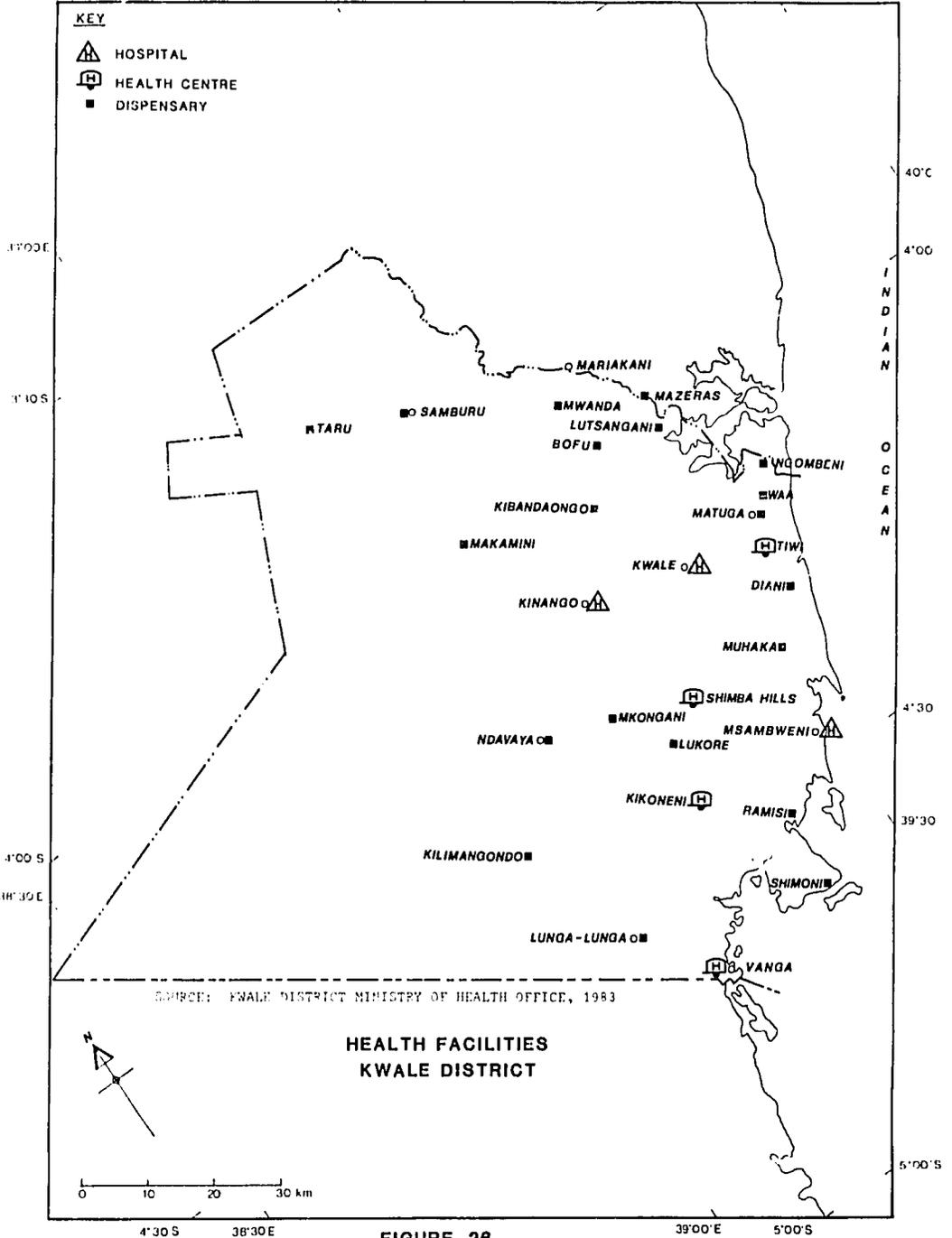


FIGURE 26.

waste disposal, education and information and family planning. The objectives of the programmes are reduction of morbidity through immunization, improvement of water supply and sewage disposal, the reduction of birth rate through family planning, improvement of nutrition and orientation in matters of hygiene.

Communicable diseases incidences will be reduced through better immunization coverages, health education, improved environmental sanitation and community participation.

In order to improve family health, it is proposed that improved Maternal Child Health/Family Planning (MCH/FP) services be delivered to the community through better antenatal and post-natal care.

The incidence of malnutrition within the district is very high (especially in Kinango Division) and many patients are admitted to hospitals yearly due to either marasmus or kwashiokor. This is brought about by many factors like large families, low-income, low-sanitary conditions and high prevalence of communicable diseases. In order to improve the nutritional status of the community efforts will be made to improve health education, school health programme, and intersectorial co-operation with other departments.

The district as a whole has a low level of sanitary conditions like low latrine coverage, lack of clean safe water for most people, poor housing, poor waste disposal methods and a large number of breeding grounds for mosquitoes and other harmful insects. To improve the environmental health, plans are underway to improve the latrine coverage, increase the availability of safe water and waste disposal methods.

Family planning education will be intensified with an aim of improving the health of mothers and children and motivating families to adopt small family norm. In order to improve the utilisation of family planning facilities, programmes should be given to both men and women.

Health education should be given the seriousness it deserves. With effective health education, (i.e. one that conforms with the local patterns and practices) it is hoped that effective community participation will result.

5.3.3 SCHISTOSOMIASIS

Kwale District is one of the endemic areas of Schistosoma haematobium in Kenya, but no intensive epidemiological survey had been carried out before the joint Kenya-Japan studies begun. The snail species in Kwale District is Bulinus (the vector for Schistosoma haematobium), has a higher drought-tolerance than the other species. In Kwale District most of the rivers and ponds are seasonal. Although some ponds remain dry for as long as 4-5 months, the period is not long enough to break the cycle of Bulinus species.

TABLE 5.7 SCHISTOSOMIASIS INCIDENCE IN PRIMARY SCHOOLS IN KWALE DISTRICT, 1983

DIVISION	TOTAL NUMBER OF SCHOOLS	NUMBER OF SCHOOLS TESTED	CHILDREN EXAMINED	NUMBER WITH SCHISTOSOMIASIS	
Kinango	36	11	392	270	69
Matuga	26	8	696	215	31
Kubo	22	7	572	180	31
Msambweni	51	15	960	411	43
DISTRICT TOTAL	135	41	2620	1076	41

SOURCE: Kenya Medical Research Institute, Nairobi 1983

A preliminary study has been carried out to assess the distribution of Schistosomiasis haematobium in the district. Out of 135 primary schools in the district, 41 were chosen at random for examination (Table 5.7). The pupils from classes 4,5 and 6 were examined for ova of Schistosoma haematobium in urine. Schistosoma haematobium was found to be widely distributed in the whole of Kwale District (Table 5.7). The average infection rate is 69% in Kinango Division and 43% in Msambweni Division. Kubo and Matuga Divisions have a relatively low infection rate. The high prevalence of the water-borne disease in the district is mainly caused by contamination of the restricted or few water sources.

To effectively control schistosomiasis in the district, the local population's attitudes and customs will have to be given greater attention. Health education will play a major role to change the attitude of the

community towards water and water-linked diseases. Particularly in areas with high endemic schistosomiasis apparently the disease is regarded as normal. Health education in this direction will have to be based on a clear understanding of the people's perception of the disease and its relation to the environment. The people will have to recognise the problem and be aware of the risks and possible consequences of infection.

5.3.4 ENVIRONMENTAL FACTORS IN PUBLIC HEALTH

The major health problems in Kwale District are caused by lack of adequate portable water supply, the absence of proper sewerage and sanitation facilities, nutrition deficiencies, poverty, ignorance about the causes of diseases and of protective measures, lack of health facilities and inability to seek and utilise them.

Malnutrition results from a complex inter-play of many factors which include the inability of families to obtain the food they need (large families with low-income are affected most), dietary practices and cultural beliefs. These factors determine the type of diet people adopt. In addition, non-dietary factors such as infectious and parasitic diseases, as well as other environmental stresses, contribute to the problem and are aggravated by it. Activities to improve nutrition should be properly integrated with other services like maternal and childhealth, family planning, environmental sanitation and control of infectious diseases.

Childhood diseases continue to contribute to high infant mortality because of problems facing immunization programmes. The problems include low vaccine coverage, loss of the original potency of vaccines (cold chain broken), shortage of health personnel and lack of understanding among the public about the importance of immunization, which leads to limited community participation in the implementation of the programme.

Communicable diseases such as schistosomiasis, malaria and some diarrhoeal diseases are caused by exposure to infected snails, mosquitoes and drinking faecal-contaminated water. In the long-term, diarrhoeal diseases can be eliminated by providing safe water, encouraging use of proper excreta disposal facilities, controlling food hygiene and improving personal cleanliness.

5.3.5 CONSTRAINTS AND PROBLEMS

Despite the efforts made over the years by the Government and non-governmental organisations, and the fact that health services have been

greatly improved in Kwale District, the basic health needs of the population have not yet been met in a satisfactory manner. Shortage of health personnel, supplies and equipment, inadequate transport facilities, and low level of community participation and lack of motivation remain as some of the restricting factors to the development of ideal health services.

The health personnel/population ratio of the district is below the national average. (Table 5.5) Inadequate motivation of the existing staff, shortage of residential houses and water, and the transport problems only worsen the problem.

To be of maximum benefit a health institution should have adequate drugs and other supplies. This is a major problem especially to the Health Centres which are linked by roads which become impassable during the wet seasons. Vanga Health Centre in Msambweni Division is one example which is known to stay for more than three weeks without essential drugs due to transport problems. The cold chain of vaccines is broken when gas for running refrigerators is not supplied promptly. The absence of telephones and electricity further aggravates the situation.

Transport problems (shortage of vehicles coupled with bad roads) apart from affecting the delivery of supplies and equipment also greatly affects the mobile programmes.

The absence of proper health education activities (health education is practically non-existent in some areas) results in a lack of understanding on the purpose and effectiveness of the health facilities, poor co-operation of the public and a low level of health in the community. Most of the people still prefer the traditional medical services to modern health services and will seek modern medical help only when the traditional one has failed. There is little doubt therefore that in order to foster the health - the real positive health, not just the absence of disease, there is need to effectively deliver health education. Notwithstanding the magnitude and gravity of the problems involved and the widespread poverty, lack of awareness and lack of resources, much need to be done to improve the health of the people in the district.

5.3.6 RECOMMENDATIONS

Nutrition: To improve the nutritional status of the population, infants and young children's nutrition should be improved. More emphasis should be put to conveying to mothers the knowledge about dietary needs of children, including the timing of meals and the form (density) of the foods. This can

be done by the use of locally produced, nutritionally and culturally accepted food during the weaning period. Examples of such foods include fish, beans, milk, eggs, fruits and vegetables. Too often efforts to improve dietary practices have been based on principles which are not suitable to local conditions, and the dietary recommendations made by health workers cannot be followed by the populations to which they are addressed.

Schistosomiasis: Community participation must be considered a fundamental aspect in schistosomiasis control. Such participation may help to reduce costs and assure the maintenance of long-term intervention measures. Provision of water-supply and treatment currently offered by the Kenya Medical Research Institute (KEMRI) should be supported by health education.

Ways and means should be looked into to control schistosomiasis by general environmental modifications like, (i) building pit latrines in rural areas and in market centres, (ii) weed control, (iii) filling and drainage of snail habitats, etc. The success of these local environmental improvements will depend on active community appreciation and participation.

The advantage of control by environmental modifications is that permanent changes can be made that have a lower maintenance cost than other methods of control.

Public health: An aggressive public health campaign is needed to make people appreciate positive health and become willing to dispose traditional habits which do not conform to proper public health conditions.

Apart from training the traditional birth attendants, public information and health education are needed in national efforts to prevent neonatal tetanus and other diseases. The entire community should be made aware that tetanus is preventable through immunization and by ensuring that the delivery is carried out under hygienic conditions.

5.4 POLLUTION AND WASTE DISPOSAL

5.4.1 ENVIRONMENTAL POLLUTION

The pollution of the soil, surface and underground water is by industrial effluents and discharges from sewerage facilities. The quality of surface and underground water has been analysed to some extent and the results are shown in Table 5.8. Dams are threatened by pollution arising from siltation, contamination by livestock and washing of household goods.

The areas likely to cause air pollution include Ramisi Sugar Company

TABLE 5.8 WATER QUALITY DATA

WATER BODY	POLLUTION TYPE	PH	TURBIDITY	COLOUR	ABSORBED OXYGEN AT 27°C FOR 4 HRS (PPM)	COLIFORM BACTERIA/100ML OF SAMPLE	MINERAL CONCENTRATION	OTHERS
Pemba River	Some organic	7.3	Medium	Medium	2.6	Detected	Well mineralised	
Unba River		7.1					Well mineralised hard water. 4ppm low content	
Vanga River		7.8					Moderate hard water	Carbonate hardness value is 130ppm. Non-carbonate is 158ppm
Ramisi River (at Dariguba)	Low organic	7.1	Low	Low	2.3		Fairly well mineralised water	Zero ppm nitrates. Ammonia as nitrogen is 0.24ppm
Ramisi River (at Ramisi Bridge below Ramisi Sugar Factory)	High organic	7.1			3.3	1800 (very high)	Water	0.16 Nitrates 0.017ppm nitrites Ammonia as Nitrogen is 0.24ppm
Msambweni Borehole Tiwi Borehole Number 1. Vanga borehole Number 2.	Some organic						4ppm Iron Soft water 0.69ppm Manganese	PH of boreholes ranged from 7.2-7.8. Water is generally hard, well mineralised and without organic pollution. Absorbed oxygen was generally zero. Wells had absorbed O ₂ of 0.6ppm
Kikoneni Springs (hot)	High chemical	7.8			3.0		Excess mineral concentration	Conductivity is 8700 S/cm. Nitrate as Nitrogen is 10ppm. Nitrite as Nitrogen is 3.5ppm.
(cold)	High chemical	7.8			2.1		Saline water	
Kikoneni Dam	Slight organic	7.6			2.5		Low mineral content	
Malera Water	Slight organic	7.6					Fluoride -0.3ppm low mineral content	This water is highly organically polluted during the rains.

SOURCE: Ministry of Water Development, 1983

and Kenya Calcium Products. The latter also produces a lot of particulate matter mostly during the crushing and packing processes. Noise pollution was notable in both factories.

5.4.2 INDUSTRIAL DEVELOPMENT AND WASTE DISPOSAL

Though the industrial sector has somewhat expanded over the last few years, the current process of development has yet to meet the basic objectives of economic development for Kwale: eradication of poverty, creation of mass employment and provision of basic needs. It will also, slowly and steadily destroy the environment and mortgage the future of the country if the aspects of pollution and resource management are not given the attention they deserve. Table 5.9 shows the main industries in Kwale District.

The environmental impacts associated with the three main industries, i.e. Ramisi Sugar Company, Kenya Calcium Products Limited and Kenya Bixa Limited, can be grouped under two main categories: ecological and socio-economic effects. The ecological effects are on air-quality, water, soils, noise and vibration, and visual quality. There are of course potential environmental health hazards which are described under section 5.4.1. The socio-economic effects are on population structure, population dynamics, land-use and settlement patterns, labour supply and employment structure. The three industries are briefly described below.

Ramisi Sugar Company: Ramisi Sugar Company is located in Msambweni Division of Kwale District. It is the oldest and the most successful industry in the district, offering employment opportunities to over 2,500 employees, most of whom are housed on the estate.

The company washes 780 tons of cane to produce 70 tons of sugar per day. It extracts 1,650 gallons/litre of water from Ramisi River, and the boiler uses 2 tons of fuelwood per day. (Source - Ramisi Sugar Company personal communication). The demand for fuelwood has led to the destruction of nearby forests to meet the energy needs.

The major environmental concerns associated with sugar production include water and air pollution and the disposal of solid wastes. With proper management, the environmental impacts can be negligible, because wastes from the manufacture of sugar are generally putrescible organic matters with the potential for utilisation and re-use.

The effluent from the processing receives no treatment prior to discharge into Ramisi River, which is a source of domestic water to people

downstream. This is a real pollution threat: No comprehensive data were available to substantiate this point, but it is clear that Ramisi River has become a resource for the sugar company to be used as a cheap dump yard for their wastes, sanctioned in the name of economic development.

Acid and caustic wastes result from the cleaning of evaporators, pans and other equipment. The quantity is sufficient to have effect on the PH level of the Ramisi River.

A significant source of waste water due to accidental spills of sugar and mollasses, and poor maintenance of machinery and equipment also contributes to oil and grease contaminants in the effluent.

The air pollution problems are odours, suspended particulate matter from boiler and drier operations, and from cane burning and gases such as sulphur dioxide.

TABLE 5.9 INDUSTRIES IN KWALE DISTRICT, 1983

<u>INDUSTRY</u>	<u>LOCATION</u>
Associated Sugar Company Ltd	Msambweni
Kenya Calcium Products Ltd	Waa
Elephant Oil Mills Ltd	Tiwi
Kenya Bixa Ltd	Tiwi
Nyari Sisal Estate Ltd	Taru (Samburu)
Kimandi Sawmillers Ltd	Tiwi
Msambweni Development Company	Gazi
Tourist Industry	Diani, Tiwi

SOURCE: Ministry of Commerce and Industry, 1983

TABLE 5.10 ENVIRONMENT AND INDUSTRY

MAJOR INDUSTRIES	INPUTS/RESOURCES USED	WASTE PRODUCTS	POSSIBLE WASTE PRODUCT RE-USE
Ramisi Sugar Company	Sugar-cane, water	Cake	Fertiliser
	Fuelwood	Wash-water	
	Phosphoric acid	Acid + Caustic	
	Sulphur, Lime	Waste, Boiler Ash	
		Floor wash	
		Bargass	Fuel

MAJOR INDUSTRIES	INPUTS/RESOURCES USED	WASTE PRODUCTS	POSSIBLE WASTE PRODUCT RE-USE
Kenya Bixa Ltd	1. Bixa seeds 2. Chemicals - i.e. Kensil, caustic soda Sulphuric acid, soda Carbonate 3. Water	Bixa seeds Acidic Effluent	
Kenya Calcium Products	Coral Stone Water Fuelwood Chemicals - Sodium Hydroxide Sulphuric Acid	Dust	
Nyari Sisal Estate	Sisal Water Fuelwood	Sisal fibres	Coffee-mulching
Msambweni Development Company	Coconuts Cashew-nuts Citrus fruits Water	Hard Shell Coconut fibre	Hard Board Making Coir

SOURCE: Ministry of Commerce and Industry, 1983

Kenya Calcium Products Limited: Kenya Calcium Products Limited is situated in Waa. Its main raw material is coral stone. It produces 30 tons of calcium products (white wash paints) per day both for local consumption and export to Middle East countries, especially Yemen and Saudi Arabia.

The major environmental concerns associated with calcium production include noise, vibration and air pollution, as a result of the crushing processes. The factory also uses a lot of woodfuel which is cut from the surrounding areas, resulting in vegetation depletion.

The firm employs about 100 people, 82 of whom are permanent and the rest casual workers.

Kenya Bixa Limited: The firm is a joint venture between Kenya and Japan. It extracts food colour from Bixa seeds which are bought from the local

farmers. Unfortunately, it can process only 1/3 of the Bixa seeds produced in Coast Province. The firm processes 32 bags of Bixa using 10,000 gallons of water to produce 120 kg of bixin per day.

The effluent from the factory has a pH of about 3 and it is discharged into the bush. This is a possible source of pollution of the Tiwi aquifer, through the seepage of industrial effluents. It has a very intense orange colour. Bixa seeds after the extraction of bixin are dumped into the bush - which becomes a breeding site for black flies. The factory has a septic tank for its domestic waste.

Other commercial undertakings are on a small-scale and they include the production of "makul'" (thatching from coconut leaves), wicker-work woven from reeds, curios, handcrafts, etc. These activities are generally cottage industries and are marketed through agents rather than co-operative societies. With the proposed industries i.e. Salt Manufacturing, Barytes and Dolomite for glass and paint manufacturing at Lunga-Lunga, block making at Waa and a rural bakery at Kwale, industrial situation in Kwale will improve.

5.4.3 DOMESTIC WASTE DISPOSAL

Development planners should focus more on the rural poor so as to raise their productivity and also to improve the access of the poor to essential services. Among these essential services is sanitary waste disposal. Few other services contribute as much to improvement in health and living standards as the provision of sanitary disposal of waste.

Sewerage is not available in Kwale town, because it requires massive investments which are not available. The methods of human waste disposal used in Kwale town are as shown in Table 5.11.

At Lunga-Lunga the sewerage treatment plant consists of two ponds which lead to a septic tank and then to a trench drain which empties into the Uмба River.

TABLE 5.11 WASTE DISPOSAL SYSTEMS IN KWALE TOWN, 1983

<u>Waste Disposal System</u>	<u>Number (Units)</u>	<u>Population Served</u>
Septic tanks	66)	
Soakaway pits	80)	
Cesspits	31).....	1,681
Bucket latrines	4	
Pit latrines	28	270

SOURCE: Sewerage Department, Ministry of Water Development, 1983

In the rural areas the latrine coverage is very low, for instance, only 16% of households have pit latrines in Kinango Division. The majority of the population prefers the traditional "bush". Differences therefore arise between the scientific explanations for diseases and the traditional explanation based upon the system of beliefs held by the local people. These beliefs constitute cultural barriers which limit the extent to which these rural communities participate in development projects such as the demonstration pit latrines designed to benefit them. These rural communities need to appreciate the scientific relationship between insanitary human waste disposal, water and diseases. This could be accomplished through some form of informal adult education programmes. It is only when the people understand why they should participate, that they appreciate the value of sanitary disposal of human wastes in the prevention of diseases.

5.4.4 RECOMMENDATIONS

Although Ramisi Sugar Factory Management claims to be in the process of constructing a pre-treatment plant, the ministries or departments concerned should ensure that implementation is done without further delay as the damage being done to Ramisi River is serious.

The Kenya Bixa Factory should pre-treat their effluent and find an acceptable method of disposing it.

Since not much has been done about Nyari Estate Industrial activities, this is the best time to act and avert any pollution in the future. Preventative measures to abate any pollution are more effective and cheaper when enacted early than remedial measures afterwards. Meanwhile the Estate should pre-treat their effluent and have large ponds that can hold all their waste water without any leakages or overflows.

In future dams or even the rehabilitated old ones, should be enclosed and have different water points for people and animals. This would stop the animals from contaminating the water and increasing siltation.

The performance of Lunga-Lunga Sewage Plant needs to be closely monitored as sewers are known to be the major cause of river pollution if they are overloaded or neglected through low sewage overflows.

The Ministries of Water Development and Health should intensify the monitoring of water pollution especially on the numerous unprotected dams where water is stagnant, rivers threatened by industrial effluents and take appropriate action against the culprits.

Pollution indicator parameters such as BOD, COD, DO, heavy metals and coliform bacteria are more important in deciding the extent of pollution and should not be neglected in analysis.

A comprehensive study should be launched to compile industrial health statistics and identify occupational health problems specific to the various industries in the district. The findings will prove whether or not there is need to set up a local industrial health unit in one of the hospitals.

Factory inspectorate officials should hold meetings regularly with the management of industries and the workers to increase their awareness of health and safety problems. Workers in particular should be taught why and how to protect themselves against dust, heat, poisoning and other causes of illnesses.

Training courses should be offered for first-aid attendants.

There is room for quarrying of limestone blocks for building purposes on a sounder basis which will be undertaken by the Sand and Stone Co-operative Society. (See Section 5.11) Development of road gravel quarries and other quarries, when fully worked out, should be reclaimed along the lines of Bamburi Cement Quarry.

5.5 HOUSING

5.5.1 TRADING CENTRES

Kwale District has no designated urban centres although by virtue of population size, Kwale Township with about 2,630 (1983) residents should be an urban centre. There are two major trading centres in the district viz. Kwale and Kinango. Other service centres include Matura, Lunga-Lunga Msambweni, Mazeras, Janga and Shimoni. The types of houses found within these centres differ in that modern houses (permanent, stone-walled and bricktile-roofed) - mainly Government offices and residencies exist alongside typical Swahili houses (makuti roofed, rectangular) and Mijikenda (grass thatched and round on the edges). Along the coastal strip a combination of modern and Swahili architecture exists whereby makuti are used extensively for roofing coral stone-walled luxury houses e.g. the many hotels on Tiwi-Diani Beach. Unlike those situated inland, the human settlements along the beaches are well catered for with such facilities as roads, health facilities, schools, electricity, telephones, water, refuse collection and disposal.

The provision of housing in trading centres is mainly the responsibility of the Kwale County Council. Despite a shortage of finances, the Council is endeavouring to accomplish this task. The National Housing Corporation has assisted in the past with loans.

The service centres in Kwale District suffer from an acute shortage of housing. According to the County Council Administration, the problem is so acute that some civil servants working in Kwale Township (The Sunday Times, February 19, 1984) have to find accommodation outside the township. This state of affairs has occurred mainly due to the reluctance of many bankers to finance the construction of more houses. Many financial institutions would rather finance housing projects in councils which have attained urban status.

The shortage of housing causes congestion while at the same time most of the houses are devoid of proper sanitary facilities. This has an adverse effect on the environment and the houses are prone to such hazards as fires, floods and disease epidemics.

Projections indicate that within the next ten years government departments alone will need 8 category B houses, 46 category C houses, 84 category D houses, 228 category E houses, 403 category F houses and 2 category G houses (Officer in-charge, Ministry of Works Buildings, Kwale 1983).

5.5.2 RURAL HOUSING

Rural housing in Kwale District is generally of poor quality. A variety of house types exist in the rural areas. The traditional Duruma house which is dome shaped, rectangular but rounded at the edges. This house comprises of a frame of wooden poles and rafters covered with grass, with only one opening (door) and without windows. The Swahili house is found mostly along the narrow coastal strip. This house has ventilation openings between roof and walls and is thatched with coconut palm leaves. The "Up-Country" type of house is found mainly in the Shimba Hills Settlement Scheme. It is rectangular shaped, and roofed with corrugated iron-sheets.

The quality of most houses in the rural areas leaves a lot to be desired. They are environmentally hazardous in that they pose a health risk due to lack of proper ventilation, they also lack proper sanitary and storage facilities and are prone to fire and other natural disasters. However, the traditional houses are fairly easy to construct and use heat and smoke from cooking fires to cure stored grain.

5.5.3 RECOMMENDATIONS

The poor state of housing within Kwale District has come about due to a host of constraints among which are:

- reluctance of housing finance institutions to finance housing projects;
- lack of awareness of the opportunities of obtaining finances for rural and urban housing;
- unavailability of land for housing schemes within urban centres;
- delays in land acquisition and in carrying out necessary survey work; and
- the rising cost of building materials and traditional conservatism towards new house types.

To improve housing in Kwale District, several recommendations are suggested. There is need to encourage the local residents to construct sanitary houses using locally available materials. A mixture of traditional and modern (low-cost) building materials can also be quite useful. Experiments in cement/murram mixtures using an hydraulic ram have been successful elsewhere.

The National Housing Corporation should play a more active role in financing housing projects within the district. There is need too to create awareness among the people about the availability of opportunities of obtaining finances for housing. The programme of the Housing Finance Company of Kenya has not been properly communicated to the people of Kwale.

The land tenure system should be revised to facilitate individual ownership while the process of land acquisition in trading centres is made easier.

Voluntary participation in housing development should be encouraged. In so doing the people should be motivated to be receptive to new ideas.

5.6 RURAL GROWTH CENTRES

5.6.1 STATUS AND CONSTRAINTS

Coast Province is one of the most urbanised provinces, second only to Central Province. However, urbanisation in Kwale District is not pronounced. By 1984 there were no designated urban centres in the district. Closest to an urban centre are the two growth points of Kwale with an estimated population of 2,630 (1983) and Kinango.

The district, however, is most wanting in designated service centres. Currently there are two rural centres i.e. Ukunda and Msambweni, eight market centres and thirty-two local centres (See Section 2.4). Identified in the 1984/1988 Kwale District Development Plan are only three rural growth points - Kikoneni, Msambweni and Diani. The growth of these centres has been relatively fast unlike that of other service centres.

Ideally, a rural growth centre is a carefully selected rural market centre in which all utilities are congregated to serve the surrounding populations (Nyamu, 1983). Within this context the growth centres in Kwale District are noticeably underdeveloped. Their growth has been hindered by a host of factors among which are:

- (1) Inadequacy of infrastructure. Most centres are linked to their hinterland by seasonal roads. There is also unavailability of electricity in the active rural growth centres and a general unreliability and unavailability of water coupled with the widespread shortage of proper housing, sanitary and recreational facilities.
- (2) Lack of development control. Loan facilities for the development necessary within such centres are limited and where available the loans are meagre, while their processing takes a long period. At the same time there exists an apparent lack of awareness about loans among the local people.
- (3) Land tenure. The pattern of land ownership within some of the centres is not clear. This hinders the development of projects in such centres.
- (4) Lack of entrepreneurship and business acumen. The prevailing high level of illiteracy has contributed to a general apathy towards development. The most conspicuous trend within most of these centres is the proliferation of "dukas" which offer only the most localised services to the populace. In this connection also is the general shortage of artisans e.g. masons, plumbers, vehicle repairers etc.

5.6.2 RECOMMENDATIONS

Growth centres, if well conceived and implemented are vital instruments for injecting overall development within the rural areas. Presently, it is apparent that though the growth centres in Kwale District are contributing

to the opening up of their hinterlands, this is being accomplished at a relatively slow pace. Thus there is need to revitalise these centres.

- (1) Adequate infrastructure is a prerequisite for any viable growing centre. There is need for the Central Government as well as the Kwale District Development Committee (D.D.C.) to put more effort in the provision of such facilities as electricity, water, roads and decent houses within the selected centres.
- (2) 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. This calls for an open attitude towards business activities.
- (3) The relevant financial institutions should step up their campaigns for educating people about the availability of loans, and simplify the lengthy procedure involved in acquiring such loans.
- (4) The process of acquiring land for business premises within these centres should be made easier than it is currently. Presently, ownership of land within some of these centres is unclear. Hence, the prospective entrepreneurs are often frustrated in their efforts to set up businesses.

5.7 POVERTY AND EMPLOYMENT

5.7.1 NATURE OF POVERTY

Poverty is one of the major causes of environmental destruction not only in Kwale District but also in other districts in Kenya. In absolute terms, poverty is defined as the number of people below a specified level of subsistence income which is necessary to secure the bare essentials of food, clothing and shelter (Todaro, 1977).

Major causes of poverty in the district include, among other things, unemployment, low agricultural productivity, especially with respect to food crops, lack of clean water in most places and the people's attitudes towards new technologies and other changes geared towards improvement in the quality of life. Sanitation in most places is very poor. It is estimated that 75 percent of the people have no sanitary facilities whatsoever.

Much of the income of the rural households is derived from small-scale agriculture, trade, social services and manufacturing. Although data on average incomes per rural household per year is not readily available, it is estimated to be approximately K£200 per year. Much of this income is used to buy food. Other needs with high priority are school fees and transportation.

Poverty is most prevalent in Kinango Division which lacks water especially during the dry season and drought years. Many people in the district live in small, temporary houses (See Section 5.5.2). Kwale District is a food deficit area with a high rate of malnutrition among children.

Poverty can have very adverse effects on the environment if measures are not taken to alleviate it. Since the poor have a limited income, they will do everything possible to the environment in order to survive. It may not matter to them that their activities may lead to more suffering in the future (Kenya Development Plan 1979/1983).

5.7.2 EMPLOYMENT TRENDS

Where agricultural opportunities are limited (See Section 4.2), the primary approach to alleviating poverty must be in fostering wage employment. About 20 percent of the estimated potential labour force is currently engaged in wage employment. In 1980, there were 11,616 people in wage employment, working in different sectors both private and public (Table 5.12). During the same year, 37.4 percent of the people in wage employment were employed in the public sector and the rest in the private sector. A large proportion of the labour force i.e. about 84.3 percent were males.

Apart from those people engaged in wage employment, there were an estimated 1,048 people who were self-employed and who worked as unpaid family workers.

TABLE 5.12 WAGE EMPLOYMENT IN KWALE DISTRICT, 1980

<u>SECTOR</u>	<u>NUMBERS</u>
Agriculture and Forestry	3,229
Mining and Quarrying	50
Manufacturing	784
Electricity and Water	1
Construction	160
Wholesale and Retail, Trade, Restaurants and Hotels	1,355
Transport and Communication	48
Finance and Insurance	20
Community, Social and Personal Services	5,969
TOTAL	11,616

SOURCE: Central Bureau of Statistics, Government of Kenya, 1980.
Employment and Earnings in the Modern Sector.

TABLE 5.13 WAGE EMPLOYMENT AND EARNINGS IN KWALE DISTRICT,
(1973-1981)

YEAR	1973	1974	1975	1976	1977	1978	1979	1980	1981
Numbers	6249	7913	7841	7233	9273	9323	9548	11616	11446
K£ "000	1294.8	1579.9	1753.1	2158.2	2633.9	3017.3	3065.6	5601.0	5354.2

SOURCE: Central Bureau of Statistics, Government of Kenya Statistical Abstracts (1978 and 1982)

Table 5.13 illustrates the trends in wage employment and earnings in Kwale District from 1973 to 1982. Over this period, there has been a general increase, although not steadily, in the number of people employed. One of the reasons accounting for the fluctuations is the large number of casual workers. For instance, out of 9,793 men employed in 1980, 2,103 were casual workers. The Government's policy on employment aims at increasing employment opportunities in the rural areas through improvement of the agricultural sector. In this connection, it is important to point

out that local people should be encouraged to participate in agricultural development and the agricultural work-force should be equipped with the appropriate technical and managerial skills. Small-scale agricultural industries are one promising source of increasing employment.

5.7.3 OCCUPATIONAL SAFETY AND HEALTH

It is difficult to obtain information on individual safety and accidents. Certainly the record throughout Kenya can be improved and often at little expense. Road accidents and injuries from machinery probably lead the list of occupational hazards.

Though there are no statistics available on occupational diseases resulting from long-term exposure to noise, dust particles, hot working environments, various toxic chemicals, physical hazards and strains from carrying heavy loads in the various industries in the district, visits to several industries reveal that exposure to hazards is receiving less attention than it deserves. Insufficient attention is paid to the health and safety of workers, probably because most workers are exposed to low levels of these hazards which may be very dangerous in the long-run although less apparent in the short-run.

Low level hazards cause chronic illnesses. The onset is often not noticed and the disease may remain unrecognised, unaccounted for and uncompensated.

Owing to lack of education, many workers are forced to the bottom of the job spectrum. Illiterates are therefore over-represented in dangerous jobs. They are usually more concerned about getting better wages or keeping their jobs than with protecting their health. At Ramisi Sugar Factory workers were alleged to have refused to use safety devices against dust and noise. The noise levels in the major factories (Ramisi, Bixa and Calcium) and dust levels in Ramisi and Calcium Factories are seemingly above the set limits. Noise, for example, is not just a nuisance, it constitutes a real and present danger to workers' health. It can produce physical and psychological stress which nobody is immune to.

There are several health problems associated with sugar-cane production and processing. The major hazards include bilharzia and hookworms in reservoirs within sugar-cane fields and bagassosis from handling bagasse.

Lack of information regarding health hazards in the work place is not restricted to only industrial workers. The introduction of agricultural technologies, mechanisation, the use of pesticides and herbicides will mean an increased rate of accidents and illnesses for the agricultural

workers at the sisal and coffee plantations at Nyari. Living conditions in the estate are also inadequate - many workers (most of whom are migrants to the area) live in small crowded huts with few pit latrines and bathing shelters and with no water supply facilities nearby. With the coffee plantations coming up, conditions will most likely become worse if the present trends continue.

5.7.4 RECOMMENDATIONS

The drive to increase employment and productivity in the various economic sectors should proceed hand in hand with measures to ensure high standards of occupational safety and health.

Factory owners and managers must appreciate the value of their workers' health. Trade Unions and other relevant organisations should organise meetings with workers to increase their awareness on occupational health. The management is responsible for the safety and health of their employees and should have safety and health policies that govern them.

5.8 TOURISM AND NATIONAL HERITAGE SITES

5.8.1 GOALS AND NATURE OF TOURISM

The fundamental national goal for tourist industry is to maximise net economic benefits from the scenic environmental resources of the country. In addition, it is intended for the industry to generate foreign exchange, increase employment and promote Kenyan ownership and management. At the same time, tourism is to proceed without compromising cultural values or destroying the environment. Local tourism is also being promoted and will provide an increasing opportunity for the local population to benefit from the natural environment, which should ensure increasing public support for environmental protection.

The Kwale coast has a vast potential for the development of tourism. There are fine beaches, historic ruins, a marine national reserve and a national game reserve close by. The beaches along the coast cover a distance of thirty kilometres, including Tiwi-Mwachema River-Diani-Gulu (15 km), Gazi area (2.5 km), Msambweni (4.5 km), and Shimoni-Wasini Island-Funzi (8.0 km).

5.8.2 TOURISM

Tourism facilities are concentrated along the Diani Beach (Figure 12). Within this area there are thirteen hotels of international standard (Table 5.14). Besides the hotels, there are over fifty cottages and

campsites. The average tourist stays over 15 days and spends K£255. During the peak tourist seasons hotels are fully booked, but during the low seasons they are almost empty (Appendix 9.4). Except during the last recent years, the number of tourists has been showing an upward trend. The decline in numbers has been due to world recession and competition from other long-haul holiday destinations (Table 5.15).

TABLE 5.14 HOTELS AND COTTAGES, KWALE DISTRICT, 1983

<u>NAME</u>	<u>ROOMS</u>	<u>BEDS</u>
<u>INTERNATIONAL</u>		
Jadini	115	310
Trade Winds	103	206
Two Fishes	136	272
Leisure Lodges	174	348
Leopard Beach	151	302
Robinson Baobab	118	235
African Sea Lodge	160	320
Diani Sea Lodge	122	244
Diani Reef	149	298
Golden Beach	124	248
Diani Paradise	25	50
SUB-TOTAL	<u>1377</u>	<u>2834</u>
<u>OTHER</u>		
Border Lodge - Lunga-Lunga	10	20
Teachers House-Kwale	7	14
Nomads	11	22
Msambweni Cottages		
Shimoni Lodge		
Pemba Channel Fishing Club	14	14
Leisure Lodge Club	36	72
Twiga Lodge	36	46
Mawani Farm Cottages	23	46
El-Capricho Cottages	20	47
Tiwi Beach Cottages	20	22
Diani Sea-Crest Cottages		
SUB-TOTAL	<u>122</u>	<u>303</u>
TOTAL	<u>1520</u>	<u>3137</u>

SOURCE: District Development Plans 1979-1983 and 1984-1988 and Returns from some individual hotels. (National Environment Secretariat Questionnaire).

TABLE 5.15 VISITS TO SOUTH COAST HOTELS, 1980

<u>Number of Hotels</u>		14
<u>Number of Beds</u>	Available	729,500
	Occupied	491,500
	Rate percentage	67.4
<u>Beds occupied by:</u>		
	Foreign visitors	425,200
	Tanzanian and Ugandan visitors	700
	Kenya residents	60,500

SOURCE: Central Bureau of Statistics 1981

Places frequently visited by tourists include Kizite/Mpunguti Marine National Park and Reserve and the Shimba Hills National Reserve (Table 5.16). The Reserve is noted for its sable and roan antelopes, and fine views across the coastal plain to the Indian Ocean. Both the Marine Park and the National Reserve need protection and development in order to reap their full potential.

TABLE 5.16 VISITORS TO KIZITE/MPUNGUTI MARINE NATIONAL PARK AND SHIMBA HILLS NATIONAL RESERVE 1976-1982

Year	Kizite/Mpunguti Visitors				Shimba Hills Visitors (Kenyan and Non-Kenyans)	Revenue (K.SHS)
	Kenyans	Non-Kenyans	Children	Total		
1976	610	593	173	1376	9874	148,396
1977	428	260	169	857	11054	180,489
1978	463	273	114	850	12124	208,725
1979	1287	841	253	2381	13992	247,387
1980	1351	2176	476	4003	15805	275,705
1981	2054	2252	427	4733	16670	308,325
1982	1288	1615	218	3121	14721	438,497

SOURCE: District Game Wardens, 1983

The hotels are a major source of wage employment in the district, although most of the people are still dependent on agriculture, livestock

of fishing. The tourist industry is largely dominated by expatriates, who represent their international companies and up-country Kenyans. However, three south coast hotels (surveyed in 1981) employed a total of 573 people, of whom 53% were from the Coast Province. Two-thirds of the employees from the Coast Province were from Kwale District and 31% were from the Coast Province. In general, the younger men with some education are more eager for the tourist industry to expand than are the older men and women who see tourism as a force of cultural change, or do not anticipate any personal benefits from tourism. Very few women are employed in the tourist industry at the coast, due to cultural and educational constraints (Migot-Adholla et al. 1982).

5.8.3 NATIONAL HERITAGE SITES

Most of the national heritage sites in the district are found along the coast (Figure 12), many of them on private lands. They consist of mosque ruins, palaces, houses, walls with gates and tombs; and remnants of household utensils and other articles.

National museums are preserved in order to maintain various aspects of Kenya's history. The list in Table 5.17 is based on the Coast Archaeological Report (Wilson, 1982) and modifications made in the light of more recent research. Although none of these sites are protected under the Antiquity and Monuments Act, 1983, the assessment in Table 5.17 shows that some have archaeological or research potential, architectural value, tourist potential, while some should be a conservation priority.

Preservation of these monuments faces several problems. Owing to the isolation of sites, they are more vulnerable to vandalism. Overgrown vegetation around some sites hinders accessibility. The monuments face erosional problems resulting from wind, rain and cracking of walls due to heat and the effect of roots of plants. The mosque at Diani, located among tourist hotels of Diani Beach, could easily be removed to give room for modern construction unless steps are taken to preserve it.

5.8.4 ENVIRONMENTAL AND CULTURAL IMPACTS

The natural and cultural environments are both important resources. The environmental impact of tourist development on the south coast has been mixed. Most of the hotels use very little wood or charcoal for heating or cooking, waste disposal seems adequate (Appendix 9.4). The major impacts are from construction of new facilities. Much of the Diani forest has been cleared for the new road, labour lines, curio shops, kiosks and hotels.

TABLE 5.17

NATIONAL HERITAGE SITES, KWALE DISTRICT

LOCATION	MOSQUES	HOUSES	TOMBS	ARTICLES	NOTES	ASSESSMENT OF SITE			
						A/RP	AV	TP	CP
Tiwi	1			1		4	4	5	5
Twiga	1					4	5	5	5
Kirima	1	1				4	4	5	5
Kongo	1		Several		The mosque should be preserved.	2	1	1	1
Diani	1				Located within tourist hotel zone. It should not be removed for hotel construction.	4	3	3	3
Ukunda	1		1		Poorly preserved mosque.	4	4	4	4
Galu		Walled-enclosure with gate houses.				3	3	3	3
Gazi	1				Mosque on private land	4	4	5	5
Gazi		Mazrui's Palace			Could be developed into a South Coast Museum	4	3	2	2

SOURCE: Wilson 1982

Abbreviations

A/RP	-	Archaeological or Research potential
AV	-	Architectural value
TP	-	Tourist potential
CP	-	Conservation priority

Scaling

1	-	Top excellent, highest
2	-	Good, high
3	-	Medium, average, moderate
4	-	Low, below average, poor
5	-	Lowest, poorest, almost none.

The Robinson Baobab Hotel stands as an example of how the indigenous forest could have been a resource. Poles for construction come from several forests, but other materials - coral rock, sand, thatch - are readily available. Secondary impacts on the marine resources are important. While tourists create a needed market for foodstuffs, they also contribute to reef damage through shell collection and mechanical damage to coral heads. Throughout the coastal tourist areas access to the sea, and in some cases to sacred places, has been restricted. This affects the fishermen and deprives the local people the opportunity to enjoy fully the beaches.

Tourism affects traditional communities in several ways. The number of immigrants settling in the area to work in the hotels has noticeable impact, in addition to cultural conflicts between the tourist and local lifestyles. A survey of almost 550 residents in the south coast and Malindi-Watamu areas revealed a number of interesting attitudes (Miqot-Adholla et al. 1982):

- 84% would like to see more tourists come to Kenya.
- 46% felt more tourism would bring more employment, progress and development.
- of those who did not want tourism to increase only 7% cited an increase in sexual promiscuity as their reason.
- Only about one-fourth reported having a direct interaction with the tourists - through selling crafts, dancing or working in the hotels - almost three-quarters of the south coast respondents had never visited a tourist hotel.
- 93% of the south coast respondents had not heard of any conflicts between tourists and local people.
- 30% of the south coast respondents said they disliked the tourists' sexual promiscuity. Over 60% reported there was nothing about the tourists that they disliked.
- 59% of the south coast respondents desired work in the tourist hotels (mostly the younger respondents with primary education).
- Benefits from tourism were agreed to include: more jobs (87%), pays well (65%) earns foreign exchange (79%), local market for goods (81%), friendship between Kenyans and foreigners (87%), and develops beaches and land for Kenyans (81%).
- Adverse consequences from tourism were agreed to include: best land alienated (68%), increased cost of living (69%), perpetuates colonial dependence (28%), lowers people's morals (50%), and increases drug use (33%),

The overall picture then, is one where a lot of the coastal people have little direct contact with tourists, but in general support the industry. The pace of cultural change is recognised and worrisome, particularly among the elders. The scanty dress of the tourists, prostitution and the rise in the number of "beach boys" are the most notable affronts to the predominately muslim coastal culture. Prostitution and crime have not been as prevalent in Diani as in Mombasa and Malindi - probably due to its greater instance from a major town. As the area develops these problems are likely to increase.

5.8.5 RECOMMENDATIONS

There is a tremendous potential for integrated tourist development in Kwale District. The attractions of the Shimba Hills, Chale Peninsula and the Marine Park offer visitors a range of wilderness experiences. The developed beaches of Diani and the sights of Mombasa provide the facilities for a comfortable holiday. The historic sites and local forests are additional attractions. Yet the plans developed in the mid 1970s have not been implemented (See Eames 1976 and Figure 27). It is recommended that the concept of integrated tourist development be revived and that co-operative funding with the tourist hotels, investors and the government be pursued. For the tourist industry it is essential that charter arrangements be developed. Perhaps charter licences could be granted subject to participation in a regional development programme.

Only a few details of such a development programme can be listed here:

The Shimba Hills facilities must be upgraded.

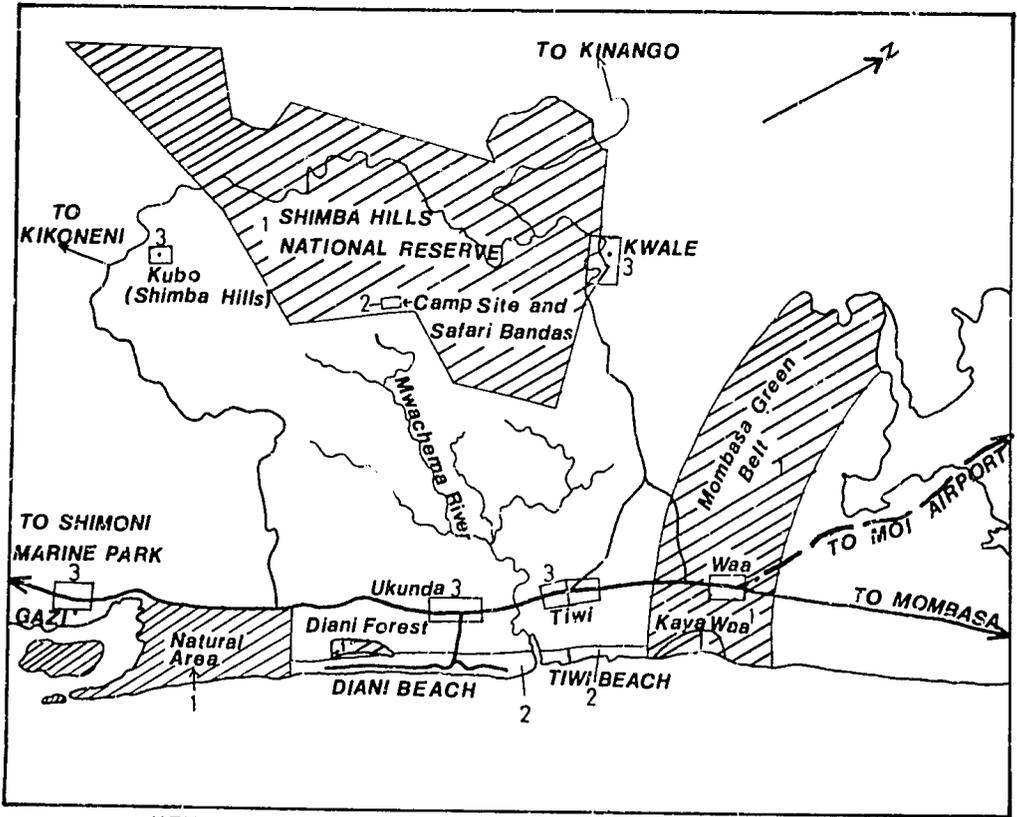
Access roads to the marine park and the Shimba Hills should be improved.

A training school should be established at the coast to provide the local people with necessary skills to participate in the tourist industry.

Access to the sea and sacred places by local people must be guaranteed and traditional rights of way recognised.

Cultural changes and conflicts will continue, but may be minimised by educational programmes, greater policing of public areas. A series of talks on the history, cultures and environment of the coast should be developed and given in the tourist hotels.

The Ministry of Tourism and Wildlife should intensify efforts in promotional and marketing programmes to include local tourism.



KEY

ROADS

— Tarmack

— Gravel

- - - Proposed Parkway

1 Natural Areas

2 Beach and Hotel Development

3 Service Centres

SOURCE: After Eames , 1976

**PROPOSED TOURIST DEVELOPMENT ,
SOUTH COAST , KWALE DISTRICT**

FIGURE 27.

5.9 TRANSPORT AND COMMUNICATIONS

5.9.1 STATUS

The road network in Kwale District is superficially established, although the coastal strip has a good network. Except for Mombasa-Lunga-Lunga road and parts of the new road to Kwale, there are no tarmacked roads in the district. Availability of public transport depends on the condition of the road network (Table 5.18).

Communication facilities likewise are concentrated along the coastal strip. The development of viable urban centres has been hampered by lack of communication (Section 5.6).

5.9.2 PROBLEMS

The major problems in developing a better road network are finance, manpower and machinery. This has hindered the tarmacking of the road from Kwale to Kombani on the Mombasa-Lunga-Lunga road except on the hilly sections that would otherwise be difficult to use during the rainy seasons. The problems have also retarded effective repair of roads e.g. at Horohoro, on the Lunga-Lunga - Tanzania tarmac road, destroyed in 1981 has not been repaired since then. Several bridges and road sections of the rural access roads have not been repaired for years.

During the rains most of the loose-surface roads become impassable. For example: the Mwambungu-Shimba Hills road (C 108) which gets submerged at Eshu-Eshu bridge on Ramisi River, the Chigutu bridge along the Kinango-Samburu road (D 545) was washed away by storm-water on an otherwise dry river valley. Mrarani-Shimba Hills (D 546) and Mrarani-Kikoneni-Manyulu (D 547) gravel/earth roads are usually impassable during the rains. The last half of the Lunga-Lunga-Vanga road (D 452) is impassable during the wet season and people have to walk up to 10 kilometres with their goods to Vanga.

Other road sections have been washed away because the culverts were too small for the runoff or no culverts were installed during the road construction. As a result, during the rains some rural people have to walk up to 50 kilometres to get public transport to their destinations.

Other problems include: serious soil erosion in a few places caused by road drainage e.g. at Perani in Msambweni Division and near Kwale town, farming along the roadsides which also causes soil erosion, quarrying of sand

TABLE 5.18 PUBLIC TRANSPORT SERVICES BY ROAD

TOWNS/CENTRES	*KBS	PRIVATE BUSES	MATATUS	OTHERS
Kwale-Likoni	X	X	X	
Kwale-Kinango		X	X	
Kwale-Mkongani-Lukore		X	X	
Likoni-Msambweni	X	X	X	
Likoni-Diani Beach	X		X	Town Operators
Likoni-Kwale-Shimba Hills	X		X	
Likoni-Msambwebi	X		X	
Likoni-Shimoni	X		X	
Likoni-Lunga-Lunga	X		X	
Lunga-Lunga-Vanga		X		
Shimoni-Wasini Island				Private Motor boats
Mombasa-Mazeras-Kinango		X	X	
Kinango-Ndavaya-Lunga-Lunga		X		
Mombasa-Mariakani-Kinango	X	X	X	
Mackinnon Road-Samburu-Mombasa	X	X	X	PSV from up-country
Msambweni-Kikoneni	X		X	
Samburu-Kinango			X	

SOURCE: District Development Officer, Kwale 1983

* KBS Kenya Bus Services

and gravel, particularly near Matuga, leaving large depressions which fill up with water during the wet season and pose a health hazard.

Problems of communication give rise to low or poor level of services. Transmission, especially of long distant calls is very poor and distribution of present telephone services is inadequate. Postal agencies in rural areas are inadequate and cannot handle specialised services like sending and receiving money orders, telegrams etc. Distribution of mails is inefficient and results in long delays as all the letters must first be taken to Mombasa where they are distributed to the various postal agencies.

There is poor reception of radio and television transmissions. The high cost of television sets restricts public access to this important communication medium. Distribution and availability of local and national newspapers especially in remote rural areas is a major problem.

5.9.3 PROGRAMMES AND RECOMMENDATIONS

Most rural areas are not adequately served by all-weather roads. The Rural Access Roads Programme (RARP), which started in Kwale in 1975 is going on but gravelling has lagged behind construction. The aim is to upgrade most rural roads to all-weather status. The current schedule of road maintenance and construction includes:

Lunga-Lunga-Vanga (C 542), Lunga-Lunga-Kinango (C 106) and Ramisi-Shimoni (D 543) roads which have been prioritised for routine maintenance.

The roads earmarked for regravelling include Lunga-Lunga-Mwereni (C 106) for 22 km, Mrima-Kikoneni-Shimba Hills-Mwambugu for 50 km and Kinango-Samburu (D 545) for 10 km.

Sections earmarked for culverting, bridging and gravelling include Shimba Hills-Msambweni (D 546), Eshu-Eshu bridge and Gandini bridge on Ramisi River (to be replaced), Kinango-Shimba Hills, Kiregwe-Kinango (E 944), Mwambungu-Shimba Hills (C 108).

Kwale-Kombani (C 106) is programmed for tarmacking. Tourist roads proposed for regravelling and maintenance include Ramisi-Shimoni (D 543), tourist circuit roads within Shimba Hills National Reserve and Funzi Island road and bridge.

Road improvement should be directed to the agriculturally productive areas to improve transportation and marketing. The bridges and culverts should be constructed to cope with large volume of rainwater. Otherwise constant repairs will far surpass the initial cost of having built adequate bridges or culverts.

The ban restricting cultivation along the roadside reserves should be enforced to stop erosion which threatens the road surface. Trees and grass should be planted along the roadsides to reduce the speed and volume of rainwater during the wet seasons.

Quarrying of sand not only leaves ugly sites but also threatens nearby roads with collapse. Quarrying should be banned or restricted to selected, appropriate areas and the miners should rehabilitate the sites, for example, by planting trees after the quarry is exhausted.

A public airstrip at Diani Beach should be built to foster tourism.

The target of providing one Post Office for every 25,000 people in Kwale District is very much behind. More post offices are planned for Msambweni, Shimba Hills, Kinango and Matuga, which are divisional headquarters. Other postal agencies are scheduled for improvement. This programme should be given high priority.

To improve telephone services, Kwale town should have an automatic telephone exchange Subscriber Trunk Dialling (STD). Telephones should also be extended to Shimba Hills Divisional Headquarters, Kikoneni, Tiribe and Lukore.

Construction and equipping of an information office for the Ministry of Information and Broadcasting in Kwale town is planned.

Implementation of the proposed projects and improvements of the existing projects would improve these important facilities for the development of the district.

5.10 ENVIRONMENTAL EDUCATION

5.10.1 THE ROLE OF EDUCATION IN ENVIRONMENTAL MANAGEMENT

In recent years people have become increasingly aware of the variety of environmental problems facing the world and the rapidity with which environmental deterioration is taking place. The complexity of the problems has brought about, in many countries, consideration regarding options available for moulding educational programmes which will show peoples' place within and responsibility towards the environment. To many people the natural components of the environment are taken for granted and regarded as inexhaustible. They use elements of the environment to supply their day to day as well as their commercial needs without anticipating any degradation.

A change in attitudes is a necessary and urgent prerequisite for a rational and wise environmental management. Education for the whole public is a powerful tool, already existing, and it should be seen in the light of creating positive attitudes towards responsible environmental management.

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, and non-formal education, out-of-school education and information. At present environmental education in Kenya is not an obligatory, integrated, continuous and sustained programme. Elements of it occur in the science syllabus, and are further developed in some courses at university, within activities of some youth clubs and by some non-governmental organisations.

5.10.2 PRIMARY EDUCATION

The district has 197 primary schools (Table 5.19) which are unevenly distributed. In the drier western part of the district children have to walk long distances to the few schools which are far apart. Most schools consist of insufficient temporary buildings lacking basic facilities.

The science syllabus in primary schools exposes learners to an integrated approach to environmental education. It aims at developing problem-solving abilities of children through investigations, and there is room for more infusion of environmental components in social sciences and languages as well. As it stands now, the primary syllabus incorporates a substantial amount of environmental material but the effectiveness is hampered by a number of national and local constraints:

- (i) The Primary Teachers' Training Curriculum has not focussed on environmental education sufficiently to create the right attitude among teachers. Over half of the primary school teachers in Kwale District are untrained and they face the disadvantage of being unable to effectively teach environment-related topics. These teachers together with inspectors of schools need to attend short courses and seminars geared to introducing the inter-disciplinary approach to environmental education.
- (ii) Relevant books and guidelines required to assist teachers in their endeavour are not available.
- (iii) Attendance in schools becomes very low during the dry seasons, especially in the drier western area, because children have to assist in fetching water from distant sources.

TABLE 5.19 PRIMARY SCHOOLS, KWALE DISTRICT, 1983

DIVISION	NUMBER OF SCHOOLS	NUMBER OF TEACHERS	NUMBER OF TEACHERS P3 OR LESS	NUMBER OF PUPILS	SPECIAL SCHOOLS
Kinango	74	610	419	14,609	-
Msambweni	62	570	366	19,191	-
Matuga	31	348	200	12,381	2
Kubo	30	225	145	6,973	-
TOTAL	197	1753	1130	53,064	2

SOURCE: Kwale District Development Plan, 1984-1988

5.3.10 POST-PRIMARY EDUCATION

The secondary schools and village polytechnics (Table 5.20 and Figure 28) in the district are too few to cope with graduates from 197 primary schools. Like in other parts of Kenya, this means environmental education within secondary school curriculum reaches a very small proportion of children of secondary school going age; and they should be reached in a different manner.

The approach adopted in teaching environmental education in secondary schools in Kenya involves the inclusion of suitable curriculum units within the existing framework of the Kenya Certificate of Education. The main objectives are to promote awareness of environmental problems, and also develop a concern for environmental quality. Among the strategies of incorporating environmental education in the education process which are considered feasible is the re-orientation of subject matter within regular education which is currently being undertaken. This has not been fully effected both in secondary schools and village polytechnics. The following are constraints facing environmental education in secondary schools and village polytechnics both at national and district levels.

1. Apart from the Environmental Education Source Book, which is not available in all schools, there is lack of general guidelines on incorporating environmental education into the school system. With the present examination-oriented structure, students tend to narrow their areas of specialisation to a few subjects, thus failing to accommodate a comprehensive environmental component.

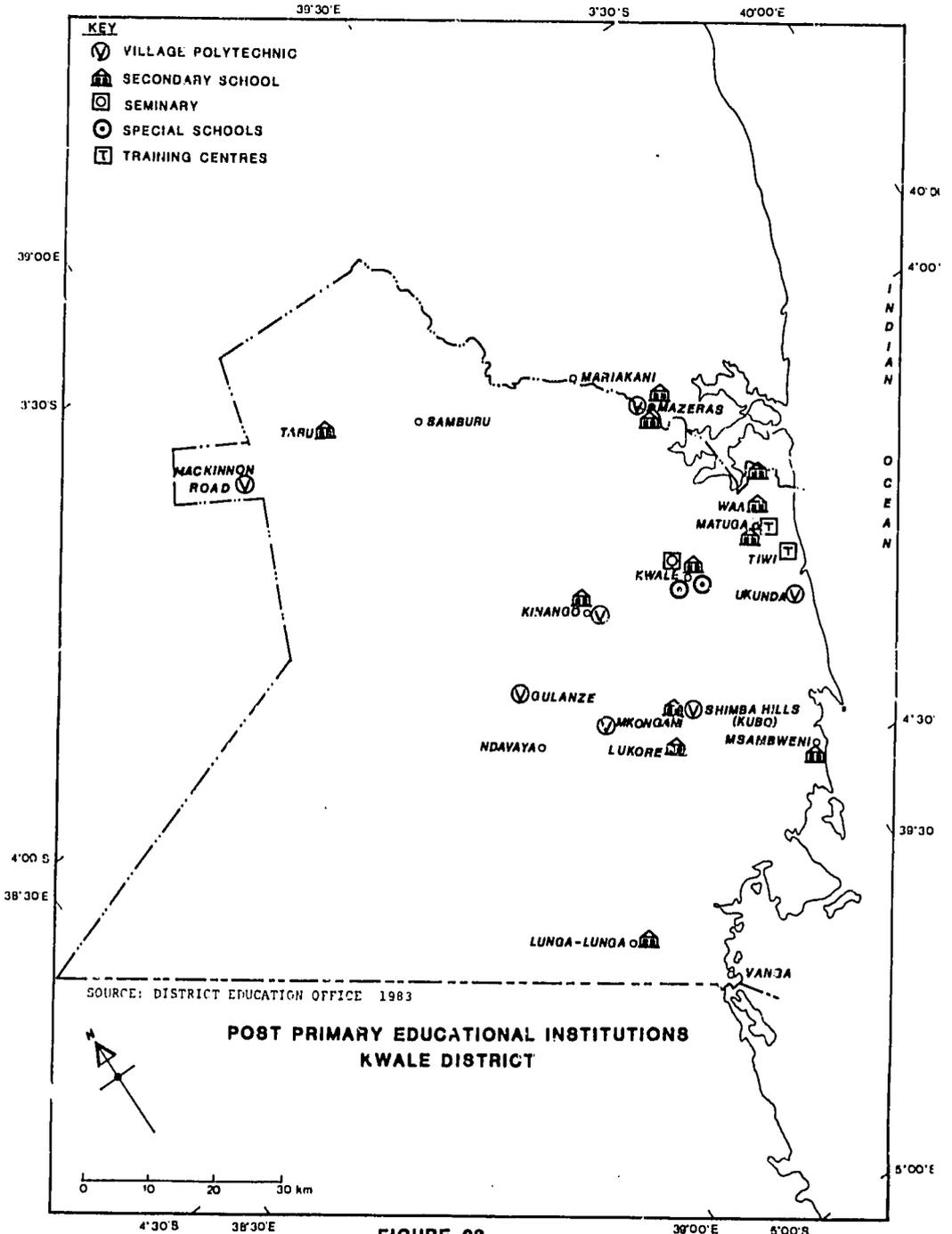


FIGURE 28.

TABLE 5.20

POST-PRIMARY EDUCATIONAL INSTITUTIONS
KWALE DISTRICT, 1983

<u>SECONDARY SCHOOL</u>	<u>ENROLMENT</u>	<u>NUMBER OF TEACHERS</u>	<u>NUMBER OF TRADES</u>
Kwale	550	19	
Matuga	412	15	
Waa	320	12	
Kinango	320	12	
St. Mary's Seminary	152	7	
Ngombeni	222	5	
Shimba Hills	320	12	
Taru	170	6	
Mazeras	320	12	
Lukore	154	7	
Msambweni	160	6	
Mivumoni	120	3	
Lunga-Lunga	40	3	
Bombolulu	40	2	
Diani Harambee	2 Classes		
<u>VILLAGE POLYTECHNICS</u>			
Mazeras	293	10	8
Ukunda	100	5	4
Shimba Hills	124	6	5
Alibokoko	24	5	5
Gulanze	30	4	4
Kinango	65	4	4
Chuphi	71	4	4
Tiwi Rural Training Centre	500	6 Plus external Lecturers	
Matuga District Develop- ment Centre	120	9 Plus external Lecturers	

SOURCE: Kwale District Development Plan 1984-1988

2. The Government maintained schools tend to have better qualified teachers than the assisted and harambee schools (Table 5.21). The large number of untrained teachers coupled with lack of basic facilities affect the amount of environmental education in a situation where the environmental curriculum is not fully developed. Many schools lack the basic facilities like classrooms, teachers' houses, laboratories, stores, libraries, water, sanitary units and electricity.

TABLE 5.21 QUALIFICATIONS OF TEACHERS IN SECONDARY SCHOOLS, KWALE DISTRICT, 1982

	<u>MAINTAINED</u>	<u>ASSISTED</u>	<u>HARAMBEE</u>
Graduates	28	2	-
Graduate U.T.	1	-	-
Dip. Ed.	2	1	1
Approved	-	1	-
Technical Teachers	1	-	-
S 1	22	-	-
'A' Levels	4	-	42
	<hr/>	<hr/>	<hr/>
TOTAL	=====58=====	=====4=====	=====43=====

SOURCE: Ministry of Education, Science and Technology
(Provisional figures, 1982)

3. The village polytechnic training programmes aim at training youths, particularly primary school leavers, to acquire skills to enable them participate fully through self-employment activities. The village polytechnics are few (Table 5.20) and offer a limited number of trades. The syllabii for various trades should incorporate relevant environmental information which is currently non-existent.

5.10.4 ADULT EDUCATION

Most environmental problems are either traceable to actions by adults (charcoal burning, deforestation, overstocking, over-exploitation of marine resources) or directly affect adults (unhealthy working conditions). Environmental adult education should, therefore, be seen as a continuous lifelong process and as a tool to enable adults to understand the complex nature of their environment and to solve their day-to-day problems. Environmental adult education faces the following constraints:

1. Only 25% of the adult education centres are full-time (Table 5.22). It is the full-time centres which have trained, paid up teachers with some dedication to their jobs. The majority of the centres face problems of untrained teachers, high rate of turnover and insufficient supervision. It would be advisable for all adult educators to be trained, in-serviced regularly, and serve on full-time basis. Although some of the Adult Education Officers in-serviced their teachers over weekends in 1981 and 1982, a minimum of three months residential course is essential to give teachers sufficient training in handling adult learners especially where there is a big teacher/learner age disparity.

TABLE 5.22 ADULT LITERACY CENTRES AND ENROLMENT, KWALE DISTRICT, 1983

DIVISION	<u>FULL-TIME</u>			<u>PART-TIME</u>			<u>SELF-HELP</u>			<u>TOTAL</u>		
	NO. OF CENTRES	M	F	NO. OF CENTRES	M	F	NO. OF CENTRES	M	F	NO. OF CENTRES	M	F
Matuga	20	80	225	14	97	189	5	36	91	39	189	498
Msambweni	22	58	152	37	171	379	4	218	315	63	447	846
Kinango	23	56	152	45	111	379	52	225	387	120	392	918
Kubo	9	102	358	25	325	1020	34	432	960	68	859	2338
TOTAL	73	300	878	120	691	1992	94	896	1720	287	1887	4600

SOURCE: District Adult Education Officer, 1983

2. Although teachers are encouraged to make learning more meaningful by inviting extension workers to participate in some of their sessions, the level of adherence to this requirement varies from teacher to teacher in different centres.

3. Many learners have not accepted illiteracy as a problem since there seems to be no immediate use of literacy on completion of courses. On the other hand, women at various centres have organised themselves into groups engaged in money-generating activities (See Section 5.11). This serves as a motivation factor and may partially be the explanation why more women attend than men.

4. The Adult Education Programme requires close supervision which is now ineffective due to lack of vehicles, personnel and equipment. The learning centres, too, face an acute shortage of basic essentials like exercise books and relevant teaching material.

5.10.5 EXTENSION SERVICES

In measure, destructive actions against the environment can be attributed to lack of information. Information may be said to include the total complex of data and facts which people receive and which contribute towards their knowledge. Information plays a major role in creating opinions about phenomena or objects.

Public Education Extension Officers normally use every available media of communication such as chiefs' barazas, village health committees, home visits, film shows, posters, radio programmes, out-patient and mobile clinics, seminars, field days and field courses to educate the people. On the other hand while their programmes are encouraging, extensive movements are hampered by transport problems.

The National Youth Service has contributed in tree planting, draining marshy areas, and they should be encouraged and supported to make the population in their vicinity aware of the local environmental problems.

Women groups are a target for many extension services. Below are some of the major agencies involved and their areas of operation.

TABLE 5.23 WOMEN'S GROUPS IN KWALE DISTRICT, 1983

SUPPORTING AGENCY	TOPIC			
	Nutrition	Maternal and Childcare	Health and Sanitation	Agriculture and Animal Production
Home Economics (Ministry of Agriculture)	X	X	X	X
Publi Health				
Family Life Training Centre	X	X		
E.A. Industries (Every Tuesday)	X	X		
Red Cross (Kwale Branch)	X			

SOURCE: District Development Plan - Kwale, 1979-1983

Co-operatives:

Co-operatives in Kwale District serve people involved in different activities e.g. farming, fishing, quarrying and dairying. The Education Secretary based at Kwale is charged with the responsibility of conducting educational programmes. In this connection, the South Coast Fisheries Co-operative Union has planned to appoint an Education Secretary to arrange a comprehensive training programme for the Union staff and fishermen.

Police and Decision-Makers:

The diffusion among policy and decision-makers, both in the public and private sector, of correct information about methods of rational utilisation of natural resources is an essential condition for achieving proper environmental management. This can be done by:

- (1) disseminating the necessary information through lectures, discussions in journals, exhibitions and on mass-media like radio and television (Press Conference, Mamo Leo etc.)
- (2) special instruction in the existing system of general education through special courses e.g. at Kenya Institute of Administration, Matuga Development Centre etc.
- (3) workshops organised at district level to involve administrators on local environmental problems.

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

5.10.6 RECOMMENDATIONS

General recommendations:

1. The Ministry of Education, Science and Technology should formulate a clear policy on the integration of environmental education at all levels of the education system.
2. Kenya Institute of Education should revive and strengthen the Environmental Education Panel to develop a suitable curriculum to meet the country's needs.
3. Where possible, curriculum developers and school inspectors should be encouraged to keep trends in environmental education by attending short courses, international seminars and workshops. This exposure will facilitate proper supervision.

4. An environmental education kit should be developed by the National Environment Secretariat (NES) in conjunction with the School Equipment Production Unit (SEPU).
5. The Environmental Education Panel, Kenyan professionals and authors should be encouraged to write books and other reading materials on current environmental issues for use both in the formal and non-formal systems of education.
6. Existing institutions like Universities and Teacher Training Colleges should be encouraged to get involved in the production of low-cost teaching aids and materials. This should be based on locally available materials and improvisation, so that they are available even to the poorest schools.
7. Environmental education should be included in both pre-service and in-service teachers' courses.
8. The Inspectorate should work out a system of supervision and evaluation to ensure environmental education is taught through the inter-disciplinary approach in schools.
9. All examinations should emphasise environmental education.
10. There should be more programmes on radio and television, and feature articles in newspapers to increase awareness of environmental issues among the public. There should be more environmental slogans between other programmes on radio.
11. Formal in-servicing and/or lectures are recommended for policy and decision-makers like politicians, K.A.N.U. Officials, Senior Public Servants, Members of the District Development Committees (D.D.C.) etc. at Kenya Institute of Administration (K.I.A.) Government Training Institutes at Matuga, Maseno, Embu and at Farmers Training Centres.
12. The National Environment Secretariat should provide support materials for clubs and societies and play a co-ordinating role in the information flow.

Specific recommendations to Kwale District

Primary Education

1. The Teachers' Advisory Centre at Kwale together with the National Environment Secretariat should provide input of environmental education in the Teachers' Advisory Centre (TAC) Programme.
2. The role of education officers and school inspectors is important and they should be encouraged to participate in environmental education programmes.

Post-Primary Education:

1. Students should be encouraged to have an Environmental Study Area near their school using guidelines to be prepared by the National Environment Secretariat.
2. Because environmental awareness is promoted through extra-curricula activities e.g. geographical clubs, wildlife clubs, scouting, 4-K clubs, girl guides etc. schools should be encouraged to organise and run more clubs. Club activities should be competitive for recognition.
3. The teachers need in-servicing and re-orientation to enable them to teach environmental components within their subjects.
4. The village polytechnics need systematic inclusion of environmental material in their curriculum, and funds for basic requirements like tools, teachers' houses, workshops, water and qualified teaching staff.
5. The Matuga Development Centre should be provided with sufficient environmental material to enable it serve as a point/data centre from which information will be disseminated.

Adult Education:

1. The adult education curriculum needs to incorporate more environmental information relevant to the learners' daily activities. Relevant reading material should be translated into Kiswahili and other vernacular languages.
2. Teachers should work very closely with chiefs, sub-chiefs and extension workers.
3. A diversity of activities among men similar to those of women groups could improve enrolment and attendance.
4. An articulate post-literacy programme should be developed and streamlined to prevent learners from lapsing into illiteracy.

Administrators-

Informal education programmes and seminars should be organised locally for planners, civil servants, K.A.N.U. Officials, Members of the District Development Committees and personnel in the private sector to discuss major issues in the district. With the decentralisation of the National Environment Secretariat, such seminars/workshops will be organised more easily. Matuga Development Centre is ideal for such activities.

The Public:

1. The administrators should in turn create the necessary awareness and concern among the masses through Barazas and more so in the rural areas: divisional and locational teams whose everyday activities have a lot of influence on the environment.
2. Environmental conservation programmes should be introduced in the activities of religious organisations, co-operative societies, trade unions, and government extension.
3. There should be more slogans in Kiswahili on radio, and feature articles on environmental issues in Sauti Ya Pwani. The National Environment Secretariat should co-ordinate with the Ministry of Information and Broadcasting on the use of mobile films.
4. Support should be given for the development of environmental exhibitions, shows etc. in the district.
5. Research findings on environmental issues should be made available to the public through libraries, pamphlets, village polytechnics etc.
6. The National Environment Secretariat should set up a data centre in a section of the Resource Centre at Matuga Development Centre.
7. The National Environment Secretariat should make materials available in Kiswahili on environmental education to be distributed to Baraza, shows, District Officers (D.Os) etc.
8. In relation to the general education of the public, a series of out-of-school activities should be designed to provide adequate information. In Kwale District, Extension Officers from various fields interact with the rural population so often that they can be a very useful vehicle of enhancing environmental awareness. But whereas their curricula already have environmental information in varying degrees, the various curricula need to be examined to allow for re-orientation and incorporation of further information.
9. The content of extension workers' programmes should be examined with a view to adding more material to give adequate environmental information relevant to each co-operative's activity, etc.
10. Environmental education should be included in Farmers Training Centres' Programmes.

5.11 DISTRICT DEVELOPMENT ADMINISTRATION

Development is the interaction of two sets of activities: Private initiative to promote individual and group welfare and National Government Programmes, and resources applied to various sectors. Critical to both activities is development administration - how these initiatives are organised, promoted and implemented. The problems misuse of public funds, poor co-ordination, lack of manpower and lack of incentive must be taken seriously if the people are to be motivated to help themselves.

5.11.1 CO-OPERATIVES

Kwale District has 36 registered societies including one union. Two more primary societies are proposed for registration. These societies fall into four major categories of activities:

(i)	Farmers' Societies	16
(ii)	Fishermen's Societies	5 + 1 Union
(iii)	Quarrying Society	1
(iv)	Savings and Credit Societies	<u>13</u>
	TOTAL	<u>36</u>

The Co-operative movement in Kwale District has about 6,250 members and employs over 50 people in administration and management. Out of 36 societies 28 are active. Management problems which led to the liquidation of Kwale District Co-operative Union have rendered some of the societies either semi-dormant or dormant (Appendix 9.5).

The major crops handled by the Farmers' Societies are Bixa, Sesame, Cashewnuts, Copra and, to a lesser extent, maize. The Fishermen's Societies, which are affiliated to the South Coast Fishermen's Co-operative Union are well organised and quite active in fish marketing. The Savings and Credit Societies are active due to good management. The only active Sand and Stones Society deals in building sand and stones as the main activity and also sells Makuti (Coconut leaves thatch) as a secondary activity.

There exists potential for further co-operative development in the fields of agriculture, fisheries, savings and credit for employees in various industries and institutions. However, co-operative development in the district can only be realised if and when the existing problems are overcome. Customs which do not allow free mixing of men and women,

reduce the level of participation of women in the movement.

Many members of various societies are illiterate and this has had adverse effects on the management of societies. Illiterate committees are unable to keep proper books of accounts and since they are not challenged by members who are also illiterate, the societies stagnate. Consequently misappropriation, embezzlement and misapplication of funds are common problems in some societies.

Many of the societies are agricultural, and they lack working capital for employing qualified staff, putting up stores and offices. Dependence on cashewnuts as the major cash crop leaves most of the agricultural societies unoperational much of the year since the crop is seasonal. The Fisheries societies, although well organised, lack modern fishing equipment and techniques. The marketing structure and transport facilities are poor. Milk societies in the hinterland and sugar-cane growing areas are seriously affected by transport problems where access roads are generally poor. In addition, the societies face stiff competition from many well established private entrepreneurs.

The Ministry of Co-operative Development does not have sufficient funds, transport, trained manpower, and lacks co-operation from other departments, non-governmental employers (e.g. in Savings and Credit Societies), and Local leadership. This is well exemplified by the Ramisi Sugar Company which often lays-off workers without informing their societies or the Ministry of Co-operative Development making it difficult to recover loans given to such workers.

At present, the Ministry of Co-operative Development, in collaboration with the Kenya-Nordic Project has programmes and projects geared towards alleviating the prevailing problems. The main approach is through training and seminars for co-operative staff committee members and members of Co-operative Societies. These are usually held at Matuga District Development Centre. Co-operative information is also extensively imparted on Committee Members' Day, Members' Information Day, and Chief's Barazas.

In order to exploit marine resources on a sustained yield basis, the Ministry has taken the following measures: it has set regulations governing the size of fish the societies should accept from the fishermen; it is also looking into ways and means of providing the fishermen with better fishing equipment at reasonable prices. South Coast Fishermen Co-operative Union will construct and manage a resale shop at Msambweni. At the same time,

a Credit Programme enabling fishermen to obtain fishing gear on credit will be instituted. This will enable fishermen to purchase fishing equipment such as large boats for deep-sea fishing thus preventing depletion in fish breeding areas. The Kenya-Nordic Project has given a grant of K.Shs. one million to the Union to help purchase the necessary equipments.

The project has to date:

- (a) bought a vehicle for the movement,
- (b) standardized marketing system,
- (c) centralized accounting and auditing,
- (d) donated (in 1983) K.Shs. 600,000.00 for training of the Co-operative movement personnel,
- (e) built Union offices at Shimoni at K.Shs. 350,000.00 and
- (f) enlisted the services of a co-operative expert.

5.11.2 SELF-HELP MOVEMENT

Since Independence, the Self-Help Movement (Harambee) has been a major driving force behind the rapid social and economic development realised in Kenya today. Through the Harambee spirit, people make contributions in form of funds, labour, and supplies to identified projects. When a project has been initiated, the Community Development Officer approaches the District Development Committee which decides on projects to be assisted.

The Government, through the annual allocations of funds, sometimes with the help from national and international non-governmental organisations, provides both technical and financial support to these projects. The Community Development Division within the Department of Social Services co-ordinates and supervises the implementation of programmes and projects.

In Kwale District the Department of Social Services supervises the following groups of programmes:

(a) Community Development Programme

In 1983, the programme had 299 self-help projects covering primary and secondary schools, day care centres, dispensaries, health centres, village polytechnics, cattle dips, community halls churches, mosques, roads, bridges and water projects (including soil and water conservation). The programme oversees activities of 224 women's groups with a total membership of over 11,000, involved in making handicrafts, poultry keeping, crop production (vegetables), goat rearing, beekeeping and small-scale business undertakings. Under this

programme, seminars and courses are organised at the Matuga District Development Committee (D.D.C.) for leaders of self-help projects, youth groups, women groups, nursery school teachers, adult education teachers, extension workers etc.

(b) Youth Development Programme:

Village polytechnics fall under this programme. They aim at giving school leavers (mostly primary) skills enabling them to participate fully in rural development through self-employment, small-scale businesses, and other activities. The programme was started by the Government in Kwale District in 1971. To-date there are nine (9) village polytechnics. Out of these, seven (7) Government assisted polytechnics are operational at Mazeras, Alibokoko, Kinango, Shimba Hills, Ukunda, Chuphi and Gulanze (See Section 5.10). Two more polytechnics will be completed soon. Courses offered include masonry, carpentry, tailoring and dressmaking, agriculture, home economics, welding, electrical, book-keeping, tinsmith, and leathercraft.

(c) Social Welfare Programme:

This programme covers the public welfare activities like: public assistance, relief of distress, rehabilitation, day care centres, voluntary organisations, sports, culture, women's programmes and seminars.

(d) Family Life Training Programme:

This programme aims at educating families in the rural areas in various aspects of family life in order to raise healthy families and hence, a healthy nation. Mothers with children suffering from severe malnutrition are referred to the Kwale Family Life Training Centre (still under construction but operating) for residential training.

(e) Adult Education Programme:

This was started in Kwale District in 1968. Literacy in the district (Plan period 1979 to 1983) was estimated at 35% (See Section 5.10).

The self-help movement in Kwale District has not yet gathered momentum as compared to other districts. Some people have a negative attitude towards manual labour e.g. in sugar plantations and quarrying, 3/4 of the workers come from outside the district. This attitude is being fought through Barazas, seminars for self-help group leaders and local leaders, and educational tours to successful areas outside the district. However, the attitude has taken its toll on self-help movement. As most people are engaged in subsistence farming, they have little or no money to contribute towards harambee projects.

Women, through the women's groups are the backbone of self-help projects in all parts of the district. Apart from the general lack of operating funds due to limited income generating activities, women groups are faced with a number of problems. In the hinterland women groups have been rendered inactive by natural conditions and poor infrastructure. The acute lack of water forces to travel long distances in search of water. Health facilities are far apart and women walk long distances to centres where mobile clinics are available. The search for essential social services leaves little or no time for women to participate in group affairs.

Probably, the major problem facing group activities in Kwale District is lack of motivation due to limited interaction between the groups and the Ministry's field workers. The district is vast with poor transport facilities and few vehicles. The field social workers can only manage limited areas by public transport. So far, Government with the help of national and international donors, has extended financial aid, supplies and technical assistance to various groups as shown in Table 5.24.

5.11.3 DISTRICT ADMINISTRATION

Development administration is the responsibility of the Government. Although initiatives also come from the local people, it is through the District Development Committee that proposed programmes are planned, co-ordinated, implemented, and necessary research authorised. The District Development Committee, chaired by the District Commissioner, is composed of heads of the various ministries and departments within the district, representatives from parastatal organisations, political and civil leaders, representatives from provincial offices, and development authorities.

The Government carries out its mandate using development grants and rural development funds. Projects in Kwale District that have benefited from these funds include: water projects, health facilities, agriculture, rural access roads, education, water and soil conservation (cut-off drains) projects. The 1984-1988 Kwale District Development Plan includes priorities in agriculture and livestock, water projects, fisheries, health, commerce, transport and communications, forestry, co-operatives, tourism and wildlife.

TABLE 5.24 ASSISTANCE TO SELF-HELP MOVEMENTS, KWALE DISTRICT

YEAR	NUMBER OF PROJECTS	ASSISTANCE (AMOUNT IN K. SHS.)	SOURCES
1982	284	236,562.00	Kenya Government
		173,141.00	CARE (K)
		101,823.00	Other donors
		5,219,234.00	Peoples contributions- Labour, materials and cash.
1983	299	528,000.00	Kenya Government
		54,700.00	CEDPA
		35,000.00	CIDA
		20,000.00	UNICEF
		50,000.00	Tototo of Mombasa (Through N.C.C.K.)

The Kenya Marine Fisheries Research Institute situated in Mombasa serves the district in research matters relating to marine resources. The Matuga District Development Centre, started in the 1940s, serves as a centre for research in agriculture, livestock and agro-forestry. The Provincial Administration provides technical services in various fields such as higher education, water supply, roads, etc.

5.11.4 EXTERNAL ASSISTANCE

The existing local economy of Kwale District leaves a lot to be desired as far as income generation is concerned. Consequently, there is little money available for self-help projects. As such, the activities of the private sector, non-governmental organisations and international donors, are very important in the development of the district.

Kwale District has a number of non-governmental and private voluntarily groups as well as international donors involved in both small and large projects.

These include:

ORGANISATION

PROJECT(S)

National Christian Council of Kenya	Women Groups
Red Cross Society	Adult Education
Child Welfare Society	Adult Education
Family Planning Association of Kenya	Adult Education
Maendeleo Ya Wanawake Organisation	Motivation of Women in income generating projects e.g. Agriculture, Handicrafts, Beekeeping, Housing etc.
Freedom from Hunger	-
Kenya Extended Programme on Immunization	Environmental Health
Council for American Relief Everywhere (Kenya)	Women Groups
CEDPA	Women Groups
United Nations International Children's Energy Fund	Women Groups
Canadian International Development Agency	Women Groups
Danish International Development Agency	Women Groups
Food and Agriculture Organisation	Goat/Sheep Research at Matuga Research station.
European Economic Community	Water projects at Vanga (2 boreholes) - has assisted the construction of Mwachi Bridge which is 75% complete.
United Nations International Development Organisation	Water project in the southern division
Swedish International Development Agency	Women Groups and water project at Mkongani upgrade health facilities at Samburu tr Health Centre
Japanese International Development Agency	Environmental Health. Trying to provide clean water at Kinango and Msambweni in a bid to combat bilharzia
Kenya Nordic Project	Co-operatives. Improve fishermen skills and increase productivity
International Trend for Agricultural development	Integrated rural development

<u>ORGANISATION</u>	<u>PROJECT(S)</u>
World Bank	Kikoneni Water Supply
United Nations Development Programme	Shallow wells programme. Rehabilitation of more than 200 boreholes.
Norwegian Agency for Development	Tiwi Rural Health Centre

Apart from these organisations, the tourist industry is the largest private investor in the district. Hotel-keepers and tour operators have contributed to an improved road-network along south coast. The private sector also plays an important role in marketing, transportation and provision of goods and agricultural impacts.

5.11.5 CONSTRAINTS AND RECOMMENDATIONS

Constraints: Most of the district is semi-arid with only two permanent rivers. As such, there is an acute shortage of water both for human consumption and irrigation schemes to step up food production. The district is vast with inadequate personnel to co-ordinate and monitor implementation projects.

Recommendations: Local leaders and the local administration (chiefs and sub-chiefs) should be more involved in co-operative affairs if the Co-operative Movement is to succeed. These are the people who command influence among the populace and if they can be influenced into having a positive attitude towards Co-operative Movement then success could be realised.

The agricultural societies need to diversify their activities to enable them to operate throughout the year.

The marketing structure should be streamlined to cope with the harvest and to enable prompt payments to the farmers.

Possibilities of providing adequate field officers, accommodation and transportation for field officers should be considered seriously to enable continued supervision of the societies. Motor-cycles are ideal for extension services in remote rural areas. Each divisional centre should have a guest house for visiting field staff.

The fight against illiteracy should be stepped up (See Section 5.10).

Co-operation among ministries and departments and the sharing of the available resources such as vehicles, field officers, etc. should be

encouraged. Travelling teams should be organised in such a way that all extension officers visit one area at a time.

The non-governmental organisations/private voluntary organisations should be involved in the planning sessions as they contribute much to development in general.

PART III

C O N C L U S I O N

6.0 SUMMARY

6.1 INTRODUCTION

In the preceding chapters we have described some of the main trends in resource use in Kwale District and the related socio-economic factors. Some serious environmental problems have been identified and a set of recommendations for dealing with them proposed at the end of each section.

This section identifies priority problems, although the list is not exhaustive, which need immediate attention so that development may proceed without undermining the natural and human resources on which it depends. These are: vegetation and energy, environmental health, development of agriculture, marine resources and environmental education.

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

6.2 VEGETATION AND ENERGY

6.2.1 VEGETATION CLEARING, DEFORESTATION AND ENERGY USE

In many parts of the district, trees are being cut down faster than they are replaced. This may cause serious and irreversible environmental damage. The main purposes for which trees are cut down include:

(a) Economic reasons:

Some industries like Ramisi Sugar Factory and Kenya Calcium Limited, depend on fuelwood for part of their energy requirements, leading to destruction of woodlands and forests.

In addition, charcoal production is an important source of income for many people especially in Kinango Division.

Some indigenous trees on Mrima Hill have been cut down to facilitate mining.

(b) Meeting domestic needs:

Individuals cut trees for building, fuelwood and when clearing land for cultivation. With increasing population the forest and woodland resources are threatened with depletion.

6.2.2 CONSERVATION OF INDIGENOUS FORESTS

The original coastal forest has been cut down leaving patches on Shimba Hills, Kayas, etc. Destruction at the current rate may deplete some economic species before they are studied and documented.

6.2.3 MANAGEMENT OF SHIMBA HILLS NATIONAL RESERVE

Shimba Hills National Reserve is currently managed both as a Forest Reserve and Game Reserve. The two management policies need to be streamlined for meaningful development to be realised in the area.

6.2.4 AGRO-FORESTRY

There is need to intensify agro-forestry to meet energy and other requirements using same land areas.

6.3 ENVIRONMENTAL HEALTH

6.3.1 HEALTH FACILITIES AND SERVICES

Health facilities and services are often insufficient to meet the existing needs and are not expanding at a rate high enough to keep pace with the population growth. In addition, malnutrition is common in many parts of the district, making people more susceptible to many other diseases. Health education, including nutrition, waste disposal and sanitation is one of the main aspects of preventive health care but it is seriously hampered by shortage of personnel and transport.

6.3.2 LACK OF WATER

The dry western part of the district lacks surface and sub-surface water. Most streams and dams dry up during the dry seasons so that water becomes more difficult to get and time consuming. Women and children have to walk long distances to fetch water or buy it from vendors. Lack of water is a major constraint to development, limiting agricultural and livestock

productivity, improvement of health, education, etc. Provision of potable or improved water is constrained by inadequate water sources, financial problems, the chemical nature of groundwater in some areas, siltation and contamination of dams.

6.3.3 POLLUTION

Water pollution

Surface and underground water is polluted by industrial effluents, agricultural chemicals, siltation and contamination by livestock. Water pollution is of particular concern because many of the district's people use untreated water, leaving them vulnerable to many health hazards. In addition, water pollution affects stream ecology and marine resources.

Siltation of dams is common during the wet seasons. Apart from reducing the capacity of dams, it lowers the water quality for human consumption.

The effluent from the Bixa Factory with a pH of about 3 is discharged into the nearby bush polluting the Tiwi aquifer through seepage. Another major source of water pollution is the Ramisi Sugar Factory which discharges untreated effluents into River Ramisi. Apart from severely degrading the water quality, the whole complex together with Nyari Sisal Estate introduces potentially harmful chemical residues from pesticides, fertilisers and other chemicals. Regular monitoring of water quality will help prevent serious effects and long-term degradation of water quality in the district.

Noise and air pollution

Potential health hazards exist in all factories on varying degrees where the working environment exposes workers to noise, vibrations, odours, dust, smoke and other suspended particulate matter while crushing and packing. These workers need to be educated on the importance of using protective clothing however cumbersome it may be.

6.4 AGRICULTURE

6.4.1 LAND TENURE

Although land tenure is a complex issue, the lack of title deeds has hindered development of agriculture in some parts of the district. It is a question which should be resolved urgently.

6.4.2 AGRICULTURAL PRODUCTIVITY

There is room to increase crop production in the wetter coastal zone and livestock on the rangelands. The crucial problems which should be addressed

apart from land tenure are, water supply in the west and wildlife menace in Kubo Division.

6.4.3 MARKETING

Co-operatives should be strengthened or organised to market fruits and vegetables to the urban markets; and industrial crops like Bixa. As far as industrial crops are concerned, there should be co-ordination between agricultural extension officers and factories so that farmers do not over-produce a particular crop beyond the factory's processing capacity. Currently, the Bixa factory buys only one-third of the seeds produced in Coast Province. This is a loss to farmers.

6.5 MARINE RESOURCES

There is need to conserve marine resources for use on a sustained yield basis. The resources include mangroves, coral reefs, shells and fisheries. These are threatened by pollution from industries, sewage, some oil spills; and potential over-exploitation of mangroves, shells, and fisheries.

6.6 ENVIRONMENTAL EDUCATION

Most people in the district take environmental components like water, vegetation, coral reefs, or fisheries for granted. There is need for people to change their attitudes if these resources are to be properly managed. Environmental education is, therefore, necessary to create the necessary awareness among administrators, extension officers, students and the public in general.

7.0 KWALE DISTRICT WORKSHOP ON ENVIRONMENT AND DEVELOPMENT JADINI BEACH HOTEL, 17-19 JUNE, 1985

The Director, National Environment Secretariat, Mr. D.R. Kamau, in his brief remarks, welcomed the Assistant Minister for Environment and Natural Resources, Hon. H. Cheboiwo. He extended the welcome to the various departmental representatives and leaders from Kwale, whose support had facilitated the preparation of the Kwale District Assessment Report. The Director regrettably indicated that, due to the forthcoming National Holiday (IDD), the seminar would last for only three days, although initially scheduled to last one week. In view of this, it was necessary that every minute be used effectively.

► Hon. H. Cheboiwo officially opened the Seminar on behalf of the Minister for Environment and Natural Resources, Hon. P. Ngei. The Minister's speech underscored the importance the Kenya Government attaches to issues relating to the environment. Major milestones that have translated this concern to action include the creation of the Ministry of Environment and Natural Resources and the setting-up of the Permanent Presidential Commission on Soil Conservation and Afforestation. On many occasions, he went on, His Excellency, the President who is a keen environmentalist, has taken the lead in activities geared towards environmental enhancement.

During this year's Tree Planting Day, he added, His Excellency the President led Kenyans in tree planting at Masinga Dam and urged them to increase their efforts towards soil and water conservation through afforestation. His concern was further reaffirmed in his address to the nation, on the occasion of the World Environment Day on June 5th 1985.

It is in the same spirit that this Seminar has been organised. Its main objectives are:

1. To promote environmental awareness.
2. To review the status of the environmental resources and problems in the district.
3. To promote the incorporation of environmental concerns during the planning process in the district.
4. To develop a plan of action for implementation of environmental consideration by the District Development Committee.

Major environmental problems, already identified in Kwale, relate to vegetation, energy, environmental health, agriculture, marine resources and environmental education. These, and others to be identified during the deliberations, should form a reference frame for the discussions. The Minister reminded the participants that these are broad environmental problems that pose a challenge to all of us. Their amelioration depends on everybody's timely action. This will mean rational management of our resources to enhance the quality of the environment in the district. In trying to solve these problems, everybody must be involved, the private sector, the non-governmental organisations and the wananchi.

In the afternoon, major environmental problems prevalent in Kwale District were highlighted in a speech, and amplified by a series of slides

taken in various parts of the district. The ensuing discussion criticised the omission in the slides of major environmental aspects, such as the destruction of the mangrove forests and serious soil erosion in the interior. In response to this, the participants were assured by the National Environment Secretariat that the imbalance would be rectified and if possible, the slides left behind for use in the district. The participants, in five problem-oriented groups, visited selected sites to get some on-site experience of the issues to be addressed. This background set the stage for the Workshop deliberations.

On the second day discussions on environmental problems in Kwale District were analysed by five different groups and recommendations made for action by the Kwale District Development Committee. On the third day the recommendations were reviewed and additions and amendments made in the plenary session.

The following were the deliberations and recommendations of the Workshop:

<u>GROUP</u>	<u>DISCUSSION AREA</u>	<u>TOPICS</u>
I	Terrestrial resources, management and conservation.	(a) Agric-forestry (b) Crop selection (c) Extension services (d) Soil conservation (e) Afforestation (f) Energy supply and conservation (g) Research (h) Wildlife (i) Water
II	Marine Resources, management and Conservation	(a) Fishing (b) Coral reef protection (c) Mangrove protection (d) Collection of shells (e) Water pollution
III	Rural Environmental Health	(a) Nutrition (b) Water supplies and quality (c) Sanitation (d) Population growth and family health (e) Extension services

<u>GROUP</u>	<u>DISCUSSION AREA</u>	<u>TOPICS</u>
IV	Environmental problems of urban areas	(a) Urban housing (b) Sanitation and waste disposal (c) Recreation facilities (d) Town Planning and Development (e) Industrial pollution (f) Working conditions
V	Environmental education	(a) Curriculum Review (b) Materials and learning aids (c) Environmental study area (d) Environmental clubs; promotion (e) Effective extension services (f) Non-governmental organisation programmes (g) Education of administrators and decision-makers (h) Public Education Programmes

TERRESTRIAL RESOURCES CONSERVATION AND MANAGEMENT

Environmental issues relating to terrestrial resources were covered under the following headings: agro-forestry, agriculture and livestock development, soil conservation, afforestation, water, energy supply and conservation. Research and extension services are part and parcel of these sectors and these were therefore incorporated in the discussions.

1. AGRO-FORESTRY:

This is defined as deliberate growing of multi-purpose trees with crops and/or animals.

Problem: The programme has had little positive response from the farmers especially in Kinango area. Along the coast, the practice has been more successful as multi-purpose trees such as coconuts, cashewnuts etc. have always been grown there.

Some of the factors that have adversely affected the programme are:

- (i) Lack of awareness among the people i.e. not appreciative of the benefits accruing from the programme.
- (ii) Scarcity of species which can be interplanted with crops without creating conflict.
- (iii) In areas still not adjudicated for individual ownership e.g. Kinango, the farmers have no motivation for such long-term programmes.
- (iv) Lack of trained personnel in agro-forestry.

Current Programmes:

- (i) Coastal farmers are being encouraged to use proper crop husbandry on tree crops and fruits.
- (ii) In Kinango where the programme is being introduced, multi-purpose seedlings are supplied by the Forest Department, Matuga District Development Committee and Soil Conservation Nurseries.

RECOMMENDATIONS

- (i) There is need to create awareness through more intensive courses for local leaders e.g. women group leaders, village chairmen, K.A.N.U., youth group leaders, chiefs, school heads, councillors etc.
- (ii) More extension services should be rendered to farmers.
- (iii) There should be more co-operation and co-ordination between the Ministry of Agriculture and the Forest Department.
- (iv) Matuga District Development Committee and Mtwapa Research Station should intensify research on species suitable for local conditions.
- (v) Group Ranches should be encouraged to set aside some land for agro-forestry purposes.

2. AGRICULTURE:

Agriculture, which is one of the main income earners in the District is characterised by low yields. The underlying causes include:

(i) Land Tenure

In ranching areas, land is communally owned thus curtailing individual incentives to undertake expensive and long-term enterprises.

(ii) Awareness

- (a) Low level of adaptability to modern agricultural practices e.g. fertilisers, pruning.

(b) Due to uncertainty of agricultural yields, farmers are reluctant to acquire loans using title deeds in case they are unable to repay the loans.

(iii) Availability of farm inputs

There are no established stockists for farm inputs in the district.

(iv) Crop selection

Some farmers grow crops in unsuitable agro-ecological zones leading to low yields.

(v) Water

In most of Kwale, rainfall is generally low and unreliable and without irrigation to supplement, crop failure is high.

(vi) Wildlife and vermin

Shimba Hills National Game Reserve has created wildlife problems in food production.

(vii) Marketing problems exist for cash crops such as bixa, mangoes and oranges but not for food crops.

(viii) Poverty

The very low incomes prevalent in Kwale inhibit maximum utilisation of existing resources.

Current Programmes:

- (i) Efforts are being made to speed up the process of land adjudication and educating farmers on the advantages of using title deeds to acquire development loans.
- (ii) The Ministry of Agriculture and Livestock Development have bulking plots for seed multiplication purposes in all divisions (fruits, food crops).
- (iii) Farmers are being trained in crop selection through demonstration farms.
- (iv) Farmers are being encouraged to plant early to make maximum use of early rains.
- (v) The Game Reserve is being fenced off to control big game by Wildlife Conservation and Management Department.

- (vi) Farmers are being encouraged to kill wild pigs and report the numbers to the department of wildlife and management.
- (vii) Crop compensation for damages caused by wildlife is being hastened.
*

RECOMMENDATIONS

- (i) The Agricultural Finance Company (AFC) and the Ministry of Agriculture should give loans in kind and intensify supervision of projects.
- (ii) Given circumstances under which farmers operate, loan repayments should be extended.
- (iii) With assistance from the Government, group ranches should develop basic infrastructures necessary for commercial ranching.
- (iv) Absentee landlords in the district should be discouraged.
- (v) The K.G.G.C.U. (Kenya Grain Growers Co-operation Union) should open up a branch in Kwale and appoint stockists in the farming areas.
- (vi) Research findings should be made available to extension workers regularly.
- (vii) The Wildlife Conservation and Management Department should speed up completion of the fence.
- (viii) Payment of compensation should be timely.
- (ix) The Game Rangers and the Administration Police should co-operate more in the control of wildlife.
- (x) Strengthening the existing co-operatives, expansion of the Bixa factory and exploration of external markets should be encouraged.
- (xi) Investors should be encouraged to establish a food processing plant in the district.

* (viii) The Administration Police have acquired shotguns to scare and kill baboons.

3. LIVESTOCK DEVELOPMENT

The main problems facing livestock development are: poor animal husbandry, inadequate water supplies, wildlife menace, diseases and pests, inadequate pasture, marketing and shortage of extension staff.

Programmes:

- (i) Extension staff are educating farmers on proper animal husbandry.
- (ii) In the ranching areas, bull camps have been set up.
- (iii) Artificial insemination is being encouraged in the high potential areas.
- (iv) Dams are being constructed in Kinango.
- (v) Hand pumps are being constructed in Msambweni.
- (vi) There is tsetse-fly research project at Ukunda.
- (vii) Vaccination against anthrax, rinderpest etc. is being carried out at regular intervals.
- (viii) There is regular dipping of cattle under the supervision of extension staff.
- (ix) Farmers are being encouraged to clear the bushes that compete with pasture.
- (x) There is organised marketing through co-operative societies and auction yards.

RECOMMENDATIONS

- (i) The Government should strengthen the existing extension services so as to reach more farmers.
- (ii) The existing disease control programme should be intensified.
- (iii) Kenya Trypanosomiasis Research Institute (KETRI) should take more interest in tsetse-fly control in Kwale.
- (iv) Farmers should be encouraged to clear bushes around their farms.
- (v) In high potential areas, farmers should be encouraged to grow fodder crops and improve pasture.
- (vi) More auction yards, should be set up to cope with the numbers of animals.
- (vii) The Ministry of Water Development, through the District Development Committee, should establish more water sources and rehabilitate the broken down ones.

4. SOIL CONSERVATION

Soil erosion is acute in the following areas:

Gondoni, Mnyenzeni, Magodzoni, Mwadudu, Tiwi, Waa, Mbuguni, Mukundi, Jorore, Tiribe, Kibaoni, Kinango, and Gandini.

The major causes are overgrazing, poor farm practices, deforestation, sand scooping (mining) and bush burning.

Programmes:

- (i) Gullies are being rehabilitated through check dams, cut-off drains, trash material.
- (ii) Terracing, cut-off drains, trash lines and tree planting are being undertaken on steep slopes.
- (iii) Overgrazed areas are being rehabilitated.
- (iv) Farmers are being encouraged to destock.
- (v) There is reafforestation of catchment areas.
- (vi) Commercial charcoal has been banned.
- (vii) There is a campaign to protect the river banks.

RECOMMENDATIONS

- (i) The extension staff should intensify efforts in educating farmers on proper crop and animal husbandry.
- (ii) Afforestation should be intensified and more control exercised on deforestation.
- (iii) To combat the health hazards created by the depressions left by sand scooping and coral block cutting, the soil and water conservation committees should exercise control by being involved in site selection.
- (iv) The Kwale County Council should exercise control on the activities and ensure rehabilitation of the sites.
- (v) The administration should intensify efforts against bush burning.
- (vi) Campaigns to protect river banks should continue.

5. AFFORESTATION

Current Programmes:

- (i) On Mrima hills, land deforested through mining has been reafforested.
- (ii) Forest extension officers regularly make the seedlings available to the farmers at a small fee.

- (iii) Chief's nurseries have been set up all over the district.
- (iv) National Tree Planting Day, Environmental Awareness Week and the World Environment Day are used to create awareness on the importance of afforestation.

RECOMMENDATIONS

- (i) There should be more vigilant control by the Administration, Forest Department and other agencies.
- (ii) Tree planting season should be scheduled to coincide with the onset of rains.
- (iii) Forest Department should deliver the seedlings to central distribution points.
- (iv) Individual farmers should be encouraged to have their own nurseries.
- (v) The Shimba Hills conflict between the Wildlife Conservation and Management Department and the Forest Department should be settled to speed up development.
- (vi) There is need for more forest extension officers, at least one for each division.
- (vii) Schools should be encouraged to have their own nurseries.

6. ENERGY SUPPLY AND CONSERVATION

There is indiscriminate deforestation and little use of alternative sources of energy e.g. coconut husks, shells, solar energy and biogas.

Current Programmes:

- (i) Charcoal burning on commercial basis is controlled in the district.
- (ii) Energy-saving jikos are being developed at Mtwapa Research Station.
- (iii) Windmills are being used for pumping water from shallow wells in Ramisi area.

RECOMMENDATIONS

- (i) The Ministry of Energy should deploy extension staff to demonstrate and train the farmers on the use of improved jikos.
- (ii) There should be stringent enforcement on commercial charcoal burning but relax control on home-consumption fuel.
- (iii) The farmers should be encouraged to use more of coconut husks and shells. Research should be conducted to find ways of reducing the smoke.

- (iv) Where possible, solar energy should be used in public institutions.
- (v) Use of windmills should be intensified.
- (vi) Encourage farmers to make use of biogas for local use. Cheaper designs digesters should be made available.
- (vii) Women groups should be encouraged to use energy-saving jikos.
- (viii) Ramisi Sugar Factory and Kenya Calcium Products and other fuelwoods users should be required to establish their own plantations.

7. WATER

The main sources of water are:

- (i) The springs in Shimba Hills and Kikoneni.
- (ii) The rivers Uмба, Ramisi, Mukurumunji and Marere.

Deforestation is threatening the source areas, hence the need to protect them.

Programmes:

Chiefs together with soil and water conservation committees have intensified campaigns against destruction of water catchment areas.

RECOMMENDATIONS

- (i) Research should be conducted to establish the possibility of geothermal power development.
- (ii) Protection of the catchment areas should be intensified.

MARINE RESOURCES MANAGEMENT AND CONSERVATION

FISHING

(a) Aquarium Fish

There is a limited number of licenced firms engaged in collecting aquarium fish for export throughout the coastal region. One particular centropyne species has been over-exploited and has almost been depleted in north coast. This has compelled collectors to converge on the south coast to exploit the available stocks.

RECOMMENDATIONS

The capture of C. acanthrops should be banned by the Department of Fisheries and research work carried out by the Kenya Marine and Fisheries Research Institute (K.M.F.R.I.) to determine the level of exploitation of the remaining species to determine the level which can be exploited on quota basis.

(b) Finned Fish

Exploitation of demersal species of fish e.g. rabbit, scavenger and pelagic sp. e.g. barracuda by the local fishermen have tended to concentrate in the inshore region due to lack of funds to purchase modern fishing gear like large mechanised boats equipped with various nets to enable them exploit the deep sea. The constraint has already been identified by the Department of Fisheries and possible solutions offered with encouraging results.

WHAT IS BEING DONE

The Nordic countries have released a total of K.Shs. one million as a grant to the Fishermen Co-operative Union as a revolving fund to be loaned to individual fishermen for the purchase of modern gears. Similarly, the IDA/Kenya Fisheries Project is to tackle this problem. Already modern prototype boats are under construction at the Fisheries Boat Building Yard in Mombasa and will soon be tested by the fishermen themselves before acquiring as a loan.

RECOMMENDATIONS

The grants from the Nordic countries to the Union are not enough, so more sources of funds should be considered to benefit more fishermen. This can be achieved if the Department of Fisheries reintroduces the Fishermen's Loans Scheme which was stopped sometimes back due to poor loan recovery. The IDA/Kenya Fisheries Project should hasten the provision of modern fishing gears which is long overdue.

(c) Crustaceans

These include lobsters, prawns and crabs whose numbers have diminished resulting to restriction in their trade by the Fisheries Department. This has been as a result of big demand in the tourist hotels.

RECOMMENDATIONS

- (i) The Fishing Industry Act covers trade in these fishery commodities. More staff should be deployed to intensify the law enforcement.
- (ii) Before the development of any mariculture project to produce prawns in Kwale, the Fisheries Department should get information on the existing Ngomeni Prawn Project in Malindi to evaluate its success. If the project is viable small-scale mariculture projects could be started in Majoreni, Kiuga and Kiiwambale areas by interested parties.

(d) Netting Undersize Fish

There is no legal backing on the mesh sizes of nets used by the local fishermen, but is covered in the new fisheries bill to be introduced in Parliament for enactment.

However, the purchasing agents have been advised to reject undersize fish e.g. finned fish and lobsters less than 10cm and crabs less than ½ kg. This has met with some degree of success.

RECOMMENDATION

The perusal of the new fisheries bill which governs mesh size and other related matters should be hastened by the Attorney-General's Office to enable the Fisheries Department to have effective control over exploitation of undersize fish.

(e) Lack of storage facilities

These are absent in most landing beaches except Shimoni, Msambweni and Vanga which in any case are not adequate.

Modern storage facilities are to be constructed in Shimoni and Vanga and in the former case with an ice-making plant through funds received from the World Bank as a loan.

RECOMMENDATIONS

(i) Those with the responsibility of implementing this project i.e. the Fisheries Department and the World Bank personnel should hasten it up.

(ii) In the meantime, co-operative societies should make reasonably sized wooden ice-boxes for fish preservation where ice is supplied by fish dealers.

(f) Algae growth

An increase in the growth of algae as a result of effluent from a Soap Factory in Tanzania has been observed on the south coast. Algae bloom can cause imbalance in marine ecosystem.

RECOMMENDATION:

This issue should be forwarded to the United Nations Environment Programme (U.N.E.P.) for action under the Regional Seas Programme.

(g) Dynamite fishing

Some fishermen use dynamite to catch fish but in the process destroy vast fish habitats with the explosions. Patrols are not effective

as these fishermen are well informed.

RECOMMENDATION

The Regional Seas Programme of the United Nations Environment Programme should be informed by the National Environment Secretariat through Kenya Mission to U.N.E.P. to explore possible areas of co-operation between Kenya and Tanzania to tackle this problem.

2. CORAL REEF PROTECTION

(a) Boat anchoring

It has been observed that boats drop their anchors indiscriminately without due regard to the coral growth, especially in the marine park, thereby destroying the coral gardens which take many years to grow.

RECOMMENDATION

The Wildlife Conservation and Management Department should erect buoys in specific locations within the park for anchorage purposes and this should be done in regions away from the coral gardens.

(b) Use of Live Coral for Building

The collection of live coral for building purposes used to be prevalent in Vanga and Majoreni areas but has been reduced considerably since a ban was placed on the plucking and trade in coral by the Government. However, there are some people who continue with this practice illegally.

RECOMMENDATIONS

- (i) Law enforcement should be intensified by Fisheries staff to avert this situation.
 - (ii) Local leaders should take the initiative of arousing public awareness on the dangers which might arise as a result of coral destruction.
- (c) Destruction of coral reefs through careless swimming and walking

This is common with tourists who frequent these places for sight seeing and swimming through the coral gardens inflicting a lot of damage.

RECOMMENDATION

Intensive campaign should be mounted with the aid of posters depicting the damage caused to corals by these careless actions and issue guidelines on how to avoid them. This should be taken as a concerted effort involving Wildlife Clubs of Kenya, National Environment Secretariat, E.A. Wildlife Society. The posters should be displayed in public places, including

tourist hotels where the management should lend a hand.

3. DESTRUCTION OF ECOSYSTEM:

It has been established that the existence of coral reefs is very much influenced by other organisms through the process of inter-dependence. The removal of triton shells, for example, and others which predate upon crown of thorns starfish results in population explosion of the latter which in turn feed extensively on corals.

There are other molluscs which are hunted for their shells and these predate upon the sea urchins which in turn feed on the corals. Any imbalance will affect the other.

RECOMMENDATIONS

- (i) Since it has been established that the crown of thorns feed extensively on the corals if not checked, its natural predator i.e. triton (Charonia tritonis) should be fully protected by banning its collection.
- (ii) Trade in other shells which form part of this ecosystem should be restricted by the Fisheries and Wildlife Departments.

4. MANGROVES PROTECTION

Exploitation of mangrove forests by the local people for domestic purposes is not a serious threat, but exploitation for commercial purposes poses a threat.

At present cutting of mangroves is restricted by issue of licences.

RECOMMENDATIONS

- (i) The public should be educated on the importance of mangrove forests.
- (ii) There should be a total ban on further exploitation where mangroves have been over-exploited or the number of mangrove cutters restricted to allow the mangroves to regenerate e.g. Bodo and Majoreni.
- (iii) The licensing methods and supervision on cutting of mangroves should be intensified.
- (iv) The Forest Department should have an up-to-date information on the state of mangrove forests.

- (v) Environmental impact assessment in all development activities likely to affect the mangrove forests or marine ecosystem in general should be submitted and verified by an independent organisation and forwarded to the District Development Committee with recommendations.

5. COLLECTION OF SHELLS

It has been established that collection of particular shells results to an imbalance in the ecosystem particularly the reef.

RECOMMENDATIONS

- (i) Only dead shells should be picked by the licenced collectors.
- (ii) Exportation of shells should be done on quota basis in view of their declining numbers. The Fisheries Department should be able to formulate such guidelines.
- (iii) The Fisheries Department should intensify patrols along the beaches.

6. WATER POLLUTION

Pollution of the sea water comes from oil, raw/sewage silt, agro-chemical residues (from fertilisers, fungicides, herbicides) and industrial effluents.

(a) Oil Pollution

This originates from the high seas and tar balls are brought to the shore by waves. This is not a major problem at present, but needs to be controlled before it is too late.

(b) Raw Sewage

Raw sewage from Ramisi Sugar Factory is discharged into Ramisi River. Beach hotels have septic tanks but no sewage treatment plants, therefore, spillage is possible. Raw sewage has a damaging effect on both riverine and marine life.

(c) Agricultural chemicals

The chemical residues find their way into the sea but at present there is not much that is known about their effects.

(d) Industrial effluents

Ramisi Sugar Factory discharges raw industrial effluents directly into Ramisi River.

RECOMMENDATIONS

- (i) Tar balls if sighted should be collected and reported to the Fisheries Department to monitor whether this pollution is increasing or decreasing for possible action.
- (ii) Ramisi Sugar Factory should pre-treat its raw sewage before discharge into Ramisi River. There is need for sewage treatment plant for the expanding tourist industry.
- (iii) More information is required on the level of any hazardous agro-chemical residues found in the marine life and possible sources identified.
- (iv) There should be a thorough analysis and monitoring of the quality of water in Ramisi River by the Ministry of Water Development and a report submitted to the District Development Committee to act against the water pollution from Ramisi Sugar Factory.

RURAL ENVIRONMENTAL HEALTH

The major environmental health problems are communicable diseases, inadequate water supplies, poor sanitation and other related components.

1. COMMUNICABLE DISEASES

There is high morbidity and mortality from preventable communicable diseases in the district. The major diseases prevailing in the district are: Malaria, Bilharzia (Schistosomiasis), Diarrhoeal disease, Acute Eye Infection. Anaemia, Measles, Intestinal Worms, Upper Respiratory Tract Infection, Skin Conditions and Malnutrition.

The underlying causes are inadequate potable water supplies, lack of awareness and poverty among the community, ideal environmental conditions for the disease vectors e.g. mosquito breeding grounds, poor housing, and adverse environmental factors (e.g. droughts, poor soil conditions) and social environmental problems.

WHAT IS BEING DONE

In a bid to improve some of the existing problems, the following steps are being undertaken.

- (i) The Swedish International Development Agency (SIDA) is funding water and sanitation projects in the district (Kwale Village

Water Supplies and Sanitation Programme).

- (ii) The Japanese International Co-operation Agency (JICA) Programme on Safe Water Supplies and Treatments, is working towards the eradication of schistosomiasis and diarrhoeal diseases.
- (iii) The District Development Committee (DDC) funds a number of small water supply projects (e.g. roof catchment and rock catchments).
- (iv) The Ministry of Water Development Programme on Rural Water Supply funds some water projects.
- (v) Kenya Expanded Programme on Immunization (KEPI) is working towards the eradication of the six childhood killer diseases i.e. (measles, tuberculosis (TB) diphtheria, tetanus, pertussis, polio).
- (vi) The Kwale Primary Health Care (Community Based Health Care) is educating communities on prevailing diseases and their control. They also train Traditional Birth Attendants (TBA).
- (vii) The Child Survival and Development Programme addresses itself to improving food production, environmental sanitation and water supplies.
- (viii) Extension workers are educating rural community on sound housing, nutrition, immunization and appropriate technology.

RECOMMENDATIONS

- (i) Since lack of awareness and resistance to change is a major problem, it was recommended that more detailed social studies should be carried out on the following subjects: Negative and Positive Beliefs, Taboos and Habits, Dependency Ratio (Poverty), Educational Level and Opinion Leaders, Causes of Divorce etc. so as to know the change agents and entry points.
- (ii) Studies should be carried on the geological conditions of the district and availability of water resources.
- (iii) There is need to improve the quality of treatment of the above diseases and supplies of appropriate drugs.

2. HEALTH FACILITIES

The problems facing health facilities are: Inadequate and sub-standard health facilities, inadequate trained health personnel, uneven distribution of health facilities, scattered rural population and inadequate appropriate transport facilities.

The major underlying causes include the following: financial constraints. poor workmanship on buildings, inheritance of sub-standard structures from the

Local Authorities, uneven distribution of staff by the Ministry Headquarters, poor justification of staff requirement by the District Health Management Team (DHMT) failure by DHMT to service and maintain existing transport and equipment facilities, dispersed population distribution and pressure groups influencing uneven distribution of facilities.

Programmes:

- (i) There is a continuous education programme for health workers to improve their managerial skills and performance skills.
- (ii) The Integrated Rural Health Programme is improving on already existing health facilities.
- (iii) The District Development Committee and other agencies e.g. UNICEF, are supporting the improvement and upgrading of some of the health facilities e.g. Kwale Family Life Training Centre.

RECOMMENDATIONS

- (i) Mobile services should be introduced in areas where the facilities do not exist.
- (ii) Depending on population density of the area, health facilities should be provided so that people will not walk for more than 5 kilometres.
- (iii) The community should be encouraged to participate in improving and maintaining local health facilities.

3. WATER SUPPLY

The District suffers from inadequate potable water supply due to: unreliable water sources; financial constraints; poor maintenance of existing supplies (e.g. Pemba Water Supplies); poor planning, design and construction e.g. Gulanze and Kikoneni dams which are colonised by crocodiles; low rainfall and saline nature of the aquifers.

RECOMMENDATIONS

- (i) The District Development Committee should pursue the desiltation of silted dams.
- (ii) There is need to encourage people to practise roof and rock catchment where applicable.
- (iii) The Pemba Water Supply should be rehabilitated to serve the hinterland.
- (iv) Maintenance of any water project should be considered during planning, designing and implementation.

- (v) The Wildlife Conservation and Management Department should get rid of crocodiles from dams.

4. SANITATION

Kwale district has a low latrine coverage and the existing latrines are not fully utilised. Houses are overcrowded, poorly ventilated and many are infested with insects and other pests. The main causes are:

- (i) High costs of constructing a latrine in rocky areas as well as in areas with loose soils.
- (ii) Lack of awareness among the public on the relationship between latrine and disease transmission.
- (iii) Plenty of bushy land discourages construction of latrine.
- (iv) The use of temporary settlements in the farms during farming period discourages use of latrines.

Programmes:

The programmes being undertaken include: low-cost sanitation by the Ministry of Health, Kwale Village Water Supply and Health Education Programme.

RECOMMENDATION

Each homestead in the district should have a pit latrine which will be put into use. Improvement of housing should include provision of adequate ventilation and provision of separate rooms for animals.

5. POPULATION AND FAMILY PLANNING

Many health problems are related to family size e.g. resources to be shared by many. The causes include:

1. Uncertainty on the survival of existing children.
2. Low level of formal education which leads to early marriages and exposes women to long periods of child-bearing. This of necessity results in large families.

Programmes:

Family Planning Programmes by various organisations are already in existence.

RECOMMENDATIONS

1. Family Life Education Programmes should be intensified both in schools and in the community.

2. Formal education, particularly for girls, should be encouraged.

ENVIRONMENTAL PROBLEMS OF URBAN AREAS

Kwale District currently does not have designated urban centres. In view of this, the discussions focussed on the existing local growth centres. These include Kwale, Kinango, Ukunda, Msambweni, Lunga-Lunga and Ramisi. Discussions covered the following topics; housing, sanitation and waste disposal, recreation facilities, town planning and development, industrial pollution and working conditions.

1. HOUSING

There is an acute shortage of houses within the local growth centres. Problems that have led to this state of affairs were identified as:

- (a) the reluctance of Housing Finance Institutions to finance housing projects. These institutions usually impose very rigid terms and conditions for the procurement of loans for housing developments. This reluctance is due to the fact that the centres in Kwale have not yet attained the designated urban status. The magnitude of this constraint is serious as illustrated in Kwale Township, where inspite of over fifty people having been allocated with plots, no new houses have come up;
- (b) the frustrating delays in the process of land acquisition and in carrying out the necessary survey work by the Department of Surveys;
- (c) the ever rising cost of building materials;
- (d) most of the existing houses are of poor standards and lack such essential services as water, electricity and proper ventilation.

RECOMMENDATIONS

To improve on the housing situation in Kwale District's local growth centres, it was recommended that:

1. The existing policy for designating growth centres should be reviewed so as to make it easy for councils like Kwale to procure loans.
2. The Government should provide the basic infrastructure and should also consider the possibility of establishing site and service schemes within some of the local growth centres.

3. The Housing Finance Institutions should be exhorted to be more flexible in their loans lending policies. They should increase loan repayment periods, lower initial deposit requirements and also lower interest rates.
4. Accessibility of land to prospective developers should be made easier. This may be accomplished through advertising of available plots within the local growth centres by the Commissioner of Lands.
5. The Survey Department should ensure that survey work on allocated plots is speedied.
6. The use of local and cheap building materials for the construction of decent housing should be encouraged. More research on such local materials as coral limestone, Makuri and Boriti is also advocated.
7. Local Authorities should have qualified personnel for the enforcement of the building by-laws.
8. Undeveloped plots should be re-allocated.

ACTION: The Ministry of Works Housing and Physical Planning
The National Housing Corporation
The Kwale District Development Committee

2. SANITATION AND WASTE DISPOSAL

The problems contributing to the inadequacy of the state of sanitation and waste disposal methods in most of the local growth centres were highlighted as:

- (a) shortage of funds for the construction of proper sewerage facilities;
- (b) while the availability and high dependence on pit latrines is alleviating sanitation problems, there are possibilities of groundwater being contaminated;
- (c) the possible pollution of river Uмба by the Lunga-Lunga treatment ponds.

RECOMMENDATIONS

The need to avert the possible pollution of river Uмба in future was noted. In view of this the relevant authorities were urged to ensure that:

- i. there should be no introduction of toxic materials in the Lunga-Lunga stabilisation ponds;
- ii. the ponds should never be overloaded.

ACTION: The Ministry of Works Housing and Physical Planning
The Ministry of Water Development

3. RECREATIONAL FACILITIES

Kwale District is well endowed with such naturally occurring recreational facilities as beaches and wildlife sanctuaries. However, inadequacies as far as these facilities are concerned were pin-pointed as:

- (a) there is a pronounced lack of sports grounds in most growth centres;
- (b) most of the good beach plots have been acquired by private developers thus limiting public access to the beach.

RECOMMENDATIONS

it was noted that some developers occasionally divert plots set aside for sports facilities to other uses. In view of this, it was recommended that:

- i. the physical plans should be strictly adhered to by any prospective developers;
- ii. the law should be amended where necessary to provide stiffer penalties to the developers who violate the set town plans;
- iii. the public should have easy access to the beach;
- iv. sports grounds should be provided in the growth centres.

4. TOWN PLANNING AND DEVELOPMENT

Proper town planning is a vital aspect of development. Within Kwale District, however, this is being hampered by:

- (a) lack of capital which hinders the development of the required basic infrastructures;
- (b) some areas which could be developed in future as towns are occupied by squatters. This problem is complicated further by the fact that most of these do not even know that they are squatters.

RECOMMENDATIONS

- i. The Kwale County Council should endeavour to look for sources of development capital.

ii. The squatter problem should be looked at by the District Development Committee.

5. INDUSTRIAL POLLUTION

In spite of industries being a base for development, they unfortunately, are a major source of environmental degradation within the district. Problems pertaining to industries were identified as:

- i. the possible pollution of the Tiwi aquifer by the seepage of industrial effluents from the Bixa Factory;
- ii. noise and vibration pollution as well as air pollution as a result of the crushing processes at the Calcium Products Factory at Waa;
- iii. pollution of River Ramisi and air by the Ramisi Sugar works;
- iv. the erosion of the local cultural values through the influence of tourists.

CONSEQUENCES

The pollution emanating from the Lime Factory and also the Bixa Factory was considered environmentally hazardous in the sense that there may result in:

- (a) Possible contamination of groundwater by the seepage of industrial effluents. The danger of possible pollution here was noted in view of the fact that there are many boreholes within this area.
- (b) Noise pollution as well as the calcium carbonate dust pose health hazards to the workers.
- (c) Damage (scarring) to the landscape done by open pit blasting of rocks.

Consequences as a result of pollution by the Associated Sugar Company at Ramisi are:

- (a) Adverse effects on the ecological balance within the River Ramisi and the Ocean.
- (b) Air pollution.
- (c) Health hazards posed to the staff and their dependents during the removal of human waste by buckets from the septic tanks for burial elsewhere. There are sewage exhausters available for hire from the Ministry of Works, Housing and Physical Planning.

While appreciating the fact that tourism as an industry is vital for development, the meeting, however, expressed its concern as to the

consequences resulting from the pollution of the local culture by tourism. The consequences highlighted were:

- (a) Contribution to the break-up of the family unit along the tourist zone.
- (b) Increase in cases of juvenile delinquency.
- (c) The proliferation of drug abuse.
- (d) Encouraging school drop-out.
- (e) Providing the basis for prostitution.
- (f) Uncontrolled collection of sea-shells, thus interfering with marine life.

ACTION BEING TAKEN

The positive action being taken to ward-off these environmental problems, includes:

- (a) Standards are being drafted by the Factories Inspectorate to deal with noise pollution.
- (b) Firms are being urged to operate under certain anti-pollution standards.

RECOMMENDATIONS

In view of the numerous environmental hazards posed by the above mentioned industries, it was recommended that:

1. No factory should be allowed to operate without meeting minimum anti-pollution measures.
2. There should be compulsory lessons given to factory workers, especially shop stewards and supervisors as to the health hazards involved in their work environment.
3. The updating of the Factories Act so as to suit the modern production methods should be hastened.
4. The Hama Lime Company is required to rehabilitate the landscape using as an example the land rehabilitation project at Bamburi.
5. Research on divorce rates should be initiated so as to determine its extent and courses.
6. There should be concerted efforts by the relevant Government institutions to intensify surveillance, monitoring and enforcement of the relevant environmental pollution legislation viz. noise, air, water and

working environment.

ACTION: The Ministry of Commerce and Industry
The Ministry of Labour
The Ministry of Water Development
The Ministry of Environment and Natural Resources
The Ministry of Culture and Social Services

6. WORKING CONDITIONS

The working environment of people in some of the industries leaves a lot to be desired. The problems highlighted include:

- (a) Noise and dust at the Calcium Factory.
- (b) Scarcity of water in such centres as Kinango.

RECOMMENDATION

Factory owners should be urged to provide their staff with decent houses properly ventilated and with water-borne sanitation where possible.

ACTION: The Ministry of Works, Housing and Physical Planning
The Ministry of Water Development
The Ministry of Labour

ENVIRONMENTAL EDUCATION

The topics discussed together with recommendations were as follows:

1. CURRICULUM REVIEW

The following observations concerning both primary and post-primary education were noted:

- (a) Although the Primary School Syllabus calls for more involvement of teachers in environmental education, it is handicapped by the fact that a large portion of primary school teachers are untrained, both professionally and in particular to teach environmental conservation. Primary schools in the district have problems which affect effective teaching of environmental education such as:
 - (i) The majority of schools are poorly equipped to teach environmental education.
 - (ii) Some schools occupy undefined boundaries, therefore, long-term developments cannot be initiated, such as tree planting.
 - (iii) Some schools own tiny plots which leave no space for demonstration plots or for out of door activities.

- (b) Secondary school curriculum has recently been revised, putting more emphasis on environmental education. This has come as a result of frequent announcements and involvement of leaders in environmental conservation.
- (i) Nearly all subjects now have environmental components. This shows that environmental education is being more seriously considered than in the past. This will be more so when agriculture becomes compulsory subject in all schools.
 - (ii) Environmental clubs, wildlife clubs, geographical clubs etc. are emphasised and these are intended to expose students to wider environmental problems and propose ways of solving them.
 - (iii) Outings and visits to areas outside the classrooms are encouraged to enable students to interact with their local environments and the surrounding communities to gain practical experiences.
- (c) Primary Teacher Training Syllabus has not yet been revised to orientate teachers to changes in the school curriculum.
- (i) This means environmental education is not adequately being imparted to trainee teachers. This has the implication that the enthusiasm of teachers to teach environmental conservation will depend on individual inclination and initiative.
 - (ii) Kenya Science Teachers College, however, is better equipped as their syllabus has been adjusted to suit the changes in school curriculum.
- (d) Adult Education Programmes although intended to improve conditions of the illiterate populations, the public response has not been adequate. More women than men attend classes. The adults have shown little interest in environmental education. This can be attributed to the following factors:
- (i) Adults are more interested in activities that seem to be of immediate and tangible benefits.
 - (ii) Social-cultural negative attitude towards manual work is deeply entrenched.

Positive developments as far as E.E.* curriculum is concerned were noted to be spearheaded by the following institutions, which/will provide manpower to Kwale institutions:

* Environmental Education

1. Kenya Science Teachers College, Moi Science Teachers College, and Kenya Technical Teachers College.
2. Kenya Polytechnic.
3. The proposed establishment of a faculty of environmental studies at Moi University.

RECOMMENDATIONS

- (i) The Kenya Institute of Education (K.I.E.) should revive the environmental education panel and broaden its representation so that it becomes a viable advisory body on the inculcation of environmental components into the education system.
- (ii) In-servicing of teachers should be encouraged. This could be done through utilisation of locally available resources and facilities. The non-governmental organisations (NGOs) could be involved in this exercise as some of them have funds as well as facilities e.g. Family Planning Association, National Christian Council of Kenya (NCCCK), Catholic Diocese of Mombasa etc.
- (iii) The syllabus for training of chiefs and assistant chiefs at Matuga Development Centre should include aspects of environmental conservation. Similarly, all in-service seminars and courses at the centre should incorporate environmental education.
- (iv) Schools which stand on unregistered land should get the land demarcated and registered.
- (v) Sufficient lands should be allocated during land adjudication so that they may have space for demonstration plots.
- (vi) The National Environment Secretariat should be decentralised so that it is represented at district level to provide co-ordination of environmental conservation and environmental education activities.

2. MATERIALS AND TEACHING AIDS

Matuga Development Centre has developed teaching materials to cover many aspects of environmental education. These range from demonstration plots on agro-forestry (fuelwood and crops) animal husbandry, biogas to visual aids (posters and slides).

- (i) Each of the chiefs and assistant chiefs who attend courses at the Centre Plant a Remembrance Tree before they depart from the Centre.

- (ii) A proposed resource centre at the centre is expected to cater for local and national needs. It will provide teaching materials for all subjects, but with emphasis on environmental education and family planning.
- (iii) At district level, each educational zone is being encouraged to develop its own appropriate teaching materials through the development of Teachers' Advisory Centres.

RECOMMENDATIONS

- (i) The National Environment Secretariat should support the Resource Centre at Matuga, by providing additional materials, such as books, posters, slides etc. At the initial stages the Centre could benefit from N.E.S. expertise on request.
- (ii) The District Development Committee should set up an environmental education committee to enhance the teaching of environmental conservation in the district. The membership of such committee should include representatives from the Ministry of Education, Science and Technology, Ministry of Environment and Natural Resources, Non-Governmental Organisations, and any other Ministries and Departments that may have a contribution to make.

An adhoc steering committee was appointed that will devise the necessary procedure on how to approach the District Development Committee. This committee was made up of the following persons:

Mr. P.K. Gichohi	-	Chairman
Mr. A.M. Mutua	-	Secretary
Mr. P. Njogu		
Mr. E.A. Aoko		
Mrs. G.N. Wanyonyi		
Mr. J.N. Mumba		
Representative from non-governmental organisations (NGOs)		

3. ENVIRONMENTAL STUDY AREAS

These are areas outside the classrooms in which learners could gain practical experience on environmental problems. Such areas could be on the school compound or outside, in urban centres or in the rural areas, at the sea front or inland.

RECOMMENDATIONS

All schools in the district should select areas nearest to them and designate them as environmental study areas. These could include botanical

gardens, forest reserves, coral reefs, school compounds or demonstration plots on which varieties of local crops are grown. The purpose of such areas should be to encourage students and the surrounding communities to be physically involved in environmental conservation.

(i) The National Environment Secretariat (N.E.S.) should explore possibilities of establishing a national environmental clubs co-ordination centre (like that of the Wildlife Clubs of Kenya). This leadership is urgently needed to encourage volunteer teachers who are burdened with the task of environmental education in schools with little support or recognition. This will also stimulate students to be more interested in such clubs.

(ii) Further incentives for propagation of environmental clubs could be provided by N.E.S., NGOs etc. by looking for funds to finance more seminars for teachers in charge of environmental clubs and sponsor field trips for teachers and students.

4. EXTENSION SERVICES IN RELATION TO ENVIRONMENTAL EDUCATION

The existing extension services are run on fragmentary basis, with each Ministry managing their own programmes irrespective of other Ministries.

RECOMMENDATIONS

(i) Environmental conservation needs a holistic approach in resource management. The existing extension workers should be offered in-service training so that each individual can offer environmental education in the course of their work.

To achieve this objective seminars for extension officers in the district are needed. Matuga Development Centre can provide a venue for such seminars. Chiefs and Assistant Chiefs should participate in such seminars.

(ii) The National Environment Secretariat should have a follow-up to ensure that there is implementation of recommendations made in seminars such as this one.

5. NON-GOVERNMENTAL ORGANISATIONS

RECOMMENDATIONS

(i) Non-governmental organisations should be encouraged to incorporate environmental education in their programmes.

(ii) Project appraisals in the district should include Environmental Impact Assessment to minimise pollution and other adverse environmental impacts once such projects have been established.

(iii) Kwale District has a large muslim community. There is need to involve their organisations in environmental conservation e.g. Muslim Youth Council.

6. EDUCATION OF ADMINISTRATORS AND DECISION-MAKERS

The involvement of administrators and decision-makers is very crucial in environmental conservation. They make the policies, vote for the funds and wananchi listen to them. It is therefore important for the success of environmental education to gain support of these persons. An informed decision-maker will make a sound decision.

RECOMMENDATIONS

- (i) Environmental seminars/workshops should be organised for this cadre at district level, divisional level and locational level. The participants of such seminars should include members of the District Development Committee, Heads of Schools both at primary and high school levels.
- (ii) The media including the newspapers, radio, television should be more aggressive in giving environmental information. Animated television cartoons should be used to reach wide audience. Traditional comedians such as Mzee Pembe, Vitimbi could be used to disseminate environmental information to members of the public.
- (iii) Public barazas, drama, folklores etc. should wherever possible be used to further environmental awareness.
- (iv) Environmental posters, slogans on T-Shirts and Khanga, Calendars, etc. should be widely distributed by N.E.S.
- (v) The District Development Committee should launch afforestation campaign in the district. The Ministries with offices in Kwale should provide the initiative by each officer getting involved in the exercise. This will be one of the best ways of educating the local population on the need for environmental conservation.

7.0

LIST OF WORKSHOP PARTICIPANTS

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9.0

APPENDICES

APPENDIX 9.1 SPECIES IN EACH VEGETATION ZONE

Typical species in each vegetation zone outlined in 1.3.1 are presented below. The natural vegetation in these zones has been substantially altered in some cases and few of the original species may now be found. The source for this list is Moomaw (1960) with some modifications such as updated nomenclature.

TABLE 9.1 LIST OF SPECIES IN EACH VEGETATION ZONE

I. Acacia Thorn Bushland

Acacia lahai
A. seyal
A. senegal
A. zanzibarica
Euphorbia nyikae
E. tirucalli
Commiphora scheffleri
Boscia salicifolia
Dobera glabra
Adenia globosa
Sansevieria kirkii
Chloris myriostachya

II. Lowland Dry Forest

Manilkara sansibarensis
M. spp.
Afzelia quanzensis
Diospyros vaughanii
Brachylaena hutchinsii
Croton pseudopulchellus
Grewia villosa
Sideroxylon diospyroides
Terminalia prunoides
Psychotria punctata
Thespesia danis

Lowland (Dry) Cultivated Savanna

Manilkara densiflora
Dalbergia melanoxyton
Acacia mellifera
Diospyros sp.
Pilostigma thonningii
Sclerocarya caffra
Hyparrhenia spp.
Themeda triandra
Panicum spp.

III. Lowland Woodland

Brachystegia spiciformis
Trachylobium verrucosum (Hymenaea verrucosa)
Paramacrolobium caeruleum
Julbernardia magnistipulata
Afzelia quanzensis
Lansea stuhlmannii
Combretum sp.
Vitex mombassae
Tinnea aethiopica
Manilkara sulcata

IV. Lowland Dry Forest on Coral Rag

Coastal Thicket

Combretum schumannii
Cassipourea euryoides
Zanthoxylum chalybeum
Hyphaene compressa
Adansonia digitata
Gyrocarpus jacquini

Lantana camara
L. viburnoides
Commiphora lindensis
Securinega virosa
Grewia glandulosa
Bridelia micrantha

V. Lowland Rain Forest

Chlorophora excelsa
Sterculia appendiculata
Antiaris toxicaria
Gyrocarpus jacquini
Newtonia paucijuga
Paramacrolobium coeruleum
Cynometra suaheliensis
Tabernaemontana holstii
Dracaena usambarensis
Monodora grandieri

VI. Lowland Moist Savanna

Afzelia quanzensis
Albizia anthelmintica
Hyphaene compressa
Ozoroa obovata
Ziziphus mauritiana
Annona chrysophylla

Dichrostachys cinerea
Panicum spp.
Themeda triandra
Pennisetum polystachyon
Sporobolus pyramidalis

VII. Mangrove thicket

Rhizophora mucronata
Avicennia marina
Sonneratia alba
Ceriops tagal
Bruguiera gymnorrhiza
Lumnitzera racemosa
Sporobolus virginicus
Suaeda monoica

VIII. Beach Crest and Coral Cliff

Capparis cartilaginea
Pemphis acidula
Cissus rotundifolia
Cordia somaliensis
Ipomoea pes-caprae
Cyperus maritimus
Dodonaea viscosa
Casuarina equisetifolia

IX. Pans and Ponds

Nymphaea spp.
Echinochloa haploclada
Setaria sphacelata
Sorghum verticilliflorum

TABLE 9.2 SPECIES RECORDED DURING THE SURVEY OF SHIMBA FOREST

Latin Name	Local or Common Name	Species Abbreviation
<i>Oldfieldia somalensis</i>	Mbambara	BBR
<i>Tamarindus indica</i>	Mkwadju	KDJ
<i>Diospyros</i> spp.	Mkulu	KUL
<i>Azelia quanzensis</i>	Mbamba-Kofi	MBK
<i>Trachylobium verrucosum</i>	Msandarusi	MDS
<i>Manilkara sansibarensis</i>	Mng'ambo	MGO
<i>Antiaris toxicaria</i>	Mguoguo	MLD
<i>Newtonia paucijuga</i>	Mleha	MLH
<i>Ekebergia rueppeliana</i>	Mununga	MNG
<i>Combretum schumannii</i>	Mgongolo	MOL
<i>Chlorophora exelsa</i>	Mvule	MV
<i>Brachystegia spiciformis</i>	Mrihi	RIH
<i>Memecylon buchananii</i>	Mtichuma	TCM
<i>Celtis mildbraedii</i>	Muruanje	URE
<i>Erythrina saculeuxii</i>	Mbambangoma	BAB
<i>Popowia</i> spp.	Mbarawa	BAW
<i>Drypetes natalensis</i>	Mshonduzi	BB
<i>Adansonia digitata</i>	Mbuvu	BUY
<i>Mangifera indica</i>	Muembe	EMB
<i>Lonchocarpus</i> spp.	Mfumbiri	FBL
<i>Allophylus</i> spp.	Mfunzakondo	FKD
<i>Vitex pyros</i>	Mfudu	FUD
<i>Vitex ferruginea</i>	Mfudumaji	FUJ
<i>Cynometra webberi</i>	Mfunda	FUN
<i>Ficus</i> spp.	Mgandikoma	GDK
<i>Combretum molle</i>	Mgoto	GOT
<i>Turraea robusta</i>	Mwalaga-kuku	GWK
<i>Millettia usaramensis</i>	Mhawa	HAW
<i>Thespesia danis</i>	Mhowe	HOW
<i>Cassia singueana</i>	Muhumba	HUB
<i>Albizia glaberrima</i>	Mkumbambega	KBB
<i>Scorodophloeus fischeri</i> (possibly)	Kifungazanzu	KFG
<i>Julbernardia maguistipulata</i>	Mkuha	KHA
<i>Teclear</i> spp.	Kikuro	KIK
<i>Leptactina platyphylla</i>	Mkokomwitu	KKW

Latin Name	Local or Common Name	Species Abbreviation
Not identified	Mkulausiku	KLK
<i>Huphaene parvula</i> (coriacea)	Mkoma	KOM
<i>Grewia plagiophylla</i>	Mkone	KON
<i>Toddalopsis sansibarensis</i>	Mkuro	KUR
<i>Paramacrolobium coeruleum</i>	Mkwe	KWE
Not identified	Mliakwembe	LKB
<i>Boscia angustifolia</i>	Mlolombuzi	LOB
Not identified	Mbwe	MBW
<i>Fagara chalybea</i>	Mdungu	MDG
<i>Ficus</i> spp.	Mugandi	MGD
<i>Sorindeia madagascariensis</i>	Mkunguma	MGM
<i>Stereospermum kunthianum</i>	Migondo	MGN
<i>Maytenus ovatus</i>	Muthuthi	MH
<i>Albizia gummifera</i>	Mukurue, Msani	MKW
<i>Euclea</i> spp.	Mlala	MLA
<i>Farnandoa magnifica</i>	Mlangalanga	MLG
<i>Albizia versicolor</i>	Mchanimbao	MMO
<i>Trichilia emetica</i>	Mnuamaji	MNJ
<i>Dracaena usambarensis</i>	Mshindamaji	MNM
Not identified	Mplalawa	MPW
<i>Conopharyngia holstii</i>	Kibombo	MRR
Prob <i>Cassia</i> spp.	Msanju	MSJ
Not identified	Mtwanda	MTW
<i>Rawsonia lucida</i>	Mutemana	MU
<i>Apodytes dimidata</i>	Muliambusi	MUE
<i>Sterculia appendiculata</i>	Mfune	MUF
<i>Ficus</i> spp.	Mugumo	MUG
<i>Bridelia micrantha</i>	Mureru, Mukoigo	MUI
<i>Blighia unijugata</i>	Muikuni, Musiama	MUN
<i>Bauhinia</i> spp.	Mwangu	MWG
Not identified	Mwaweche	MWH
<i>Uvaria</i> spp.	Mchizatsaka	MWK
<i>Pachystela brevipes</i>	Mwambo, Msamvia	MWO
Not identified	Munyanyakanda	MYD
Not identified	Mnyenya	MYE
<i>Cussonia zimmermannii</i>	Muyala	MYL
<i>Cassipourea euryoides</i>	Nkibantu	NRD

Latin Name	Local or Common Name	Species Abbreviation
<i>Lannea stuhlmannii</i>	Mnyumbu	NYB
<i>Sclerocarya caffra</i>	Mnyumbumaji	NUJ
<i>Parkia filicoidea</i>	Mnyenze	NYZ
<i>Markhamia zanzibarica</i>	Mpalawanda	PWD
<i>Diospyros squarrosa</i>	Mpweke	PWE
<i>Dalbergia</i> spp. (possibly)	Mranze	RAN
<i>Crossopteryx febrifuga</i>	Msongamwiko	SGK
<i>Lonchocarpus</i> spp.	Msumari-bara	SMB
<i>Croton jatrophaoides</i>	Msindusi	SNS
<i>Turraea</i> spp.	Mosanyama	SOM
<i>Heeria reticulata</i>	Msalasanga	SSG
<i>Malacantha alnifolia</i>	Msamviakoma	SVK
<i>Rhodognaphalon schumannianum</i>	Msufimwitu	SYM
<i>Celtis durandii</i>	Musienze	US
<i>Bridelia</i> spp.	Kivalakanga	VKG
<i>Alchornea laxiflora</i>	Mvunjajembe	VUJ
<i>Terminalia spinosa</i>	Mwanga	WAN
Not identified	Mnyelaso	YLS
<i>Manilkara sulcata</i>	Mzezi	ZEZ
<i>Syzygium cordatum</i>	Mzihae	ZIH
<i>Hunteria zeylanica</i>	Mziwaziwa	ZYZ

SOURCE: Shimba Hills Reserve Land Use Study
Draft Report Wildlife Planning Unit. Ecosystems Ltd.

APPENDIX 9.2

FISHING DATA

TABLE 9.3

SOME IMPORTANT FISH SPECIES OBSERVED IN KWALE DISTRICT

SCIENTIFIC NAME	ENGLISH NAME	SWAHILI NAME	SHIMONI	VANGA	DIANI	MSAMBWENI	GAZI	NOTES
Lethrinus sp.	Scavenger Emperor	Changu	X	X	X	X	X	Very important food fish
Siganus sp.	Rabbit Fish	Tafi	X	X	X	X	X	Very important food fish
Lutianus	Snapper/Sea Perch		X	X			X	
Parupeneus	Goat Fish						X	
Pseudopeneus Dasyatis	Sting ray	Taa		X	X		X	
Cheilinus	3-tailed Maori Wrasse	Stefue			X	X		Very common
Leptoscarus	Blue-speckled parrotfish				X	X	X	
Acanthurus	Tang Surgeon fish				X	X		
Caranx	King fish	Nguru	X		X			
Gaterin	Sweet lips		X		X			
Cephalopholus	Rock cod Groupers	(Tewa)	X					
Scarus	Parrotfish	Pono	X	X	X	X	X	Very common
Rhinecarthus	Trigger fish				X			
Halichoeres	Wrasse		X	X	X	X	X	Common. Not good eating
Platycephalus	Flathead	Vunbama			X		X	
Epinephalus	Rock cod	(Tewa)			X		X	

TABLE 9.4

SPORT FISHING IN KWALE DISTRICT

Sport fishing facilities are offered at several beach hotels by a few private individuals and at Pemba Channel Fishing Club which caters for overseas visitors seeking game fish. There has not been a decline in sport fish catches in recent years.

<u>ENGLISH NAME</u>	<u>LATIN NAME</u>	<u>TYPICAL WT.</u>	<u>NOTES</u>
<u>Sharks</u>			
Tiger Shark	<i>Galeocerda duvleri</i>	250-400 lbs	Hot season
Mako Shark	<i>Isurus glaucus</i>	300 lbs	All year
Hammerhead Shark		288 lbs	Nov.-March
Black tip Shark		(150 (250)	
Lazy Grey Shark	<i>Scyliahinus capensis</i>		
White tip Shark	<i>Carcharodon carcharias</i>		Sept/Oct
Blue Shark			Strays, rarely seen
Long Finned Shark	<i>Alopias valpinus</i>		
Oceanic Bonito			
Common Bonito			
Yellowfish Tuna (Tunny)	<i>Neothunnus macropterus</i>	100 lbs	S.E. Monsoon
Sailfish	<i>Istiophorus orientalis</i>		Feb/March Oct/Nov
Stripped Marlin	<i>Makaira audax</i>	150 lbs	
Blue Marlin	<i>Makaira nigricans</i>	167 lbs	S.E. Monsoon
Black Marlin	<i>Istiompax marlina</i>	154 lbs	
Broadbill swordfish	<i>Xiphias gladius</i>		
Barracuda	<i>Sphaeridae</i>		
Frigate Mackerel	<i>Katsuwonus pelamis</i>		
Wahao	<i>Acarthocyburim solandri</i>	100 lbs	All year
Dolphin Fish or Darado	<i>Coryphaena hippurus</i>		Migrates/All year

TABLE 9.5

SHELL COUNT AT DIANI, NOVEMBER, 1983

SPECIES	LOCATION				
	ROBINSON'S BAOBAB (1)	ROBINSON'S BAOBAB (2)	TWO FISHES	KIOSKS - DIANI BEACH ROAD I	II
<i>Cypraea tigris</i>	100	70	15 + 20	100	120
<i>C. Maureitiana</i>	<20	<20	-	-	-
<i>C. clandestina</i>	1		-	-	-
<i>C. annulus</i>			-	-	-
<i>C. moneta</i>			-	-	10
<i>C. talpa</i>	1		1 + 12	-	-
<i>C. testudinaria</i>	2		-	7	3
<i>C. argus</i>	2	1	- 1	-	1
<i>C. caputserpentis</i>	4	-	2	3	31
<i>Tridacna squamosa</i>	70	20	30s 16L	<20	>25
<i>Chisoreus ramosus</i>	50	50	20	<20	<30
<i>Harpa major</i>	20	10	5	10	3
<i>Bursa bubo</i>	8	10	12	9	<15
<i>Pinctada margaritifera</i>	40	-	-	-	<20
<i>Cypraeassis rufa</i>	20	28	28	<10	<20
<i>Oliya sp.</i>	80	-	-	-	-
<i>Lambis sp.</i>)			10	<15	<20
<i>L. crocata</i>)	100	80	10	<15	<20
<i>Liscorpiis</i>)			10	<15	10
<i>L. arthritica</i>)			10	<15	20
<i>L. lambis</i>	6	6	15	6	15
<i>Turbo manuratus</i>	7	5	5	5	<45
<i>Charonia tritonis</i>	2	2	-	4	4
<i>Tonna galea</i>	-	3	-	-	-
<i>Conus leopardus</i>				1	<30
<i>Conus betulinus</i>					<10
<i>Conus textile</i>	1	1	-	-	-
<i>Conus geographicus</i>	1			-	2
<i>Conus stratus</i>	1	-	-	-	-
<i>Mitra mitra</i>	1		1	-	-
Auger shell	1			-	-
<i>Terebra maculata</i>					
<i>Ovula ovum</i>	6	3	5	-	5
<i>Strombus lentiginosus</i>	3			-	5
<i>Nautilus pompilius</i>			5	6	3
<i>Conus virgo</i>			1	-	3
<i>Cypraea vittellus</i>	-	-	-	15	75

NOTE: S = Small
L = Larger

TABLE 9.6

SHELL PRICES AT DIANI, NOVEMBER 1983, K.SHS.

SPECIES	HOTELS		KIOSKS		WHOLESALE
	ROBINSON'S	TWO FISHES	DIANI BEACH		
	ea.	ea.	ED. I ea.	II	
<i>C. tigris</i>	5-10	5	3-5		1088/1000 pcs
<i>C. testudinaria</i>	200-250	250	120-250	200	
<i>C. cladestina</i>	10		-	-	
<i>C. annulus</i>	1			1	
<i>C. moneta</i>	1		-	1	
<i>C. talpa</i>	25	80	-	40	
<i>C. argus</i>	140	60	-	-	
<i>C. caputserpentis</i>	2		12	-	
<i>Tridacna squamosa</i>	20		110	45	
<i>Harpa major</i>	20		10	5	1360/100 pcs
<i>Chicoreus ramosus</i>	20		20	15	
<i>Bursa bubo</i>	40	250	10	10	
<i>Pinctada spp</i> <i>margaritifera</i>	5		-	-	
<i>Cypraeacassis rufa</i>	25	40	5	10	1020-2040/100 pcs
<i>Lambis spp</i> grouped	10		5	10	
<i>Lambis truncata</i>	120	120	120	150	
<i>Turbo marmoratus</i>	250		40	60	
<i>Charonia tritonis</i>	s = 250 1 = 500		150 250	50 500	
<i>Tonna galea</i>	40		-	-	
<i>Conus spp.</i>	10		-	-	13.60/kg
<i>Conus tessulctus</i>	35		-	-	
<i>C. textile</i>	10		-	-	
<i>Mitra mitra</i>	25		-	-	
<i>Terebra maculata</i>	25		-	-	
<i>Ovula ovum</i>	15		5	10	
<i>Nautilus pompilius</i>	-	150	80	40	
<i>C. listeratus</i>			25	-	

TABLE 9.7

FISH SPECIES EXPORTED IN AQUARIUM FISH TRADE

<u>LATIN NAME</u>	<u>COMMON NAME(S)</u>	<u>NOTES</u>
Pterois volitans	Scorpion Fish Lion Fish Dragon Fish	These are caught for food by inshore fishermen and are a spectacular addition to lagoon fauna for the swimmer and goggler.
Other Pterois sp. Antemarius sp.	Angler Fish	Very fascinating fish. Have a long thread in front of mouth to attract other fish which it feeds on.
Arothron sp.	Puffer Fish) Toad Fish) Globe Fish) Blow Fish)	These are caught only when very small.
Diodar sp.	Porcupine sp.	Only caught when very small.
Carthigaster sp.	Long-nosed puffers	Small fish, grows only to 10 or 12 cm. Brilliantly coloured, extremely attractive.
Ostracion sp.	Box Fish	Extremely interesting fish, with a 'shell' of fused scales.
O. tertiginasum		Very bright colours.
O. tuberculatum		Can be used for food.
Rhinecanthus sp. e.g. R. aculeatus R. echarpe	Trigger Fish	Caught when small. Has dorsal fins modified into a defensive 'trigger'. Other genera of trigger fish are caught but these are commonly taken.

<u>LATIN NAME</u>	<u>COMMON NAME(S)</u>	<u>NOTES</u>
Many genera e.g. <i>Cartherines</i> <i>Amanses</i>	File Fish	Have a spine above the eye. Very interesting group.
<i>Acarthurus friastegus</i>	Convict Surgeon Fish	Taken when small. And important food fish to inshore fishermen.
<i>Acarthurus</i> sp. e.g. <i>A. lineatus</i> <i>A. leucosternon</i>	Surgeon Fish Tang	Many are collected. All are attractive with bright colours and markings.
<i>Zebrasoma</i> sp.	Sailfin-Tang	Rounded fish with large fins. Blue and yellow colours in particular.
<i>Labroides dinidiatus</i>	Cleaner Wrasse	A small bright fish. Has a special ecological importance in that it removes parasites from the skin of other fish.
<i>Thalassema</i> sp. e.g. <i>T. purpureum</i> <i>T. hebraicum</i>	Wrasses	All bright coloured. Are important food fish when mature.
<i>Abudefduf</i> sp. e.g. <i>A. dicki</i> <i>A. saxatilis</i>	Sergeant major	Small, colourful coral fish. Favourite aquarium fish.
<i>Chromis</i> sp. e.g. <i>Chromis dimidiatus</i> <i>Chromis caeruleus</i>	Puller	Small fish found in shoals above coral heads.
<i>Dascyllus</i> sp. <i>aruanus</i> e.g. <i>Dascyllus</i> <i>D. trimaculatus</i>	Humbag	Small, lively fish. Found near coral. Popular aquarium fish.
<i>Pomacentrus</i> sp. e.g. <i>P. tripunctatus</i> <i>P. sulfureus</i>	Damsel Fish Sergeant major fish Demoiselle	Small, bright fish. Very popular aquarium subjects.

<u>LATIN NAME</u>	<u>COMMON NAME(S)</u>	<u>NOTES</u>
Cantropyge sp. e.g. <i>C. bispinosus</i> <i>C. multispinus</i>	Angel Fish	
Amphiprion sp. e.g. <i>A. allardi</i> <i>A. akallopisos</i>	Clown Fish, Anemone Fish.	Has symbiotic relationship with the large sea anemones.
Pomacanthodes sp. e.g. <i>P. irrperator</i> <i>P. annularis</i>	Angel Fish	Beautiful fish with huge dorsal and vertical fins.
Chaetodon sp. e.g. <i>C. bennetti</i> <i>C. trifasciatus</i>	Coral Fish	Very ornate, round bodied, with large fins. Used as aquarium fish when young.

APPENDIX 9.3

TABLE 9.8

SERVICE CENTRES
SERVICE CENTRES AND INFRASTRUCTURE, KWALE DISTRICT

NAME OF CENTRE	DESIGNATION	ELECTRICITY	TELEPHONE	POST OFFICE	HEALTH FACILITIES	HOSPITAL	WATER SUPPLY MOWD	WASTE DISPOSAL	OTHER SERVICES
KWALE	Urban Centre	X	X	X		X	X	Septic tanks.	Mobile Bank Sec. School Police Station District Hqs.
KINANGO	Urban Centre	X	X	Agency		X	X	Septic tanks. Pit latrines.	Sec. School Loc/Sub-Loc. Hqs. Police Station Divisional Hq.
UKUNDA (DIANI)	Rural Centre	X	X	Agency	X		X	Septic tanks. Pit latrines.	Sec. School Police Post Location Hq.
MSAMBWENI	Rural Centre	Generator	X	Agency		X	X	Septic tanks. Pit latrines.	Police Station Sec. School
TIWI	Market Centre	X	X	Agency	X		X	Pit latrines.	Sec. School Police Post Loc/Sub-Loc. Hq.
NGOMENI	Market Centre	X	X	Agency	X		X	Pit latrines.	Sec. School Location Hq.
RAMISI	Market Centre	Private Generator						Pit latrines. Septic tanks	Police Post Sec. School Sub-Loc. Hq.
VANGA	Market Centre			Agency	X			Septic tanks. Pit latrines	Sub-Loc. Hq.
LUNGA-LUNGA	Market Centre	Private Generator	X	Agency	X		X	Sewerage system.	Police Station border post Sec. School
KIKOHENI	Market Centre		X	Agency	X		X	Pit latrines.	Loc/Sub-Loc. Hq.
NDAVAYA	Market Centre				X			Pit latrines.	Loc/Sub-Loc. Hq.
SAMBURU	Market Centre		X	Agency	X			Pit latrines	Loc. Hq.
TSUNZA	Local Centre							Pit latrines.	Sub-Loc. Hq.
GANDINI	Local Centre						X		Sub-Loc. Hq.
MATUGA	Local Centre	X	X	Agency	X		X	Septic tanks. Pit latrines.	Division/Loc. Hq.
WAA	Local Centre	X	X	Agency	X		X	Pit latrines.	Sec. School Loc/Sub-Loc. Hq.

NAME OF CENTRE	DESIGNATION	ELECTRICITY	TELEPHONE	POST OFFICE	HEALTH FACILITIES	HOSPITAL	WATER SUPPLY MOWD	WASTE DISPOSAL	OTHER SERVICES
KIGATO	Local Centre						X	Pit latrines.	Sub-Loc. Hq.
MUHAKA (Mwabungo)	Local Centre				X			Pit latrines.	Sub-Loc. Hq.
GAZI	Local Centre	Private Generator			X			Pit latrines.	Sub-Loc. Hq.
SHIMONI	Local Centre		X		X			Pit latrines.	Sub-Loc. Hq.
MAJORENI	Local Centre							Pit latrines.	Sub-Loc. Hq.
MWANGWEYE (MRIMA)	Local Centre							Pit latrines.	
MKOMBA	Local Centre						X	Pit latrines.	
MKONGANI	Local Centre				X		X	Pit latrines.	Loc/Sub-Loc. Hq.
MWANGULU	Local Centre							Pit latrines.	Loc/Sub-Loc. Hq.
MWERENI	Local Centre							Pit latrines.	Loc/Sub-Loc. Hq.
GULANZE	Local Centre							Pit latrines.	Loc. Hq.
VIGURUNGANI	Local Centre						X	Pit latrines.	Sub-Loc. Hq.
MATUMBI	Local Centre							Pit latrines.	Sub-Loc. Hq.
KINANGONI	Local Centre							Pit latrines.	Sub-Loc. Hq.
MACKINNON ROAD	Local Centre			Agency			X	Pit latrines.	Police Post Sub-Loc. Hq.
MAJI YA CHUMVI	Local Centre						X	Pit latrines.	
MAKAMINI	Local Centre				X		X	Pit latrines.	Loc/Sub-Loc. Hq.
SHIMBA HILLS	Local Centre			Agency	X		X	Pit latrines.	Divisional Hq. Loc/Sub-Loc. Hq. Police Post
LUKORE	Local Centre				X			Pit latrines.	Loc/Sub-Loc. Hq.
MAKUBE	Local Centre				X			Pit latrines.	

NAME OF CENTRE	DESIGNATION	ELECTRICITY	TELEPHONE	POST OFFICE	HEALTH FACILITIES	HOSPITAL	WATER SUPPLY MWD	WASTE DISPOSAL	OTHER SERVICES
MWALU-VANGA	Local Centre						X	Pit latrines.	
KILULU	Local Centre							Pit latrines.	
TARU	Local Centre			Agency	X			Pit latrines.	Sec. School Loc/Sub-Loc. Hq.
MWALU-PHAMBA	Local Centre							Pit latrines.	Loc/Sub-Loc. Hq.
MAJI-MBONI	Local Centre							Pit latrines.	
ESHU	Local Centre							Pit latrines.	
MAMBA	Local Centre							Pit latrines.	Sub-Loc. Hq.

APPENDIX 9.4

BEACH HOTELS

TABLE 9.9

RESPONSES FROM SELECTED BEACH HOTELS, KWALE DISTRICT 1983

LOCATION OF HOTEL	CAPACITY	OCCUPANCY				EMPLOYEES	WHEN BUILT	EXPANSION	PROBLEMS FACING TOURIST INDUSTRY	CHANGE IN TOURISM OVER THE LAST 20 YEARS
		DEC-FEB	MARCH-MAY	JUNE-AUG	SEPT-NOV					
Ukunda	22	80%	20%	30%	50%	30	1979	N/A	-	Development of more hotels
Ukunda	206	86%	50%	38%	43%	137	1935	1971 1977	Poor shopping facilities. No theatres. Thefts on beaches.	Over expansion in tourist hotels.
Shimoni	14	90%	10%	10%	30%	22	1961	N/A	Very poor roads. Lack of water and power.	Increase in fishing and goggling.
Ukunda	272	88.85%	49.42%	51.53%	60%	194	1939	1970 1973 1977	Beach boys	Tourist propensity to spend has been going down.

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CONFLICT IN VALUES	ENERGY				WATER		WASTE DISPOSAL
	Hot Water	Cooking	Lighting	Fridge	Drinking	Washing	
-	Electricity 100%	Gas 100%	Electricity 100%	-	Kwale mains	Boreholes	Loos-Soakaways Kithen-County Council.
Degradation of morals. Tourists should be made to appreciate African culture and observe their ethics.	Electricity 100%	Gas 100%	Electricity 100%	-	Kwale pipeline	Kwale pipeline	Sewage system by cesspit 2-3 km from the beach.
Tourists should not use beach wear away from beaches.	Solar 100%	Gas 100%	Electricity 100%	Electricity 50% Gas 50%	Roof catchment	Well	Waterborne sanitation 92.3 metres from the sea.
Social habits of local people seem to merge into those of tourists which is a difficult problem to solve.	Electricity 100%	Gas 100%	Electricity 100%		Kwale pipeline	Kwale pipeline	Sewage disposal 3 km from hotel beach. Dustbins collected by Kwale County Council.

APPENDIX 9.5

CO-OPERATIVES

TABLE 9.10

INVENTORY OF CO-OPERATIVE INFRASTRUCTURE, KWALE DISTRICT, 1983

CO-OPERATIVE SOCIETY NAME	DIVISION	LOCATION	TYPE	FUNCTIONS PERFORMED	ACTIVE/DORMANT	MEMBERSHIP
<u>Farmers Co-operative Society</u>						
1. Lunga-Lunga FCS Ltd	Msambweni	Lunga-Lunga	Marketing	Buys dry produce	Active	300
2. Shimba Hills FCS Ltd	Kubo	Lukore/MJN	Marketing	Buys dry produce	Active	800
3. Vanga FCS Ltd	Msambweni	Vanga/Lunga	Marketing	Buys dry produce	Half dormant	-
4. Mkongani FCS Ltd	Kubo	Mkongani	Marketing	Buys dry produce	Active	64
5. Kwale FCS Ltd	Msambweni	Msambweni	Marketing	Buys dry produce	Active	900
6. Kikoneni FCS Ltd	Msambweni	Kikoneni	Marketing	Buys dry produce	Active	528
<u>Dairy</u>						
7. Kinango Milk Dairy CS Ltd	Kinango	Kinango	Dairy	Milk marketing	Dormant	-
8. Mwereni Milk Dairy CS Ltd	Kinango	Mwereni	Dairy	Milk marketing	Dormant	-
9. Ndavaya Milk Dairy CS Ltd	Msambweni	Ndavaya	Dairy	Milk marketing	Dormant	-
10. Puma Milk Dairy CS Ltd	Kinango	Puma	Dairy	Milk marketing	Dormant	-
11. Samburu Milk Dairy CS Ltd	Kinango	Samburu N & S	Dairy	Milk marketing	Dormant	-
<u>Others</u>						
12. Chenze Ranch	Kinango	Puma	Ranching	Ranching	Active	-
13. Coast Hinterland LSK Marketing	Kinango	Kilibole	Livestock	Buying of livestock	Dormant	102
14. Kaya Farmers Co-op. Society Ltd	Matuga	Tsimba	Marketing	Buys dry produce	Dormant	-
15. Kwale Multi-purpose CS Ltd	Matuga	Hg'ombeni	Multi-purpose	Sand marketing	Half dormant	80
16. Kitsakama FCS Ltd	Matuga	Waa	Farm P.	Farm purchase	Dormant	135
<u>Savings and Credit</u>						
17. Baobab Co-op. Savings & Credit Ltd	Msambweni	Diani	CS-CS	Savings & Loans to members	Active	148
18. Chokaa Co-op. Savings & Credit Ltd	Matuga	Waa	CS-CS	Savings & Loans to members	Active	76
19. Jadini CS-CS Ltd	Msambweni	Diani	CS-CS	Savings & Loans to members	Active	128
20. Kwale Civic CS-CS Ltd	Matuga	Tsimba	CS-CS	Savings & Loans to members	Active	129
21. Kwale Teachers CS-CS Ltd	Matuga	Tsimba	CS-CS	Savings & Loans to members	Active	468
22. Leopard CS-CS Ltd	Msambweni	Diani	Sav. & Cr.	Savings & Loans to members	Active	138
23. Ramisi CS-CS Ltd	Msambweni	Msambweni	CS-CS	Savings & Loans to members	Active	530
24. Trade Winds CS-CS Ltd	Msambweni	Diani	CS-CS	Savings & Loans to members	Active	111
25. Two Fishes CS-CS	Msambweni	Diani	CS-CS	Savings & Loans to members	Active	174
26. Leisure Lodge CS-CS	Msambweni	Diani	CS-CS	Savings & Loans to members	Active	244
27. Diani Sea Lodge CS-CS Ltd	Msambweni	Diani	CS-CS	Savings & Loans to members	Active	46

CO-OPERATIVE SOCIETY NAME	DIVISION	LOCATION	TYPE	FUNCTIONS PERFORMED	ACTIVE/DORMANT	MEMBERSHIP
<u>Fisheries</u>						
28. South Coast Fishermen CS-CS	Msambweni	Pongwe/Kidimu	Fisheries	Fish marketing to members	Active	5
29. Mwachugu Fishermen CS-CS Ltd	Msambweni	Pongwe/Kidimu	Fisheries	Fish marketing to members	Active	185
30. Shimoni Fishermen CS-CS Ltd	Msambweni	Pongwe/Kidimu	Fisheries	Fish marketing to members	Active	161
31. Msambweni Fishermen	Msambweni	Pongwe/Kidimu	Fisheries	Fish marketing to members	Active	177
32. Diani Fishermen CS Ltd	Msambweni	Pongwe/Kidimu	Fisheries	Fish marketing to members	Active	84
33. Majoreni Fishermen CS Ltd	Msambweni	Pongwe/Kidimu	Fisheries	Fish marketing to members	Active	125
34. Diani Peef CS-CS Ltd	Msambweni	Diani	CS-CS	Savings & Loans to members	Active	11
35. Golden CS-CS Ltd	Msambweni	Diani	CS-CS	Savings & Loans to members	Active	87
36. Mbuguni/Tembo Farmers CS-CS	Matuga	Mbuguni	Marketing	Buys dry produce	Active	10
37. Mramanga Farm Purchase	Msambweni	Diani	Farm purchase		Active	320
38. Kenya Bixa	Matuga	Tiwi	CS-CS	Savings & Loans to members	Proposed	
39. Mwalupamba Farmers Co-op. Society	Kubo	Malupamba	Marketing	Produce buying	Proposed	
					TOTAL	6250

- Remarks:
- (a) The Five Fishermen Co-operative Societies are affiliated to the south coast Fishermen Co-operative Union.
 - (b) Dairy Co-operative Societies fall dormant due to the failure of Kwale/Kilifi Dairy Co-operative Union Ltd.
 - (c) Kwale District Co-operative Union is under liquidation.

SOURCE: District Co-operative Officer, Kwale District 1983

TABLE 9.11

TURNOVER AND ASSETS OF SELECTED CO-OPEPATIVES, KWALE DISTRICT 1983

SOCIETY NAME	ANNUAL TURNOVER 1983 K.SHS.	CONDITIONS OF PHYSICAL ASSETS	UTILISATION	IMPROVEMENTS NEEDED
Kikoneni Farmers Co-operative Society	28,000	One vehicle, stores and offices.	Transportation of dry produce and eggs.	Bigger vehicle with a larger carrying capacity is needed.
Kwale Farmers Co-operative Society	1,390,000	One vehicle and store.	Transportation of dry produce and sugar-cane.	More transport is needed.
Shimba Hills Farmers CS-CS	29,000	One vehicle and store.	Transportation of dry produce.	Bigger vehicle with a larger carrying capacity is needed.
Mwagugu Fishermen Coop-rative Society	455,000	Consumer shop and vehicle.	Transportation of fish.	The vehicle is too old. A new vehicle is needed.
South Coast Fishermen Co-operative Society	1,203,000	One vehicle.	Service vehicle.	A refrigerated vehicle for fish transportation, a cold storage and chillroom needed.

APPENDIX 9.6

DROUGHT YEARS IN KWALE DISTRICT

STATION	YEARS OF RECORD	DROUGHT YEARS	MISSING RECORDS
Kikoneni Dispensary	1956-83	1956, 62, 65, 69, 71, 74-6, 80, 83	
Lunga-Lunga School	1951-83	1952, 55, 59-60, 62, 64-5, 70-1, 73-5, 80	1953, 81-2
Msambweni D.O.	1936-82	1943, 49-50, 52, 54-6, 58, 62, 64-5, 69, 71, 74-6, 80	1970, 77-9, 81
Tiwi Dispensary	1940-78	1945, 49, 54-5, 58, 62, 64, 70-1, 73-6	1942-4, 48, 50, 52, 56
Mwangulu	1949-83	1949, 52, 55, 58, 70-71, 74-5, 80	1953, 56-7, 59-60, 66, 76, 82
Samburu Rw. Stn.	1930-81	1931, 33-35, 41, 43, 44, 52, 54-6, 58, 62, 65, 71	1945
Kwale Agric.	1912-83	1912-4, 16, 18, 21, 23, 28, 30, 33, 35, 43, 49, 52, 54, 56, 69-71, 74-6, 80, 83	1917, 22, 24, 44
Gazi Kenya Sugar	1935-83	1949, 52, 69, 71, 75, 80	1942, 64, 82
Vanga Primary School	1936-83	1943, 49, 52, 54-6, 59-60, 62, 64-5, 70-71, 80	1982
Shimba Hills S.S.	1952-83	1952, 56, 58, 62, 64, 69-71, 73-76	1955

NOTE:

Drought year is counted where annual rainfall is less than the 60% reliability amount.

SOURCE-

Meteorological Department 1983